

# Sketch Up and Lumion 1



**University of Global Village (UGV),**

**Barishal**

| COURSE INFORMATION                           |  |
|--|--|
| SketchUp and Lumion I                        |  |
|  |  |
| PRE-REQUISITE                                |  |
| Civil Engineering Drawing Lab I, AUTO CAD 2D |  |

| No.  | Course Learning Outcomes  |
|------|---|
| CLO1 | Master the SketchUp Interface: Gain a comprehensive understanding of the SketchUp user interface, tools, and workflows.           |
| CLO2 | Create 3D Models: Model basic shapes, objects, and scenes using fundamental modeling techniques.                                  |
| CLO3 | Utilize Advanced Modeling Tools: Employ advanced tools like Push/Pull, Follow Me, and Intersect Face to create complex 3D models. |
| CLO4 | Apply software knowledge to solve engineering problems effectively.   |
| CLO5 | Plan effectively to work individually and in a group.   |

| SI | Content of Course   | Class Time (hr) | CLOs |
|----|---|-----------------|------|
| 01 | <p><b>Introduction to SketchUp</b></p> <p> Understanding the Interface:</p> <ul style="list-style-type: none"> <li>• Navigating the 3D workspace</li> <li>• Using basic tools like Line, Arc, Circle, and Rectangle</li> </ul> <p> Creating Basic Shapes:</p> <ul style="list-style-type: none"> <li>• Drawing 2D shapes and extruding them into 3D objects</li> <li>• Using the Push/Pull tool to modify shapes</li> </ul> <p> Working with Components and Groups:</p> <ul style="list-style-type: none"> <li>• Organizing models into reusable components</li> <li>• Creating complex models by combining</li> </ul> | 03              | CLO1 |

|    |   |    |                        |
|----|---|----|------------------------|
|    | components  |    |                        |
| 02 | <p><b>Basic Modeling Techniques</b></p> <p>🎬 Modeling Complex Forms:</p> <ul style="list-style-type: none"> <li>• Using the Follow Me tool to create complex shapes</li> <li>• Working with Intersections and Unions</li> </ul> <p>🎬 Creating Realistic Details:</p> <ul style="list-style-type: none"> <li>• Modeling doors, windows, and other architectural elements</li> <li>• Adding details like moldings and cornices</li> </ul> <p>🎬 Using Layers and Tags:</p> <ul style="list-style-type: none"> <li>• Organizing models effectively</li> <li>• Isolating and hiding objects</li> </ul>                               | 12 | CLO2,<br>CLO3,<br>CLO4 |
| 03 | <p><b>Working with Components</b></p> <p>🎬 Importing SketchUp Models:</p> <ul style="list-style-type: none"> <li>• Transferring models from SketchUp to Lumion</li> </ul> <p>🎬 Basic Scene Setup:</p> <ul style="list-style-type: none"> <li>• Creating a realistic environment with sky, ground, and vegetation</li> </ul> <p>🎬 Applying Materials and Textures:</p> <ul style="list-style-type: none"> <li>• Assigning materials to objects in Lumion</li> </ul> <p>🎬 Basic Lighting and Rendering:</p> <ul style="list-style-type: none"> <li>• Setting up lighting conditions</li> <li>• Rendering simple images</li> </ul> | 09 | CLO2,<br>CLO3,<br>CLO4 |

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|----|--|----|---------------------------------|
| 04 | <p><b>Materials and Textures</b></p> <ul style="list-style-type: none"> <li>  Applying Materials and Textures: <ul style="list-style-type: none"> <li>• Assigning materials to surfaces</li> <li>• Creating custom materials and textures</li> </ul> </li> <li>  Using the Texture Browser: <ul style="list-style-type: none"> <li>• Accessing and applying pre-made textures</li> </ul> </li> <li>  Creating Realistic Materials: <ul style="list-style-type: none"> <li>• Adjusting material properties like color, glossiness, and roughness</li> </ul> </li> </ul>  | 06 | CLO2,<br>CLO3,<br>CLO4          |
| 05 | <p><b>Scenes and Cameras</b></p> <ul style="list-style-type: none"> <li>  Save Camera Views: Save specific camera positions and orientations as scenes. </li> <li>  Manage Scenes: Rename, delete, and reorder scenes. </li> <li>  Animate Scenes: Create animations by transitioning between different scenes. </li> </ul>   | 06 | CLO2,<br>CLO3,<br>CLO4          |
| 06 | <p><b>Rendering and Exporting</b></p> <ul style="list-style-type: none"> <li>  Introduction to Rendering: <ul style="list-style-type: none"> <li>• Understanding the rendering process</li> <li>• Setting up lighting and shadows</li> </ul> </li> <li>  Using Styles: <ul style="list-style-type: none"> <li>• Applying pre-defined styles to models</li> <li>• Creating custom styles</li> </ul> </li> <li>  Creating 2D Drawings: <ul style="list-style-type: none"> <li>• Using the Layout feature to create floor plans, elevations, and sections</li> </ul> </li> <li>  Exporting Models: <ul style="list-style-type: none"> <li>• Exporting models in various formats (e.g., 3D PDF, DWG, DXF)</li> </ul> </li> </ul> | 06 | CLO2,<br>CLO3,<br>CLO4,<br>CLO5 |

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|    |  |    |                                 |
| 07 | <p><b>Advanced Techniques</b></p> <ul style="list-style-type: none"> <li>  Using Extensions: <ul style="list-style-type: none"> <li>• Installing and using popular SketchUp extensions</li> <li>• Creating custom extensions</li> </ul> </li> <li>  Modeling with Inference: <ul style="list-style-type: none"> <li>• Using inference lines and points to create accurate models</li> </ul> </li> <li>  Working with the 3D Warehouse: <ul style="list-style-type: none"> <li>• Downloading and using models from the 3D Warehouse</li> </ul> </li> <li>  Creating Animations: </li> </ul> | 09 | CLO2,<br>CLO3,<br>CLO4,<br>CLO5 |

| Week  | Topic                     | Teaching Learning Strategy                         | Assessment Strategy    | Corresponding CLOs     |
|-------|---------------------------|--|------------------------|------------------------|
| 01    | Introduction to SketchUp  | Lecture, Oral presentation, Software demonstration | Lab Test               | CLO1                   |
| 02-05 | Basic Modeling Techniques | Lecture, Discussion, Software demonstration        | Lab Test, Quiz, Report | CLO2,<br>CLO3,<br>CLO4 |
| 06-08 | Working with Components   | Lecture, Discussion, Software demonstration        | Lab Test, Quiz, Report | CLO2,<br>CLO3,<br>CLO4 |
| 09-10 | Materials and Textures    | Lecture, Discussion, Software demonstration        | Lab Test, Quiz, Report | CLO2,<br>CLO3,<br>CLO4 |
| 11-12 | Scenes and Cameras        | Lecture, Discussion, Software demonstration        | Lab Test, Quiz, Report | CLO2,<br>CLO3,         |

|       |                         |  |                        |                        |
|-------|-------------------------|--|------------------------|------------------------|
|       |                         |  |                        | CLO4                   |
| 13-14 | Rendering and Exporting | Lecture, Discussion,<br>Software demonstration | Lab Test, Quiz, Report | CLO2,<br>CLO3,<br>CLO4 |
| 15-17 | Advanced Techniques     | Lecture, Discussion,<br>Software demonstration | Lab Test, Quiz, Report | CLO2,<br>CLO3,<br>CLO4 |

#### REFERENCEBOOKS

1. SketchUp for Dummies: Aidan Chopra
2. SketchUp for Site Design: A Guide to Modeling Site Plans, Terrain, and Architecture: Daniel Tal
3. SketchUp for Builders: A Comprehensive Guide for Creating 3D Building Models Using SketchUp: John Brock
4. SketchUp for Interior Design: Various Authors

# **Week-(01)**

## **Introduction to SketchUp**

# Chapter 1

## Meeting SketchUp

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### *In This Chapter*

- ▶ Comparing SketchUp with other 3D software
  - ▶ Finding out what you can and can't do with SketchUp
  - ▶ Looking around the application
- 

Once upon a time, software for building three-dimensional (3D) models of things like buildings, cars, and other stuff was hard to use. I mean *really* hard — people went to school for years to learn it. And if that wasn't bad enough, 3D modeling software was expensive — so expensive that the only people who used it were professionals and software pirates (people who stole it, basically). Then along came SketchUp.

Operating under the assumption that lots of people may want — and need — to make 3D models, SketchUp's inventors designed a program that works more intuitively than high-end modeling programs. In SketchUp, you don't think about 3D models as complex mathematical constructs (the way computers think). You build models with familiar elements: lines and shapes.

So do you need to know how to draw to use SketchUp? In the latest version of the software, not really. Traditional drawing is about *translating* what you see onto a flat piece of paper: going from 3D to 2D, which is hard to do for most people. In SketchUp, you're always in 3D, so no translation is involved — you just *build*, and SketchUp takes care of stuff like perspective and shading for you.

This first chapter is about putting SketchUp in context: where to get it, how it compares with other 3D software, and what you can (and can't) do with it. In the last part of the chapter, I give a quick tour of the program, just to let you know where things are.

## *Things You Ought to Know Right Away*

Before I continue, here's some information you may need:

- ✓ **You get SketchUp by downloading it from the Internet.** Just type [www.sketchup.com](http://www.sketchup.com) into your web browser and read through the first page of the SketchUp website. Click the links to download the application to your computer, and then follow the installation instructions on the web.
- ✓ **SketchUp works in Windows and Mac OS X.** SketchUp is available for both operating systems and it looks (and works) about the same way on both.
- ✓ **SketchUp comes in two flavors: SketchUp Make and SketchUp Pro.** The 3D modeling part is nearly identical in both versions, but there are some significant differences when it comes to importing and exporting, document preparation, terms of use (the legal stuff), and tech

support. The SketchUp website spells out the differences between them in detail; in the meantime, here's the condensed version:

- *SketchUp Make* is the free version that anyone can download and use for noncommercial purposes. As long as you're not using it for work, SketchUp Make's user license allows you to model anything you like, for free, forever.
- *SketchUp Pro* is the full-featured, professional version that you can buy if you need it. The Pro version includes several terrific features that folks like architects, construction pros, and other design professionals need for exchanging files with other software. SketchUp Pro also includes a whole separate application — dubbed *LayOut* — for creating documents from your SketchUp models; it's the subject of Chapters [14](#) and [15](#).

If you know you need SketchUp Pro, go ahead and download it. You have eight hours of trial time to use it before you have to buy a license. After that, it stops working until you license it.



If, on the other hand, you're undecided about which version to use, go ahead and download Make. You'll still have eight hours to try all the extra features in Pro (it starts off in evaluation mode), but after that, only the Pro stuff stops working. You'll still have SketchUp Make forever and ever. And if you ever decide to upgrade to Pro, all you have to do is buy a license — there's nothing else to download.

## Comparing SketchUp to Other 3D Modeling Programs

If you're reading this book, I presume you're at least interested in two things: building 3D models and using SketchUp to do so. The following sections tell you something about how SketchUp compares with other 3D modeling programs — how long it takes to figure out how to use it and what kind of models it produces.

### Jumping right in

Among the widely available 3D modeling applications, SketchUp is the easiest to use. This software has been successful for one reason: Within a few hours of launching SketchUp for the first time, you can get good enough at SketchUp to build something. You have no thick manuals to read, and no special geometric concepts to understand. Modeling in SketchUp is about grabbing your mouse and making something.

So how long should it take you to discover how SketchUp works? That depends on your background and experience; in general, you can expect to make something recognizable in less than four hours. That's not to say you'll be a whiz — it just means that SketchUp's learning curve is extremely favorable. You don't need to know much to get started, but you'll still pick up things years from now. In fact, I've discovered a couple things just writing this book.

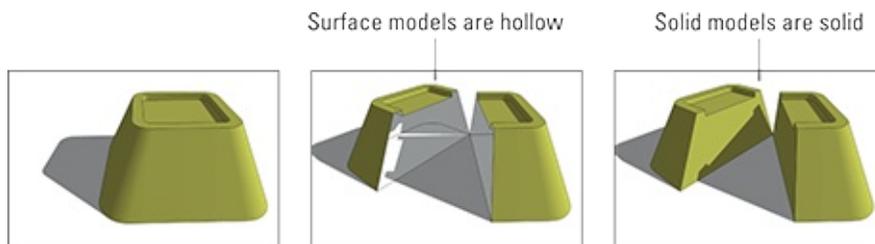
But is SketchUp *easy*? Lots of people say so, but I think it's all relative. SketchUp is, without a doubt, *easier* than any other modeling program I've tried, but 3D modeling itself can be tricky.

Some people catch on right away, and some folks take longer. But I can say this for sure: If you want to build 3D models and you have an afternoon to spare, there's no better place to start than SketchUp (and this book, of course). Chapter [3](#) walks you through the basics to help you start modeling in SketchUp quickly.

## Understanding the difference between paper and clay

Three-dimensional modeling software comes in two basic flavors: *solids* and *surfaces*. Figure [1-1](#) and the following points illustrate the difference:

- ✓ **SketchUp is a surfaces modeler.** Everything in SketchUp is basically made up of thin (infinitely thin, actually) surfaces — dubbed *faces*. Even things that look thick (like cinderblock walls) are actually hollow shells. Making models in SketchUp is a lot like building things out of paper — really, really thin paper.



**Figure 1-1:** SketchUp models are hollow.

Surfaces modelers like SketchUp are great for making models quickly because all you really need to worry about is modeling what things *look* like. That's not to say that they're less capable; it's just that they're primarily intended for visualization.

- ✓ **Using a solids modeler is more like working with clay.** When you cut a solid model in half, you create new surfaces where you cut; that's because objects are, well, solid. Programs like SolidWorks, form•Z, and Autodesk Inventor create solid models.

People who make parts — like mechanical engineers and industrial designers — tend to work with solid models because they can use them to do some pretty precise calculations. Being able to calculate the volume of an object means that you can figure how much it will weigh, for example. Also, special machines can produce real-life prototypes directly from a solid-model file. These prototypes are handy for seeing how lots of little things are going to fit together.

An important point to reinforce here is that there's no best type of modeling software. It all depends on three things: how you like to work, what you're modeling, and what you plan to do with your model when it's done.



Despite what I just said about SketchUp being only a surfaces modeler, one of the niftiest features (introduced in SketchUp Pro 8) is a set of tools that lets you manipulate special solid objects in your models. The Solid Tools feature offers a whole new way to work in SketchUp. Read all about it in Chapter [6](#).



Yet another caveat: When I said (a few paragraphs ago) that 3D modeling programs come in two basic flavors, I sort of lied. The truth is, you can split them into two groups another way: by the kind of math they use to produce 3D models. You can find *polygonal* modelers (of which SketchUp is an example) and *curves-based* (NURBS) modelers. The former type uses straight lines and flat surfaces to define everything — even things that *look* curvy, aren't. The latter kind of modeler uses true curves to define lines and surfaces. These yield organic, flowing forms that are much more realistic than those produced by polygonal modelers, but that puts a lot more strain on the computers that have to run them — and the people who have to figure out how to use them. Ultimately, it's a trade-off between simplicity and realism.

## What You Should (and Shouldn't) Expect SketchUp to Do

Have you ever been to a hardware store and noticed the multitool gizmos on the racks next to the checkout stands? I once saw one that was a combination screwdriver, pliers, saw, tape measure, and (I swear) hammer. I sometimes wonder whether the hardware store people put them there as a joke, just to make you feel better about standing in line.

I generally don't like tools that claim to do everything. I much prefer *specialists* — tools designed for doing one thing *really* well. In the case of SketchUp, that one thing is building 3D models.

Here's a list of things (all model-building related) that you can do with SketchUp:

- ✓ **Start a model in lots of ways:** With SketchUp, you can begin a model in whatever way makes sense for what you're building:
  - *From scratch:* When you first launch SketchUp, you see nothing except a little person standing in the middle of your screen. If you want, you can even delete her, leaving you a completely blank slate on which to model anything you want.
  - *From a photograph:* Part of Chapter [8](#) talks about how you can use SketchUp to build a model based on a photo of the thing you want to build; it's not really a beginner-level feature, but it's there.
  - *With another computer file:* SketchUp can import images that you can use as a starting point for what you want to make. SketchUp Pro can even import CAD (computer-aided drawing) files that give you even more of a head start.
  - *From a geo-location snapshot:* If you've ever used Google Earth, you know that Google has amazing aerial imagery and 3D terrain data for the whole world. In SketchUp, it's easy to grab a geo-location snapshot (a small chunk of the planet, basically) to use as a site for your model; read all about it in Chapter [8](#).
- ✓ **Work loose or work tight:** One of my favorite things about SketchUp is that you can model without worrying about exactly *how big* something is. Your models can be super-sketchy or absolutely precise. SketchUp is just like paper in that way; the amount of detail you add is entirely up to you.

- ✔ **Build something real or make something up:** What you build with SketchUp really isn't the issue. You work with only lines and shapes — or in SketchUp, *edges* and *faces* — so how you arrange them is your business. SketchUp isn't intended for making buildings any more than it is for creating other things. It's just a tool for drawing in three dimensions.
- ✔ **Share your models:** After you make something you want to show off, you can do a number of things, which you can discover in detail in Part [IV](#):
  - *Print:* Yep, you can print from SketchUp.
  - *Export images:* If you want an image file of a particular view, you can export an image in one of several popular formats.
  - *Export movies:* Animations are a great way to present three-dimensional information, and SketchUp can create them easily.
  - *Export other 3D model formats:* With the Pro version of SketchUp, you can share your model with other pieces of software to create CAD drawings, generate photorealistic renderings, and more.
  - *Upload to the 3D Warehouse:* This is a giant, online repository of SketchUp models. Add (or take) all the models you want.

What *can't* SketchUp do? A few things, actually — but that's okay. SketchUp was designed from the outset to be the friendliest, fastest, and most useful modeler available — and that's it, really. Fantastic programs are available that do the things in the following list, and SketchUp can exchange files with most of them:

- ✔ **Photorealistic rendering:** Most 3D modelers have their own, built-in photo renderers, but creating model views that look like photographs is a pretty specialized undertaking. SketchUp has always focused on *nonphotorealistic rendering (NPR)* instead. NPR (as it's known) is essentially technology that makes things look hand-drawn — sort of the opposite of photorealism.
- ✔ **Animation:** A few paragraphs ago, I mention that SketchUp can export animations, but that's a different thing. The movies that you can make with SketchUp involve moving your “camera” around your model. True animation software lets you move things around *inside* your model. SketchUp doesn't do that, but the Pro version lets you export to programs that do.

## Is this model a toaster or a bungalow?

SketchUp models are made from two basic kinds of *geometry*: *edges* (straight lines) and *faces* (2D surfaces bound by edges). That's it. When you use SketchUp to draw a bunch of edges and faces in the shape of a staircase, all SketchUp knows is how many edges and faces it has to keep track of, and where they all go. There's no such thing as a *stair* in SketchUp — just edges and faces.

That said, SketchUp's *Dynamic Components* are preprogrammed objects that know what they are. A dynamic staircase, for example, is smart enough to know that it should add or subtract steps when you make it bigger or smaller. Dynamic Components are a big step for SketchUp; all of a sudden, there's a class of stuff in the program that has (what software types would call) *intelligence*. What's that mean for you? For starters, SketchUp is easier to pick up than it's ever been. I go on and on about Dynamic Components in Chapter [5](#).

With the exception of Dynamic Components, though, things in SketchUp don't have any idea what they're supposed to represent. Coming to this realization has the tendency to freak out some people. If you want a model of something, you have to make it out of edges and faces. The thing to remember is that SketchUp was created to let you model *anything*, not just buildings, so its tools are designed to manipulate geometry. That's good news, believe it or not, because you're not restricted in any way; you can model anything you can imagine.

## Taking the Ten-Minute SketchUp Tour

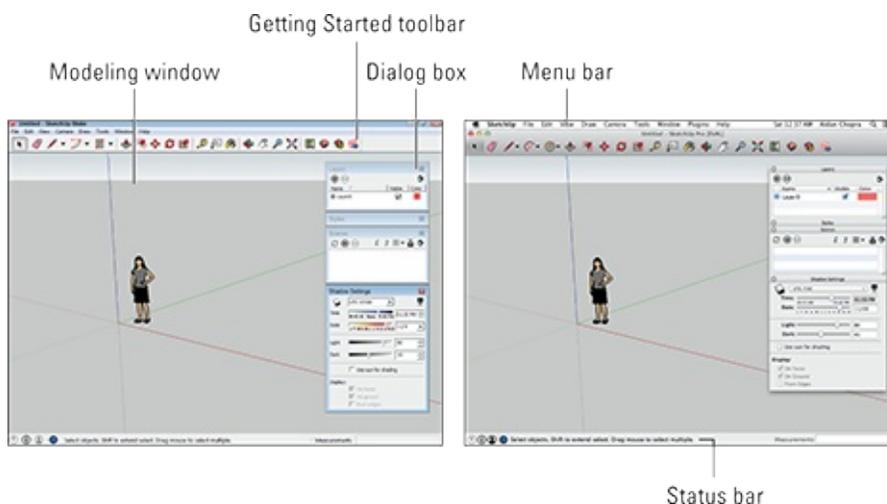
The point of this portion of the chapter is to show you where everything is — kind of like the way a parent shows a new babysitter around the house before leaving for a couple hours. Here I don't explain what anything *does*, per se. I just want you to feel like you know where to look when you start modeling.

Just like most programs you already use, SketchUp has five main parts. Figure 1-2 shows them all, in both the Windows and Mac versions of the program. I describe these parts, plus an additional feature, in the following list:

- ✓ **Modeling window:** See the big area in the middle of your computer screen? That's your modeling window, and it's where you spend 99 percent of your time in SketchUp. You build your model there; it's sort of a frame into a 3D world inside your computer. What you see in your modeling window is *always* a 3D view of your model, even if you're looking at it from the top or side.
- ✓ **Menu bar:** If you've used a computer in the last 30 years, the menu bar is nothing new. Each menu contains a long list of options, commands, tools, settings, and other goodies that pertain to just about everything you do in SketchUp.
- ✓ **Toolbars:** These contain buttons that you can click to activate tools and commands; they're faster than using the menu bar. SketchUp has a few toolbars, but only one is visible when you launch it the first time: the Getting Started toolbar.



If your modeling window is too narrow to show all the tools on the Getting Started toolbar, you can click the arrow on the right to see the rest of them.



**Figure 1-2:** All SketchUp's parts: in Windows (left) and on the Mac.

- ✓ **Dialog boxes:** Some programs call them palettes and some call them inspectors; SketchUp doesn't call them anything. SketchUp's documentation (the SketchUp Help document you can get to in the Help menu) refers to some of them as managers and some as dialog boxes, but I thought I'd keep things simple and just call them all the same thing: dialog boxes.
- ✓ **Status bar:** You can consider this your SketchUp dashboard. The status bar contains contextual information you use while you model.
- ✓ **Context menus:** Right-clicking things in your modeling window usually causes a context menu of commands and options to open. These are always relevant to whatever you right-click (and whatever you're doing at the time), so the contents of each context menu are different.



Although the following items aren't part of the SketchUp user interface (as all the stuff in the preceding list is), they're a critical part of modeling in SketchUp:

- ✓ **A mouse with a scroll wheel:** You usually find a left button (the one you use all the time), a right button (the one that opens the context menus), and a center *scroll wheel* that you both roll back and forth and click down like a button. A mouse with a scroll wheel will improve your SketchUp experience more than any single other thing you can buy.
- ✓ **A keyboard:** This sounds silly, but some people have tried to use SketchUp without one; it's just not possible. So many of the things you need to do all the time (such as make copies) involve your keyboard, so you'd better have one handy if you plan to use SketchUp.

## *Hanging out at the menu bar*

SketchUp's menus are a pretty straightforward affair; you won't find anything surprising like "Launch Rocket" in any of them, unfortunately. All the same, here are the menus:

- ✓ **File:** Includes options for creating, opening, and saving SketchUp files. The File menu is also where to go if you want to import or export a file, or make a printout of your model view.
- ✓ **Edit:** Has all the commands that affect the bits of your model that are selected.
- ✓ **View:** This one's a little tricky. You'd think it'd contain all the options for flying around in 3D space, but it doesn't — that stuff's on the Camera menu. Instead, the View menu includes all the controls you use to affect the appearance of your model itself: what's visible, how faces look, and so on. View also contains settings for turning on and off certain elements of SketchUp's user interface.
- ✓ **Camera:** Contains controls for viewing your model from different angles. In SketchUp, your "camera" is your point of view, literally.
- ✓ **Draw:** Includes tools for drawing edges and faces in your modeling window.
- ✓ **Tools:** Most of SketchUp's tools are contained here, except of course for the drawing tools.
- ✓ **Window:** If you're ever wondering where to find a dialog box, you can open nearly all of them from this menu.

- ✓ **Plugins:** You can get extra tools for SketchUp — little programs that “plug in” to it and add functionality. Some of them show up here after they’re installed. Note that the Plugins menu only appears if you’ve installed at least one plugin that requires it.
- ✓ **Help:** When you’re stuck, and this book isn’t helping (heaven forbid), check out the Help menu; it’s the gateway to SketchUp salvation.



## Where are all the tools?

The Getting Started toolbar contains a small subset of the tools that you can use in SketchUp. The thinking (which I agree with, incidentally) is that seeing all the tools right away tends to overwhelm new users, so having a limited selection helps people.

To get access to more tools (through toolbars, anyway — you can always access everything through the menus), you do different things depending on which operating system you use:

- ✓ **Windows:** Choose View⇒Toolbars. The mother lode! I recommend starting off with the Large Tool Set to begin with and then adding toolbars as you need them (and as you figure out what they do).
- ✓ **Mac:** Choose View⇒Tool Palettes⇒Large Tool Set. To add even more tools, right-click the Getting Started toolbar (the one right above your modeling window) and choose Customize Toolbar. Now drag whatever tools you want onto your toolbar and click the Done button.

## Checking the status bar

The narrow strip of information below the modeling window is packed with information goodness:

- ✓ **Context-specific instructions:** Most of the time, you check here to see what options may be available for whatever you’re doing. *Modifier keys* (keyboard strokes that you use in combination with certain tools to perform additional functions), step-by-step instructions, and general information about what you’re doing all show up in one place: right here.
- ✓ **The Measurements box:** The Measurements box is where numbers show up (to put it as simply as I can). Chapter [2](#) goes into more detail, but basically, the Measurements box enables you to model precisely.



- ✓ **Status indicator icons:** These four little icons appear in the lower-left corner of your screen. They change to tell you things about your model, and you can click them to find out what they do. The most important one to note (this early in your SketchUp tutelage) is the one that looks like a question mark. When you click this icon, it opens the Instructor dialog box, which contains information about the tool you’re currently using.

## Taking a peek at the dialog boxes

Most graphics programs have a ton of little controller boxes that float around your screen, and

SketchUp is no exception. After the dialog boxes are open, you can “dock” them together by moving them close to each other, but most people I know end up with them all over the place — me included. Dialog boxes in SketchUp contain controls for all kinds of things; here are the ones that I think deserve special attention:

- ✓ **Preferences:** Although the Model Info dialog box (see the next bullet point) contains settings for the SketchUp file you have open right now, the Preferences dialog box has controls for how SketchUp behaves — *no matter what* file you have open. Pay particular attention to the Shortcuts panel, where you can set up keyboard shortcuts for any tool or command in the program.

On the Mac, the Preferences dialog box is on the SketchUp menu, which doesn't exist in the Windows version of SketchUp.



Some changes to the Preference settings don't take effect until you open another file or restart SketchUp altogether, so don't worry if you can't see a difference right away.

- ✓ **Model Info:** This dialog box is, to quote the bard, the mother of all dialog boxes. It has controls for everything under the sun; you should definitely open it and take your time going through it. Chances are, the next time you can't find the setting you're looking for, it's in Model Info.
- ✓ **Entity Info:** This little guy is small, but it shows information about *entities* — edges, faces, groups, components, and lots of other things — in your model. Keeping it open is a good idea because it helps you see what you've selected.
- ✓ **Instructor:** The Instructor does only one thing: It shows you how to use whatever tool happens to be activated. While you're discovering SketchUp, keep the Instructor dialog box open off to the side. You can also open it at any time by clicking the little ? icon in the status bar at the bottom of your screen.

## Chapter 2

# Establishing the Modeling Mind-Set

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### *In This Chapter*

- ▶ Understanding edges and faces
  - ▶ Representing three dimensions on a two-dimensional screen
  - ▶ Inferencing like a pro
  - ▶ Warming up with SketchUp
  - ▶ Using guides to line up things
  - ▶ Adding color and texture to your work
- 

When you were learning how to drive a car, you probably didn't just get behind the wheel, step on the gas, and figure it out as you went along. (If you did, you probably have bigger things to worry about than getting started with SketchUp.) My point is, you should really know several things before you get started. This chapter introduces those things — concepts, really — that can make your first few hours with SketchUp a lot more productive and fun.

So here's the deal: I've divided this chapter into three main parts:

- ✔ The first part talks about edges and faces — the basic *stuff* that SketchUp models are made of.
- ✔ The second part deals with how SketchUp lets you work in 3D (three dimensions) on a 2D (flat) surface — namely, your computer screen. Understanding how SketchUp represents depth is everything when making models. If you've never used 3D modeling software before, pay close attention to the middle part of this chapter.
- ✔ The final part of this chapter is about the things you need to do all the time — things like navigating around your model, drawing lines, selecting things, and working with accurate measurements.

## *All about Edges and Faces*

In SketchUp, everything is made up of one of two kinds of *elements*: edges or faces. They're the basic building blocks of every model you'll ever make.



Collectively, the edges and faces in your model are *geometry*. When someone (including me) refers to geometry, she's talking about edges and faces. Other modeling programs have other kinds of geometry, but SketchUp is pretty simple. That's a good thing — there's less to keep track of.

The drawing on the left in Figure [2-1](#) is a basic cube drawn in SketchUp; it's composed of 12

edges and 6 faces. The model on the right is a lot more complex, but the geometry's the same; it's all just edges and faces.

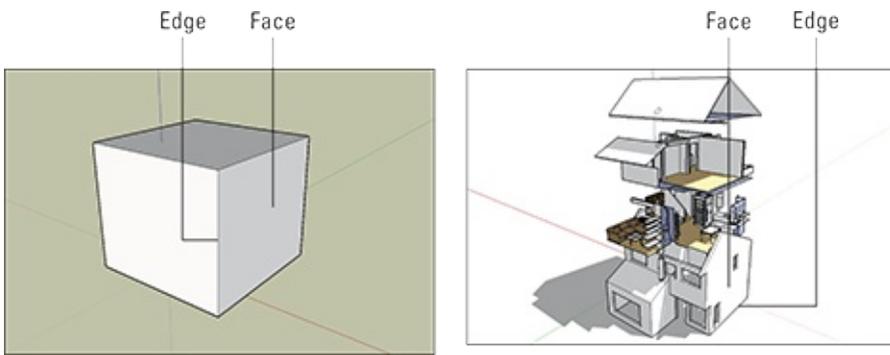


Figure 2-1: SketchUp models are made from edges and faces.

## Living on (with, actually) the edge

Edges are lines. You can use lots of tools to draw them, erase them, move them, hide them, and even stretch them. Here are some things you ought to know about SketchUp edges:

- ✓ **Edges are always straight.** Not only is everything in your SketchUp model made up of edges, but all those edges are also perfectly straight. Even arcs and circles are made of small straight-line segments, as shown in Figure [2-2](#).
- ✓ **Edges don't have a thickness.** This one's a little tricky to get your head around. You never have to worry about how thick the edges in your model are because that's just not how SketchUp works. Depending on how you choose to *display* your model, your edges may look like they have different thicknesses, but your edges themselves don't have a built-in thickness.

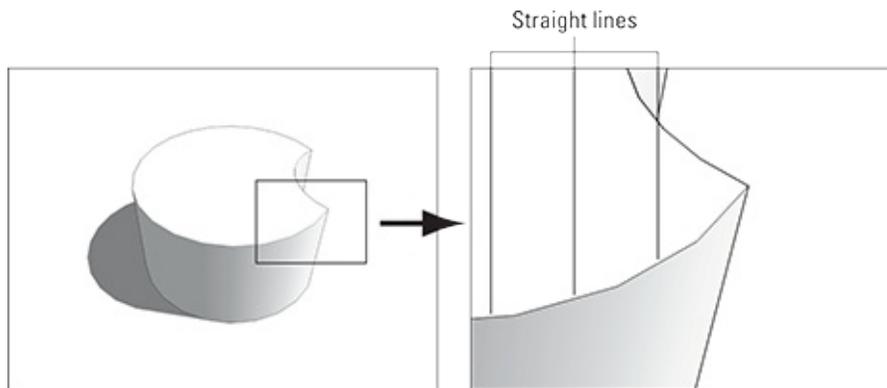
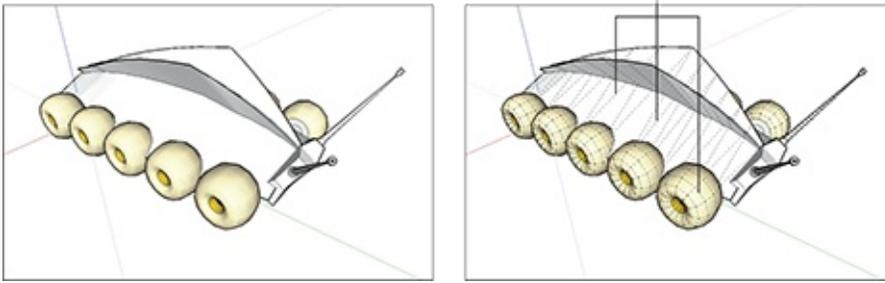


Figure 2-2: Even curved lines are made up of straight edges.

- ✓ **Just because you can't see the edges doesn't mean they're not there.** Edges can be hidden so that you can't see them; doing so is a popular way to make certain forms. Take a look at Figure [2-3](#). On the left is a model that looks rounded. On the right, I've made the hidden edges visible as dashed lines — see how even surfaces that look smoothly curved are made of straight edges?

These edges are smoothed, but still there

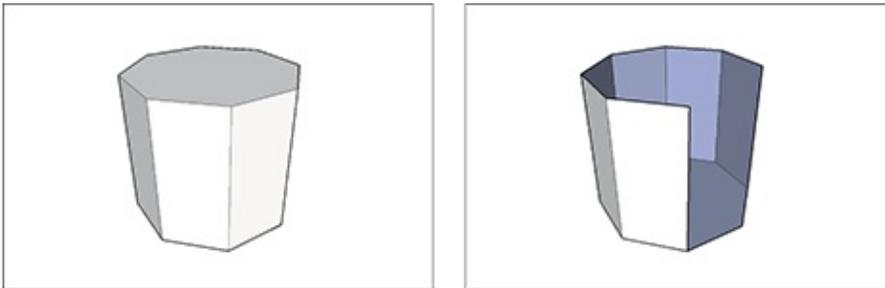


**Figure 2-3:** Even organic shapes and curvy forms are made up of straight edges.

## Facing the facts about faces

Faces are surfaces. If you think of SketchUp models as being made of toothpicks and paper (which they kind of are), faces are basically the paper. Here's what you need to know about them:

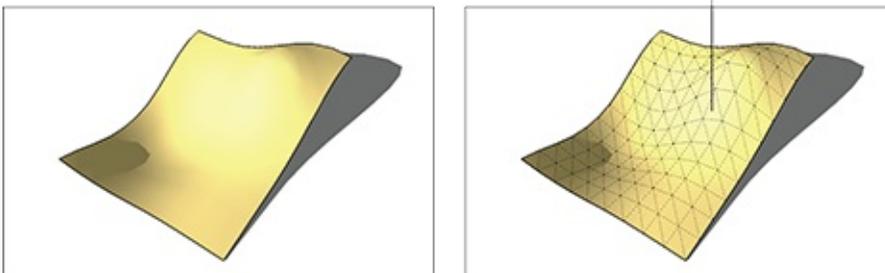
- ✔ **You can't have faces without edges.** To have a face, you need to have at least three *coplanar* (on the same plane) edges that form a loop. In other words, a face is defined by the edges that surround it, and those edges all have to be on the same, flat *plane*. Because you need at least three straight lines to make a closed shape, faces must have at least three sides. There's no limit to the number of sides a SketchUp face can have, though. Figure 2-4 shows what happens when you get rid of an edge that defines one or more faces. I started with the model on the left and deleted the edge that completed both the top face and one of the side faces. The result, shown in the right, is that both of those faces disappeared.



**Figure 2-4:** You need at least three edges to make a face.

- ✔ **Faces are always flat.** In SketchUp, even surfaces that look curved are made up of multiple, flat faces. In the model shown in Figure 2-5, you can see that what looks like organically shaped surfaces (on the left) are really just lots of smaller faces (on the right). To make a bunch of flat faces look like one big, curvy surface, the edges between them are *smoothed*; you can find out more about smoothing edges in Chapter 6.

Each of these triangles is perfectly flat



**Figure 2-5:** All faces are flat, even the ones that make up larger, curvy surfaces.

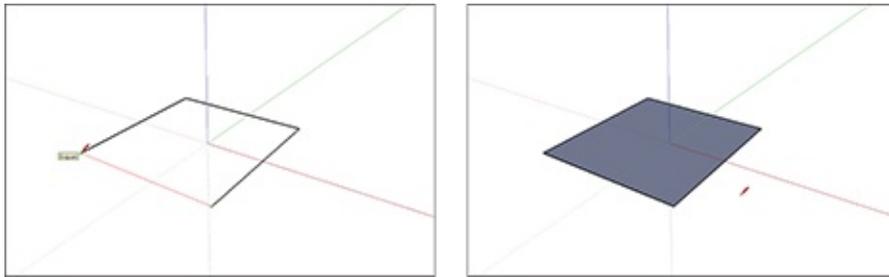
- ✔ **Just like edges, faces don't have any thickness.** If faces are a lot like pieces of paper, they're *infinitely thin* pieces of paper — they don't have any thickness. To make a thick surface (say, a 6-inch-thick wall), you need to use two faces side by side.

## Understanding the relationship between edges and faces



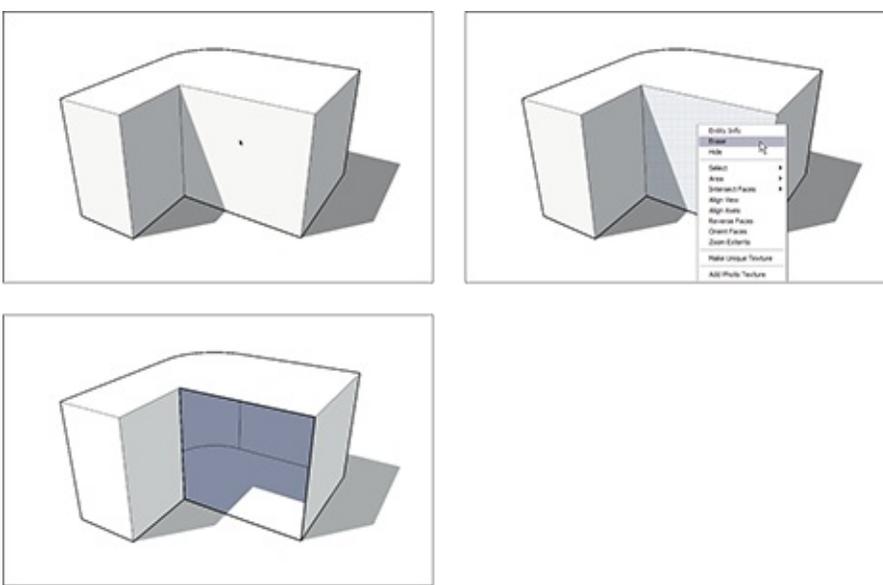
Now that you know that models are made from edges and faces, you're most of the way to understanding how SketchUp works. Here's some information that should fill in the gaps. To see the following concepts in action, watch the video that's available via [www.dummies.com/extras/sketchup2014](http://www.dummies.com/extras/sketchup2014).

- ✔ **Every time SketchUp can make a face, it will.** There's no such thing as a "Face tool" in this software; SketchUp just automatically makes a face every time you finish drawing a closed shape out of three or more coplanar edges. Figure 2-6 shows this in action: As soon as I connect the last edge that I draw to the first one to close the loop, SketchUp creates a face.

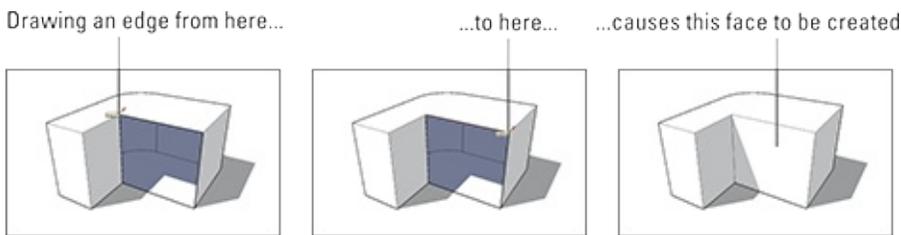


**Figure 2-6:** SketchUp automatically makes a face whenever you create a closed loop of coplanar edges.

- ✔ **You can't stop SketchUp from creating faces, but you can erase them if you want.** If SketchUp creates a face you don't want, just right-click the face and choose Erase from the context menu. That face is deleted, but the edges that defined it remain, as illustrated in Figure 2-7.
- ✔ **If you delete an edge that defines a face, that face will be deleted too.** When I erase one of the edges in the cube (with the Eraser tool, in this case), *both* the faces that were defined by that edge disappear. This happens because it's impossible to have a face without also having all its edges.
- ✔ **Retracing an edge re-creates a missing face.** If you already have a closed loop of coplanar edges but no face (because you erased it, perhaps), you can *redraw* one of the edges to make a new face. Just use the Line tool to trace over one of the edge segments, and a face reappears, as shown in Figure 2-8.

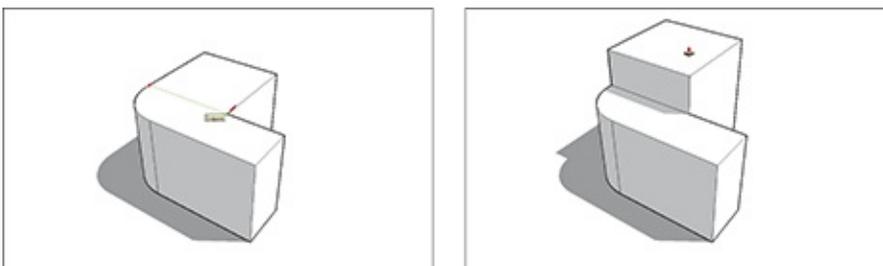


**Figure 2-7:** You can delete a face without deleting the edges that define it.



**Figure 2-8:** Just retrace any edge on a closed loop to tell SketchUp to create a new face.

- ✓ **Drawing an edge all the way across a face splits the face in two.** When you draw an edge (like with the Line tool) from one side of a face to another, you cut that face in two. The same thing happens when you draw a closed loop of edges (like a rectangle) on a face — you end up with two faces, one “inside” the other. In Figure 2-9, I split a face in two with the Line tool and then I extruded one of them out a little bit with the Push/Pull tool.
- ✓ **Drawing an edge that crosses another edge automatically splits both edges where they touch.** In this way, you can split simple edges you draw with the Line tool, as well as edges created when you draw shapes like rectangles and circles. Most of the time, this auto-slicing is desirable, but if it’s not, you can always use groups and components to keep things separate. Flip to the first part of Chapter 5 for more information.



**Figure 2-9:** Splitting a face with an edge, and then extruding one of the new faces.

## Drawing in 3D on a 2D Screen

For computer programmers, letting you draw 3D objects on your screen is a difficult problem. You wouldn’t think it’d be such a big deal; after all, people have been drawing in perspective for a very long time. If some old guy could figure it out 500 years ago, why should your computer have

problems?



The thing is, human perception of depth on paper is a trick of the eye. And of course, your computer doesn't have eyes that enable it to interpret depth without thinking about it. You need to give your computer explicit instructions. In SketchUp, this means using drawing axes and inferences, as I explain in the sections that follow. At

[www.dummies.com/extras/sketchup2014](http://www.dummies.com/extras/sketchup2014), you find links to videos that demonstrate the topics in each section.

## Don't worry about drawing in perspective

Contrary to popular belief, modeling in SketchUp doesn't involve drawing in perspective and letting the software figure out what you mean. This turns out to be a very good thing for two reasons:

- ✓ **Computers aren't very good at figuring out what you're trying to do.** This has probably happened to you: You're working away at your computer, and the software you're using tries to "help" by guessing what you're doing. Sometimes it works, but most of the time it doesn't, and eventually, it gets really annoying. Even if SketchUp *could* interpret your perspective drawings, you'd probably spend more time correcting its mistakes than actually building something.
- ✓ **Most people can't draw in perspective anyway.** I can see you nodding because even if you're one of the few folks who *can*, you know darn well that most people couldn't draw an accurate 3D view of the inside of a room if their lives depended on it — drawing just isn't one of the things people are taught, unfortunately. So even if SketchUp *did* work by turning your 2D perspective drawings into 3D models (which it most certainly doesn't), the vast majority of those who "can't draw" couldn't use it. And that would be a shame because building 3D models is a real kick.

## Giving instructions with the drawing axes

Color Plate 1 (see this book's color insert) is a shot of the SketchUp modeling window, right after you create a new file. See the three colored lines that cross in the lower-left corner of the screen? These are the *drawing axes*, and they're the key to understanding how SketchUp works. Simply put, you use SketchUp's drawing axes to figure out where you are and where you want to go in 3D space. When you're working with the color axes, you need to keep three important things in mind:

- ✓ **The red, green, and blue drawing axes define 3D space in your model.** If you were standing at the spot where all three axes meet — the *axis origin* — the blue axis would run vertically, passing through your head and feet. The red and green axes define the ground plane in SketchUp; you'd be standing on top of them. The axes are all at right angles to one another, and extend to infinity from the origin.
- ✓ **When you draw, move, or copy something parallel to one of the colored axes, you're working in that color's direction.** Take a look at Color Plate 2. In the first image, I'm drawing a line parallel to the *red* axis, so I would say I'm drawing "in the *red* direction." I'm sure that the line I'm drawing is parallel to the red axis because the line turns red to let me know. In the second image, I'm moving a box parallel to the *blue* axis, so I'm "moving in the *blue* direction." I know I'm parallel to the blue axis because a dotted, blue line appears to tell

me so.

- ✓ **The whole point of using the red, green, and blue axes is to let SketchUp know what you mean.** Remember that the big problem with modeling in 3D on a computer is the fact that you're working on a 2D screen. Consider the example shown in Color Plate 3: If I click the cylinder with the Move tool and move my cursor *up*, how is SketchUp supposed to know whether I mean to move it *up* in space (above the ground) or *back* in space? That's where the colored axes come into play: If I want to move it *up*, I go in the *blue* direction. If I want to move it *back*, I follow the *green* direction (because the green axis happens to run from the front to the back of my screen).



When you work in SketchUp, you use the colored drawing axes *all the time*. They're not just handy; they're what make SketchUp work. Having colored axes (instead of ones labeled *x*, *y*, and *z*) lets you draw in 3D space without typing commands to tell your computer where you want to draw. They make modeling in SketchUp quick, accurate, and relatively intuitive. All you have to do is make sure that you're working in your intended color direction as you model by lining things up with the axes and watching the screen tips that tell you what direction you're working in. After your first couple hours with the software, paying attention to the colors becomes second nature — I promise.

## *Keeping an eye out for inferences*

If you've spent any time fiddling with SketchUp, you've noticed all the little colored circles, squares, dotted lines, yellow tags, and other doodads that show up as you move your cursor around your modeling window. All this stuff is referred to collectively as SketchUp's *inference engine*, and its sole purpose is to help you while you build models. Luckily, it does. Without inferences (the aforementioned doodads), SketchUp wouldn't be very useful.

### *Point inferences*

Generally, SketchUp's inferences help you be more precise. *Point* inferences (see Color Plate 4) appear when you move your cursor over specific parts of your model. They look like little colored circles and squares, and if you pause for a second, a yellow label appears. For example, watching for the little green Endpoint inference (which appears whenever your cursor is over one of the ends of an edge) helps you accurately connect an edge you're drawing to the end of another edge in your model. Here's a list of them (I don't give descriptions because I think they're pretty self-explanatory):

- ✓ Endpoint (green circle)
- ✓ Midpoint (cyan or light blue circle)
- ✓ Intersection (red X)
- ✓ On Edge (red square)
- ✓ Center (of a circle or arc, dark blue)
- ✓ On Face (dark blue square)



In SketchUp, lines are called *edges*, and surfaces are called *faces*. Everything in your model is made up of edges and faces.

## Linear inferences

As you've probably already noticed, color plays a big part in SketchUp's *user interface*, or the way it looks. Maybe the best example of this is in the software's *linear inferences* — the “helper lines” that show up to help you work more precisely. Color Plate 5 is an illustration of them all in action, and here's a description of what they do:

- ✓ **On Axis:** When an edge you're drawing is parallel to one of the colored drawing axes, the edge turns the color of that axis.
- ✓ **From Point:** This one's a little harder to describe. When you move your cursor, sometimes you see a colored, dotted line appear. The dotted line means that your cursor is “lined up” with the point at the other end of the dotted line. Naturally, the color of the From Point inference corresponds to whichever axis you're lined up “on.” Sometimes From Point inferences show up on their own, and sometimes you have to *encourage* them; see the section “[Encouraging inferences](#),” later in this chapter, for details.
- ✓ **Perpendicular:** When you draw an edge that's perpendicular to another edge, the one you're drawing turns magenta (reddish purple).
- ✓ **Parallel:** When the edge you're drawing is parallel to another edge in your model, it turns magenta to let you know. You tell SketchUp which edge you're interested in “being parallel to” by *encouraging* an inference.
- ✓ **Tangent at Vertex:** This one applies only when you draw an arc (using the Arc tool) that starts at the endpoint of another arc. When the arc you're drawing is *tangent* to the other one, the one you're drawing turns cyan. *Tangent*, in this case, means that the transition between the two arcs is smooth.



One of the most important inferences in SketchUp is one that you probably didn't even realize was an inference: Unless you specifically start on an edge or a face in your model, you always draw on the ground plane by default. That's right — if you just start creating stuff in the middle of nowhere, SketchUp just assumes that you mean to draw on the ground.

## Using inferences to help you model

A big part of using SketchUp's inference engine involves *locking* and *encouraging* inferences — sometimes even simultaneously. At first, these actions seem a little like that thing where you pat your head and rub your stomach at the same time, but with practice, they get easier.

### Locking inferences

If you hold down the Shift key when you see any of the first four types of linear inferences described previously, that inference gets *locked* — and stays locked until you release Shift. When you lock an inference, you constrain whatever tool you're using to work only in the direction of

the inference you locked. Confused? Check out the following example for some clarity.

In Color Plate 6, locking a blue On Axis inference while I'm using the Line tool would be useful. I want to draw a vertical line that's exactly as tall as the peak of the house's roof, so here's what I do:

1. **Click once to start drawing an edge.**
2. **Move my cursor until I see the edge I'm drawing turn my desired axis color.**

For the purposes of my example, this is the blue On Axis inference that lets me know I'm exactly parallel to the blue drawing axis.

3. **Hold down the Shift key to lock the inference I see.**

My edge gets thicker to let me know it's locked, and now I can draw only in the blue direction no matter where I move my cursor.

4. **Click where you want the edge to end.**

For my line, I click the peak of the roof to make my vertical edge end at exactly that height. In Color Plate 6, you can see that, with my inference locked, I have the freedom to mouse away from the edge I'm drawing to click the roof peak as a reference point.

5. **Release Shift to unlock the inference.**

### *Encouraging inferences*

Sometimes an inference you need doesn't show up on its own — when this happens, you have to *encourage* it. To encourage an inference, just hover your cursor over the part of your model you want to “infer” from and then slowly go back to whatever you were doing when you decided you could use an inference. The following example demonstrates how to encourage an inference.

Color Plate 7 shows a model of a cylinder. I want to start drawing an edge that lines up perfectly with the center of the circle on top of the cylinder, but I don't want the edge to start at the center itself. Follow these steps:

1. **Hover (don't click) over the edge of the circle for about two seconds.**
2. **Move slowly toward the middle of the circle until the Center Point inference appears.**
3. **Hover (still don't click) over the center point for a couple seconds.**
4. **Move your cursor slowly in the direction of where you want to start drawing your edge.**

A dotted From Point inference appears.

5. **Click to start drawing your edge.**

## *Warming Up Your SketchUp Muscles*



I can think of eight activities you need to do every time you use SketchUp. Formal-education types would probably call them *core competencies*, but I find language like that tends to put people to sleep. Whatever you care to call these activities, I introduce them all in the following sections so you can come back and get a quick refresher whenever you want. I also created several videos, available via [www.dummies.com/extras/sketchup2014](http://www.dummies.com/extras/sketchup2014), so you can see several of these activities in action.

## Getting the best view of what you're doing

Using SketchUp without learning how to orbit, zoom, and pan is like trying to build a ship in a bottle. In the dark. With your hands tied behind your back. Using chopsticks. Get the picture?



Fully half of modeling in SketchUp uses the Orbit, Zoom, and Pan tools, which let you change your view so that you can see what you're doing. Most people who try to figure out SketchUp on their own take too long to understand the importance of these navigation tools and spend hours squinting, grunting, and having an all-around miserable time trying to “get at” what they're working on. The following sections help you avoid the headache (literally).

### Going into orbit

Hold a glass of water in your hand. Now twist and turn your wrist around in every direction so that the water's all over you and the rest of the room. Stop when the glass is completely empty. I think that's a pretty memorable way to find out about the Orbit tool, don't you?

Just as your wrist helps you twist and turn a glass to see it from every angle, think of using Orbit as the way to fly around your work. Figure 2-10 shows Orbit in all its glory.

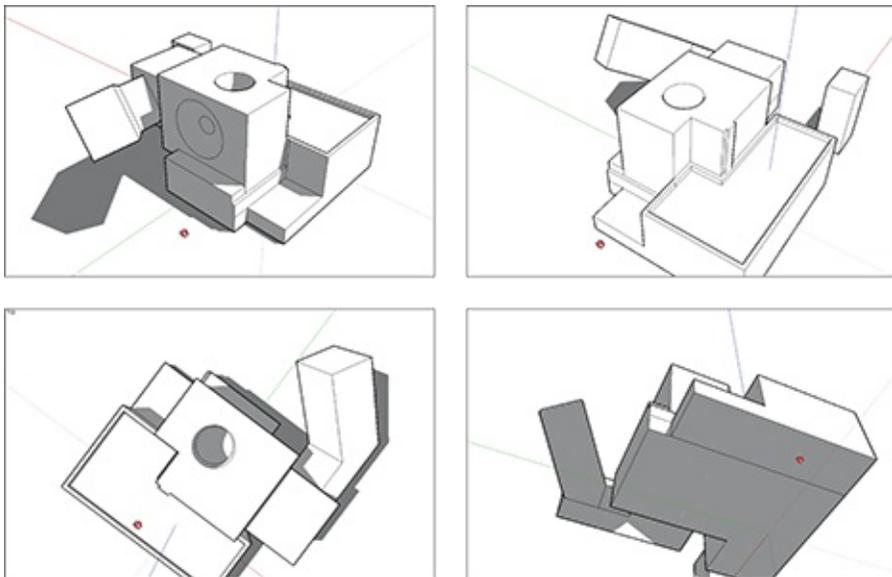


Figure 2-10: The Orbit tool lets you see your model from any angle.



Although you can find the Orbit tool on the Camera menu and an Orbit button on the toolbar, here's how you should *always* orbit: Click the scroll wheel of your mouse and hold it

down. Now move your mouse around. See your model swiveling around? Release the scroll wheel when you're done. Using your mouse to orbit means that you don't have to switch tools every time you want a better view, which saves you *truckloads* of time.

## Zooming in and out

Hold your empty glass at arm's length. Close your eyes and then bring the glass rushing toward you, stopping right when it smashes you in the nose. Now throw the glass across the room, noticing how it shrinks as it gets farther away. That, in a nutshell, describes the Zoom tool.

You use Zoom to get closer to (and farther from) your model. If you're working on something small, you zoom in until it fills your modeling window. To see everything at once, zoom out. Figure 2-11 is a demonstration.

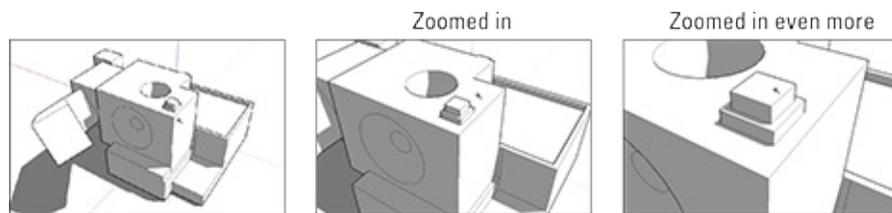


Figure 2-11: Use the Zoom tool to get closer to the action.



I can think of a couple of things you need to remember about Zoom:

- ✓ **The best way to zoom is to roll your finger on the scroll wheel of your mouse to zoom in and out.** Instead of clicking the scroll wheel to orbit, just roll your scroll wheel back and forth to zoom. And just like Orbit, you can find a Zoom tool on the Camera menu and a Zoom button on the toolbar, but using your mouse's scroll wheel to zoom means that you don't have to switch tools. As soon as you stop scrolling to zoom in or out, you revert to whatever tool you were using before.
- ✓ **Use Zoom Extents to see everything.** Technically, Zoom Extents is a separate tool altogether, but I think it's related enough to mention here. If you want your model to fill your modeling window (which is especially useful when you "get lost" with the navigation tools — trust me, it happens to everyone), just choose Camera⇒Zoom Extents.



When you're zooming with the scroll wheel of your mouse, SketchUp zooms in on your cursor; just position it over whatever part of your model you want to zoom in on (or zoom out from). If your cursor isn't over any of your model's geometry (faces and edges), zooming doesn't work very well — you end up zooming either really slowly or really quickly.

## Just panning around

Using the Pan tool is a lot like washing windows — you move the paper towel back and forth, but it stays flat and it never gets any closer or farther away from you. The Pan tool is basically for sliding your model view around in your modeling window. To see something that's to the right, you use Pan to slide your model to the left. It's as simple as that.



Although you find a Pan tool on the Camera menu and a Pan button on the toolbar, here's the best way to pan: Hold down your mouse's scroll wheel button and press the Shift key. When you do both at the same time — basically, Orbit+Shift — your cursor temporarily turns into the Pan tool. When your cursor does so, move your mouse to pan.

## Drawing and erasing edges with ease

Being able to use the Line tool without having to think too much about it is *the* secret to being able to model anything you want in SketchUp. You use the Line tool to draw individual edges, and because SketchUp models are really just fancy collections of edges (carefully arranged, I'll admit), anything you can make in SketchUp, you can make with the Line tool.



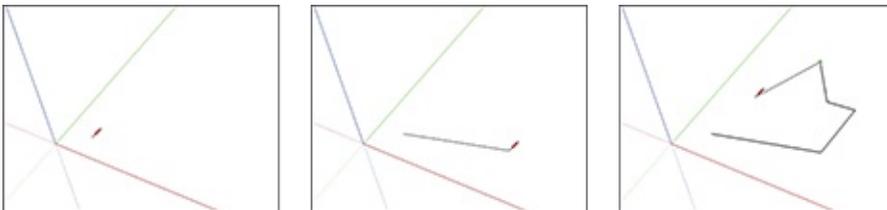
SketchUp models are made up of edges and faces. Any time you have three or more edges that are *connected* and *on the same plane*, SketchUp creates a face. If you erase one of the edges that *defines*, or borders, a face, the face disappears, too. Take a look at the section “[All about Edges and Faces](#),” earlier in this chapter, for more information on the relationship between edges and faces.

Drawing edges is simple. Just follow these steps:

1. **Select the Line tool on the Draw menu (some people call it the Pencil tool).**
2. **Click where you want your line to begin.**
3. **Move your cursor to the desired endpoint for your line and click again to end.**

Figure [2-12](#) demonstrates the basic idea.

When you draw a line segment with the Line tool, notice how SketchUp automatically tries to draw another line? This is called *rubber banding* — the Line tool lets you continue to draw edge segments, automatically starting each new one at the end of the previous one you drew.



**Figure 2-12:** Use the Line tool to draw edges.

4. **When you want the Line tool to stop drawing lines, press the Esc key to snip the line at the last spot you clicked.**



SketchUp lets you draw lines in two ways: You can either use the click-drag-release method or the click-move-click one. They both work, of course, but I highly recommend training yourself to click-move-click. You'll have more control, and your hand won't get as

tired. When you draw edges by clicking and *dragging* your mouse (click-drag-release), you're a lot more likely to "drop" your line accidentally. Because the Line tool draws only straight lines, think about using it less like a pencil (even though it looks like one) and more like a spool of sticky thread.

The Eraser tool is specifically designed for erasing edges; use it by clicking the edges you don't like to delete them. You can also *drag* over edges with the Eraser, but I think that's a little harder to get used to.

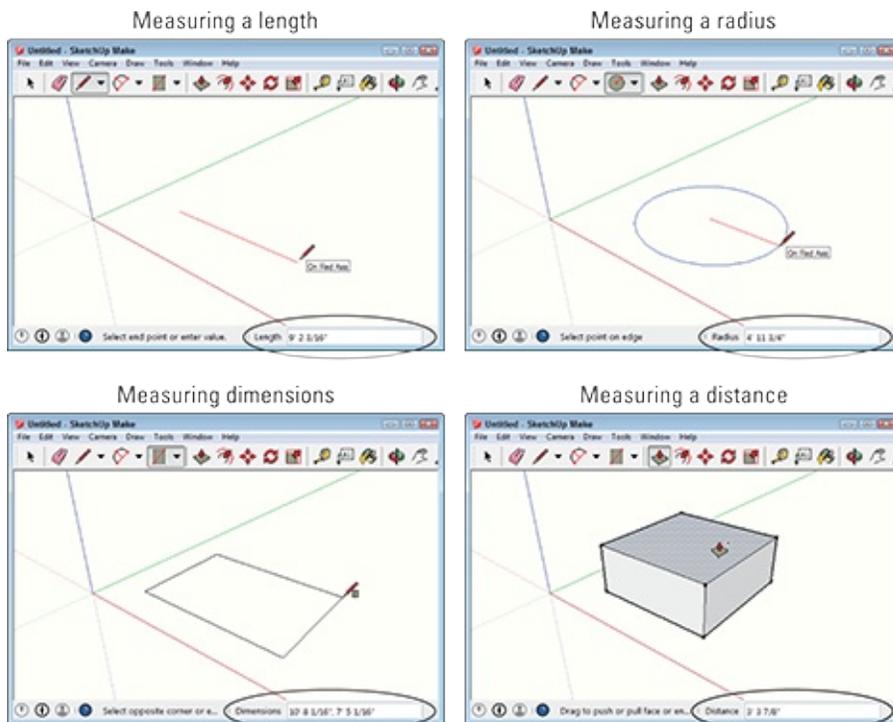
## Turning off rubber-banding lines

Depending on what you're making and on how you work, you may want to turn the Line tool's rubber-banding behavior off. To do so, follow these steps:

1. Choose **Window**⇒**Preferences** (SketchUp⇒Preferences on the Mac).
2. Choose the **Drawing** panel from the list on the left in the Preferences dialog box.
3. Deselect the **Continue Line Drawing** check box.

## Injecting accuracy into your model

It's all well and fine to make a model, but most of the time you need to make sure that it's accurate — that what you've modeled is precisely the size you intend it to be. The key to accuracy in SketchUp is the little text box that lives in the lower-right corner of your SketchUp window — the one I point out in Figure 2-13.



**Figure 2-13:** SketchUp's Measurements box is the key to working precisely.

This box is the Measurements box, and here are some things you can do with it:

- ✓ Make a line a certain length.
- ✓ Draw a rectangle a certain size.
- ✓ Push/pull a face a certain distance.
- ✓ Change the number of sides in a polygon.
- ✓ Move something a given distance.
- ✓ Rotate something by a certain number of degrees.
- ✓ Make a certain number of copies.
- ✓ Divide a line into a certain number of segments.
- ✓ Change your field of view (how much you can see).

Here's what you need to know about the Measurements box:

- ✓ **You don't have to click in the Measurements box to enter a number.** This one's a big one: SketchUp beginners often assume that they need to click in the Measurements box (to select it, presumably) before they can start typing. You don't have to click it — just start typing, and whatever you type shows up in the box automatically. When being precise, SketchUp always “listens” for you to type something in this box.
- ✓ **The Measurements box is context-sensitive.** What this box controls depends on what you happen to be doing at the time. If you're drawing an edge with the Line tool, it knows that whatever you type is a length; if you're rotating something, it knows to listen for an angle.
- ✓ **You can set the default units for the Measurements box and override the default when needed.**
  - *You don't need to type a unit if you want to use the default unit.* Perhaps you want a line you're drawing to be 14 inches long. If inches are your default unit of measurement, just type **14** into the Measurements box and press Enter — SketchUp assumes that you mean 14 inches.
  - *Do type a unit if you want to override the default unit.* For example, if your default is inches and you want to draw something 14 feet long, type **14'**, just to let SketchUp know that you mean feet instead of inches. You can override the default unit of measurement by typing any unit you want. If you want to move something a distance of 25 meters, type **25m** and press Enter.
  - *You set the default units in the Model Info dialog box.* You can open this dialog box from the Window menu. Open the Units panel, and choose your new default unit from the drop-down menu.
- ✓ **Sometimes, the Measurements box does more than one thing.** In certain circumstances, you can change its mode (what it “listens for”) by typing a unit type after a number. For example, when you draw a circle, the default “value” in the Measurements box is the radius — if you type **6** and press Enter, you end up with a circle with a radius of 6 inches. But if you type **6s**, you're telling SketchUp that you want 6 sides (and not inches), so you end up with a circle with 6 sides. If you type **6** and press Enter, and then type **6s** and press Enter again, SketchUp draws a hexagon (a 6-sided circle) with a radius of 6 inches.

- ✓ **The Measurements box lets you change your mind.** As long as you don't do anything after you press Enter, you can always type a new value and press Enter again; there's no limit to the number of times you can change your mind.
- ✓ **You can use the Measurements box *during* an operation.** In most cases, you can use the Measurements box to be precise *while* you're using a tool. Here's how that works:
  1. *Click once to start your operation (such as drawing a line or using the Move tool).*
  2. *Move your mouse so that you're going in the correct color direction. Be sure not to click again.*

If you're using the Line tool and you want to draw parallel to the green axis, make sure that the edge you're drawing is green.

3. *Without clicking the Measurements box, type the dimension you want.*

The dimension appears in the box.

4. *Press Enter to complete the operation.*

- ✓ **You can also use the Measurements box *after* an operation.** Doing this revises what you've just done. These steps give you an idea of what I'm talking about:

1. *Complete your operation.*

This may be drawing a line, moving something, rotating something, or any of the other things I mention at the beginning of this section.

2. *Before you do anything else, type whatever dimension you intended and then press Enter.*

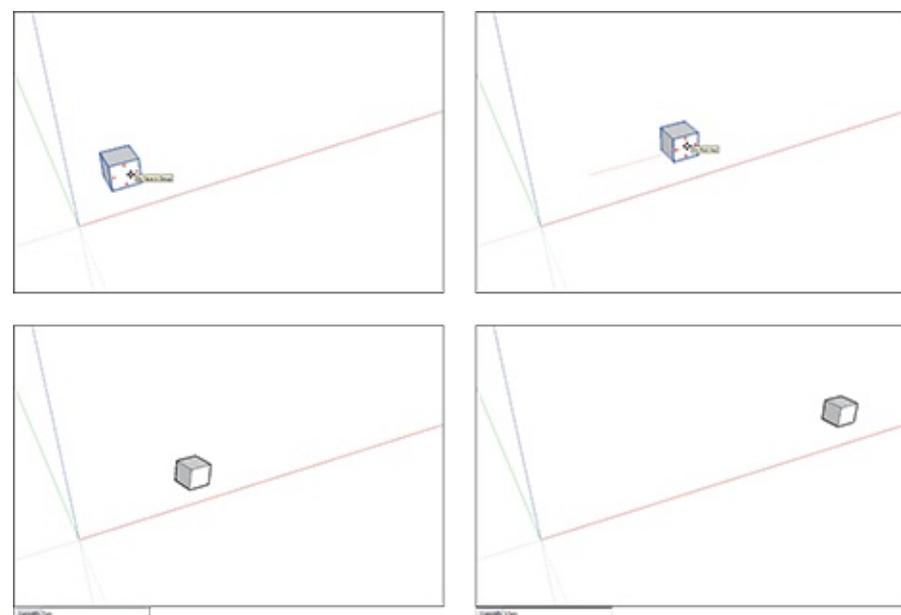
Whatever you did is redone according to what you typed.

To give you a more concrete example, say I want to move my box, as shown in Figure [2-14](#), a total of 5 meters in the red direction (parallel to the red axis). Here's what I'd do:

1. With the Move tool, I click the box once to pick it up.
2. I move my mouse until I see the linear inference that tells me I'm moving in the red direction.
3. I type **5m** and then I press Enter. My box is positioned exactly 5 meters from where I picked it up.
4. On second thought, I don't think I'm happy with the 5 meters, so I decide to change it. I type **15m** and then press Enter again.

The box moves another 10 meters in the red direction.

5. I can keep changing the box's position until I'm happy (or bored).



**Figure 2-14:** I move the box 5 meters, and then I change my mind and move it 15 meters instead.

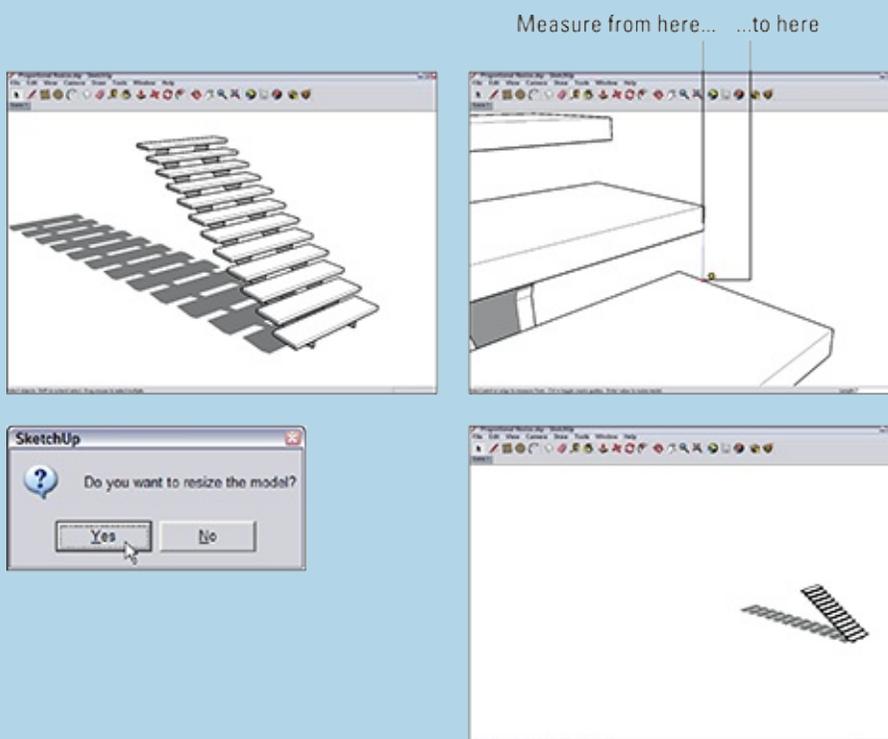


## Resizing everything with the Tape Measure tool

Consider that you've been working away in SketchUp, not paying particular attention to how big anything in your model is, when you suddenly decide that you need what you've made to be a specific size. SketchUp has a terrific trick for taking care of this exact situation: You can use the Tape Measure tool to resize your whole model based on a single measurement.

Here's how this tool works: In the following figure, I started to model a simple staircase, and now I want to make sure that it's the right size; doing so will make it easier to keep working on it. I know I want the *riser height*, the vertical distance between the steps, to be 7 inches, so this is what I do:

1. Select the Tape Measure tool (choose Tools⇒Tape Measure).



2. Make sure that the Tape Measure is in Measure mode by pressing the Ctrl key (Option on the Mac) until I don't see a plus sign (+) next to the Tape Measure cursor.
3. To measure the distance I want to change (in this case, the riser height), I click once to start measuring and click again to stop.
4. I type the dimension I *want* what I just measured to be: 7 (for 7 inches).
5. In the dialog box that appears, asking me whether I want to resize my whole model, I click the Yes button.

When I click the Yes button, my whole model is resized proportionately to the dimension I entered.

## Selecting what you mean to select

If you want to move (rotate, copy, and so on) something in your model, you need to select it first. When you make a selection, you're telling SketchUp that *this* is the stuff you want to work with. To select things, you use (drum roll, please) the Select tool, which looks exactly the same as the Select tool in every other graphics program on the planet — it's an arrow. That's a good thing because selecting isn't the sort of thing you should have to relearn every time you pick up a new program. Here's everything you need to know about selecting things in SketchUp:



Technically, every single thing you see in your modeling window is an *entity*.

**SketchUp has three different kinds of entities:**

- *Elements* are basic pieces of geometry like edges and faces.
- *Objects* are made up of elements. Components and groups, which I cover in Chapter 5, are objects. Anytime you want to make a separate *thing* with its own name and metadata, you make an object. In SketchUp, they're everywhere.
- *Annotations* are things like text, guides, dimensions, and section planes. It's kind of a catch-all category — anything that isn't an element or an object is an annotation.

Just click anything in your model to select it (while you're using the Select tool, of course).

To select more than one thing, hold down the Shift key while you click all the things you want to select; see Figure 2-15.



The Shift key works both ways when it comes to the Select tool. You can use it to *add* to your set of selected things (which I mention earlier), but you can also use it to *subtract* something from your selection. In other words, if you have a bunch of stuff selected and you want to deselect something in particular, just hold down Shift while you click it — it isn't selected anymore.

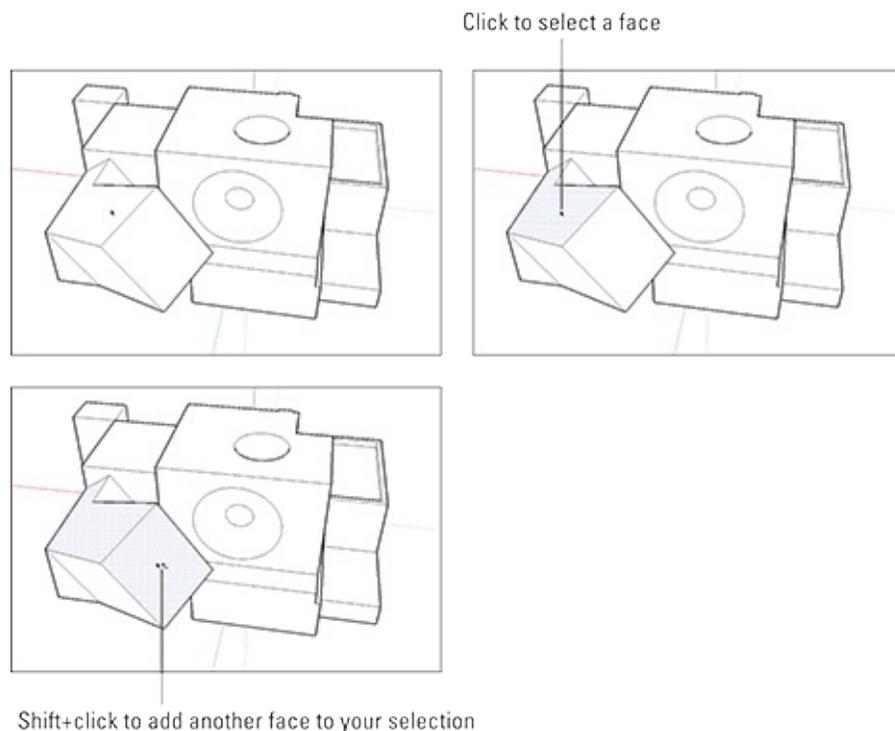
Selected entities in SketchUp look different depending on what they are:

- Selected edges turn blue.
- Selected faces look covered in tiny blue dots.
- Selected groups and components have a blue box around them.

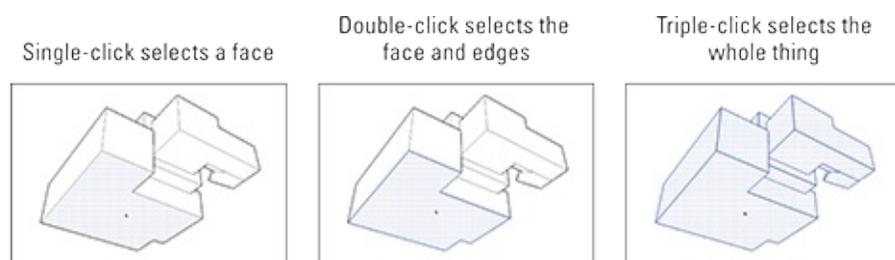
- Selected annotations turn blue.



**A much fancier way to select things in your model is to double- and triple-click them.** When you double-click a face, you select that face and all the edges that define it. Double-clicking an edge gives you that edge plus all the faces that are connected to it. When you *triple-click* an edge or a face, you select the whole conglomeration that it's a part of. Figure 2-16 shows what I mean.



**Figure 2-15:** Click entities with the Select tool to select them. Hold down Shift to select more than one thing.



**Figure 2-16:** Try single-, double-, and triple-clicking edges and faces in your model to make different kinds of selections.

**You can also select several things at once by dragging a box around them.** You have two kinds of selection boxes; the one you use depends on what you're trying to select. See Figure 2-17:

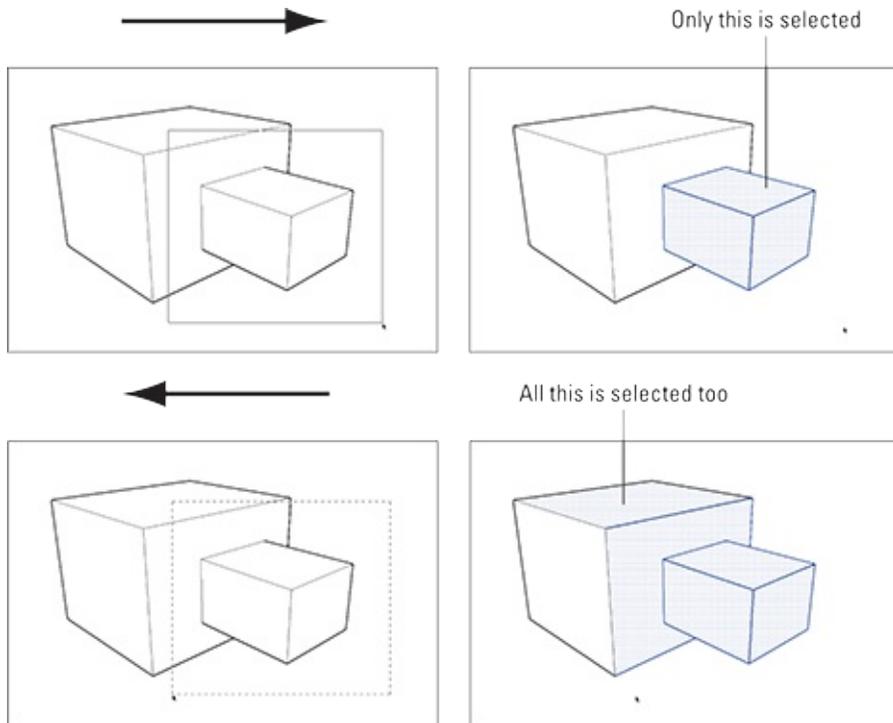
- *Window selection:* If you click and drag from *left to right* to make a selection box, you create a window selection. In this case, only things that are *entirely* inside your selection box are selected.
- *Crossing selection:* If you click and drag from *right to left* to make a selection box, you create a crossing selection. With one of these, anything your selection box touches (including what's inside) is selected.



I keep saying that selected stuff turns blue in SketchUp, but you can make it turn any color you want. Blue is just the default color for new documents you create. The “selected things” color is one of the settings you can adjust in the Styles dialog box; if you’re interested, you can read all about styles in Chapter [10](#).



Just because you can’t see something doesn’t mean it isn’t selected. Whenever you make a selection, it’s a very good idea to orbit around to make sure you have only what you intended to get. Accidentally selecting too much is an easy mistake to make.



**Figure 2-17:** Dragging left to right selects everything inside your selection box. Dragging right to left selects everything that your selection box touches.

## *Moving and copying like a champ*

To move things in SketchUp, use the Move tool. To make a copy of something, use the Move tool in combination with a button on your keyboard: the Ctrl key in Windows and the Option key on a Mac. It’s really that simple.

### *Moving things*

The Move tool is the one that looks like four red arrows. Using this tool involves clicking the entity you want to move, moving it to where you want it to be, and clicking again to drop it. The maneuver isn’t complicated, but getting the hang of it takes a bit of time.



Here are tips for using Move successfully:

✓ **Click, move, and click. Don’t drag your mouse.** Just like using the Line tool, try to avoid the temptation to use the Move tool by clicking and dragging with your mouse; doing so makes

things a lot harder. Instead, practice clicking once to pick things up, moving your mouse without any buttons held down, and clicking again to put down whatever you're moving.

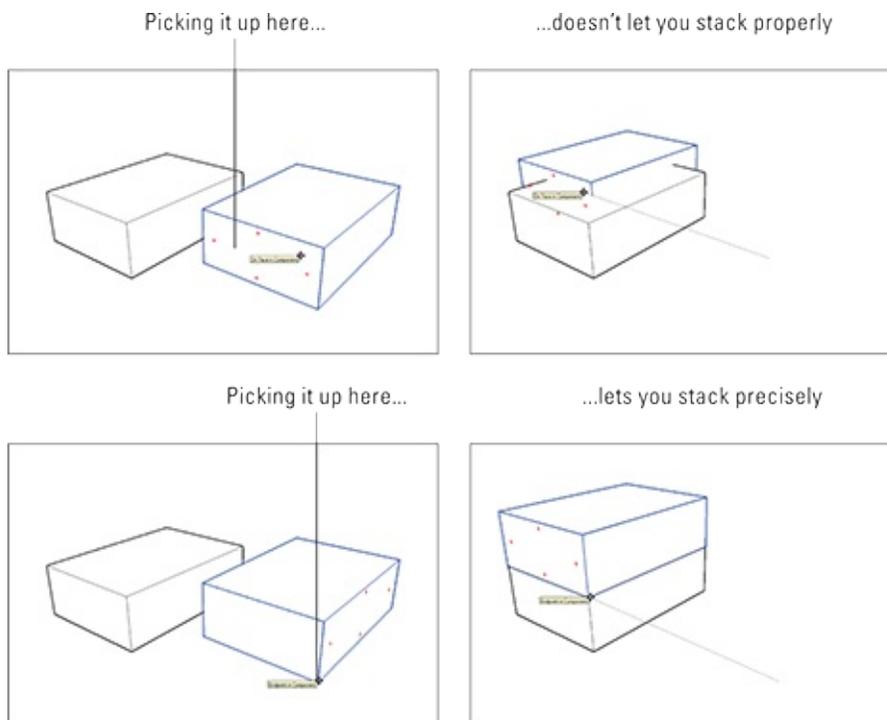
- ✔ **Click a point that will let you position whatever you're trying to move *exactly* where you want when you drop it (instead of just clicking anywhere on the thing you're trying to move to pick it up).** Figure 2-18 shows two boxes that I want to stack on top of each other precisely. If I just click anywhere on the first box and move it over the other one, I can't place it where I want; SketchUp just doesn't work that way.

To stack the boxes precisely, I have to click the *bottom corner* of the soon-to-be top box to grab it there and then move my cursor over the *top corner* of the bottom box to drop it. Now my boxes are lined up perfectly.

- ✔ **Press the Esc key to cancel a move operation.** Here's something beginners do all the time: They start to move something (or start moving something accidentally) and then they change their minds. Instead of pressing Esc, they try to use Move to put things back the way they were. Inevitably, they don't, and things get messed up.

If you change your mind in the middle of moving something, just press Esc, and everything goes back to the way it was.

- ✔ **Don't forget about inferences.** To move something in one of the colored directions, just wait until you see the dotted On Axis linear inference appear; then hold down Shift to lock yourself in that direction. For more information about using SketchUp's inference engine, check out the section "[Keeping an eye out for inferences](#)," earlier in this chapter.
- ✔ **Don't forget about the Measurements box.** You can move things precise distances with the Measurements box; see "[Injecting accuracy into your model](#)," earlier in this chapter.



**Figure 2-18:** To move things precisely, choose precise points to grab things and put them down.

In SketchUp, the Move tool is very important for modeling; it's not just for moving whole objects. You can also use this tool to move just about anything, including *vertices* (edges' endpoints), edges, faces, and combinations of any of these. By moving only certain *entities* (all the things I just mention), you can change the shape of your geometry pretty drastically. Figure [2-19](#) shows what I mean.

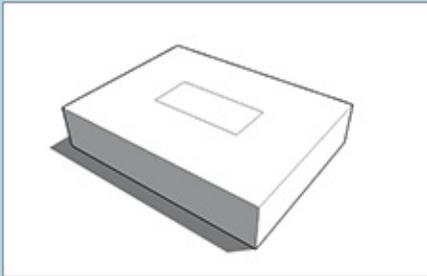


Using the Move tool to create forms (instead of just moving them around) is an incredibly powerful way to work but isn't particularly intuitive. After all, nothing in the physical world behaves like the Move tool — you can't just grab the edge of a hardwood floor and move it up to turn it into a ramp in real life. In SketchUp, you can — and should.

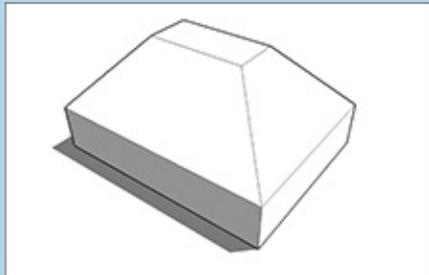
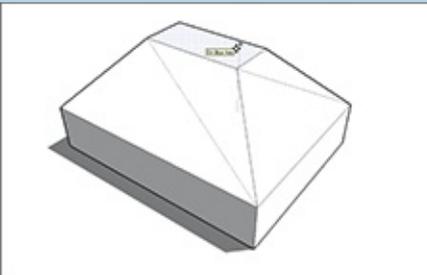
## Telling SketchUp who's boss with Auto-Fold

This will happen to you sooner or later: As you try to move a vertex, an edge, or a face, you can't go in the direction you want. SketchUp doesn't like to let you create *folds* (when extra faces and edges are created in place of a single face) with the Move tool, so SketchUp constrains your movement to directions that won't add folds. To force the move, press and hold down the Alt key (Command on a Mac) while you move. When you do this, you're telling SketchUp that it's okay to proceed — to create folds if it has to. This is called *Auto-Fold*, and the following figure shows how it works.

Click once with the Move tool  
to start moving



Hold down Alt (Command on a Mac)  
and move your mouse

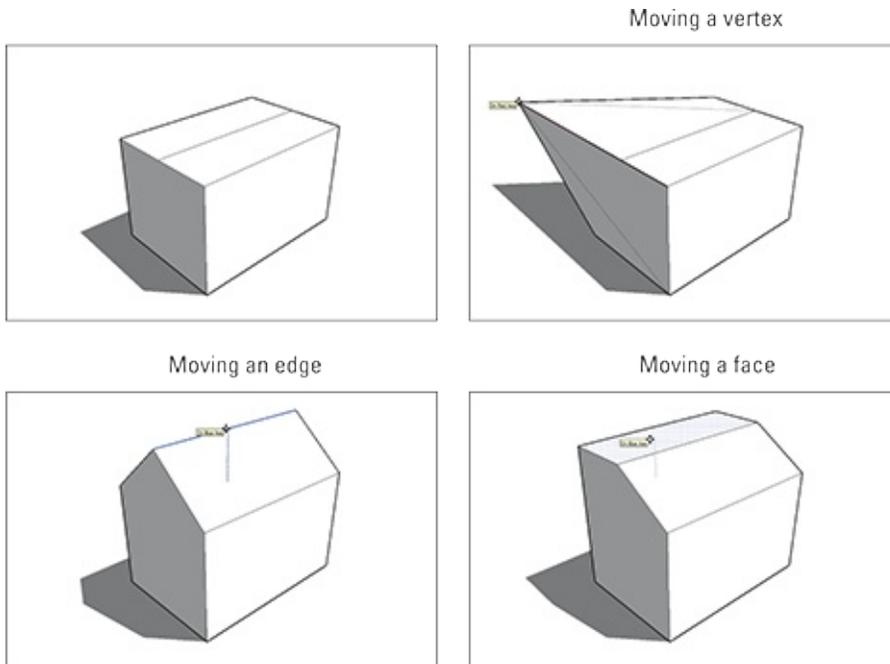


### *To preselect or not to preselect*

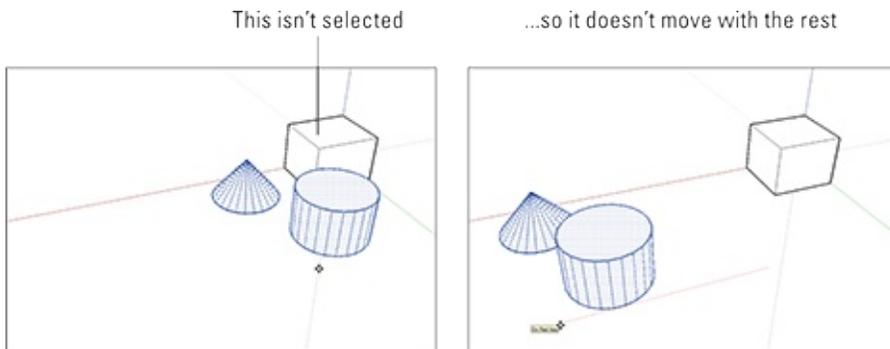
The Move tool works in two different ways; you eventually need to use them both, depending on what you're trying to move:

- ✓ **Moving a selection:** When you have a selection of one or more entities, the Move tool moves only the things you've selected. This comes in handy every time you need to move more than one thing all at once; Figure [2-20](#) shows how to move selected items with the Move tool.

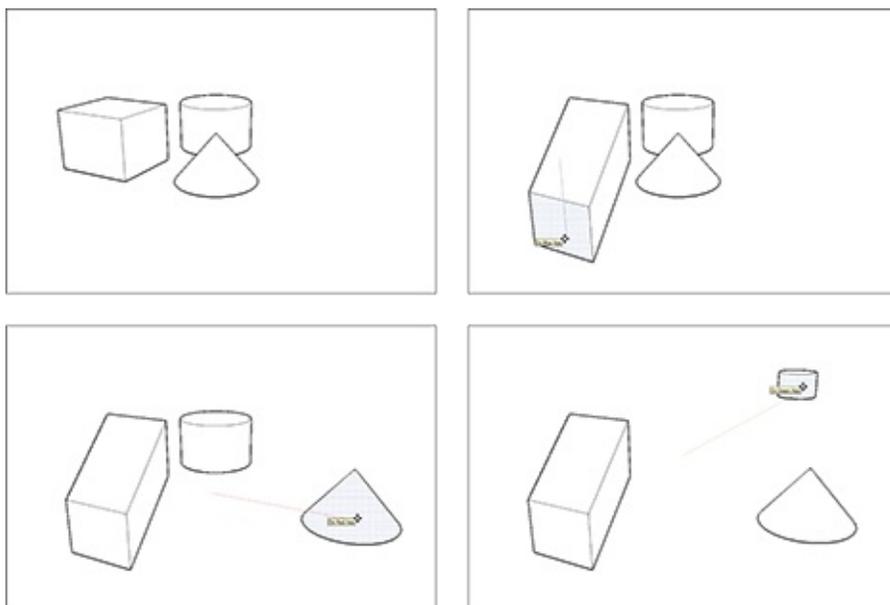
✔ **Moving without a selection:** If you don't have anything selected, you can click anything in your model with the Move tool to move it around. Only the thing you click moves, as shown in Figure 2-21.



**Figure 2-19:** You can use the Move tool on vertices, edges, and faces to model different forms.



**Figure 2-20:** Using the Move tool when you have a selection moves only the things in that selection.



**Figure 2-21:** Without anything selected, you can click anything in your model with the Move tool to start moving it.

## ***Making copies with the Move tool***

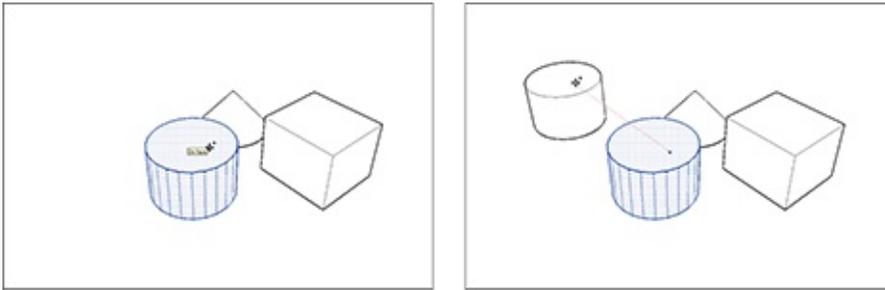
Lots of folks spend time hunting around in SketchUp, trying to figure out how to make copies. It's very simple: You just press a *modifier key* — a button on your keyboard that tells SketchUp to do something different — while you're using the Move tool. Instead of moving something, you move a copy of it. Here are a couple things to keep in mind:

- ✓ **Press the Ctrl key to copy in Windows, and press the Option key to copy on a Mac.** This tells SketchUp to switch from Move to Copy while you're moving something with the Move tool. Your cursor shows a little + next to it, and your copy moves when you move your mouse. Figure [2-22](#) shows this in action.



If you decide you don't want to make a copy, just press the Ctrl key (Option on a Mac) again to toggle back to Move; the + sign disappears.

- ✓ **Copying is just like moving, except you're moving a copy.** This means that all the same rules for using the Move tool apply to making copies, too.

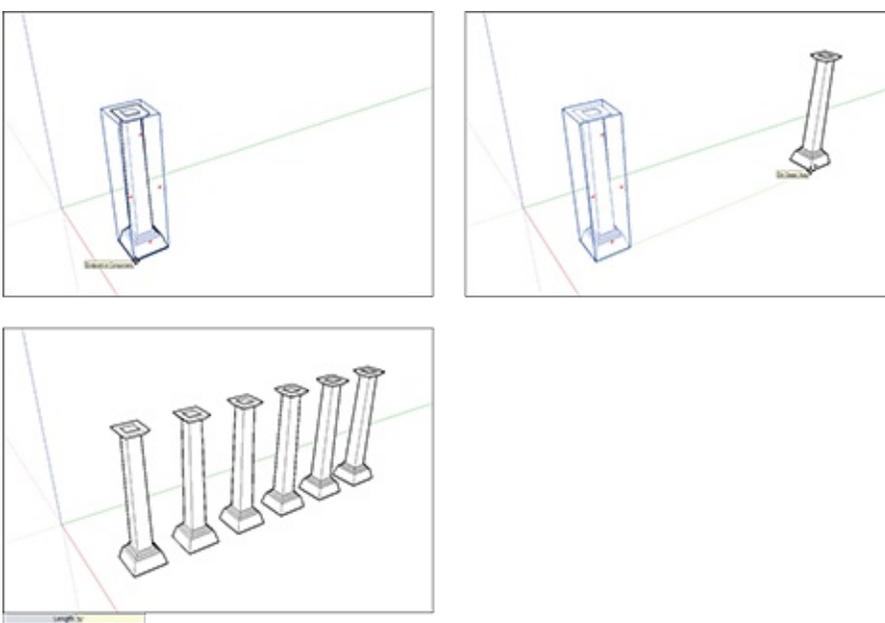


**Figure 2-22:** Press Ctrl (Option on a Mac) to tell SketchUp to make a copy while you move something.



You can make more than one copy at a time. Perhaps I want to make five equally spaced copies of a column, as shown in Figure [2-23](#). All I have to do is move a copy to where I want my last column to be; then I type `5/` and press Enter. This makes five copies of my column and spaces them evenly between the first and last column in the row. Neat, huh?

If I know how far apart I want my copies to be, I can move a copy that distance, type `5x`, and press Enter. My five copies appear equally spaced in a row, as shown in Figure [2-24](#).

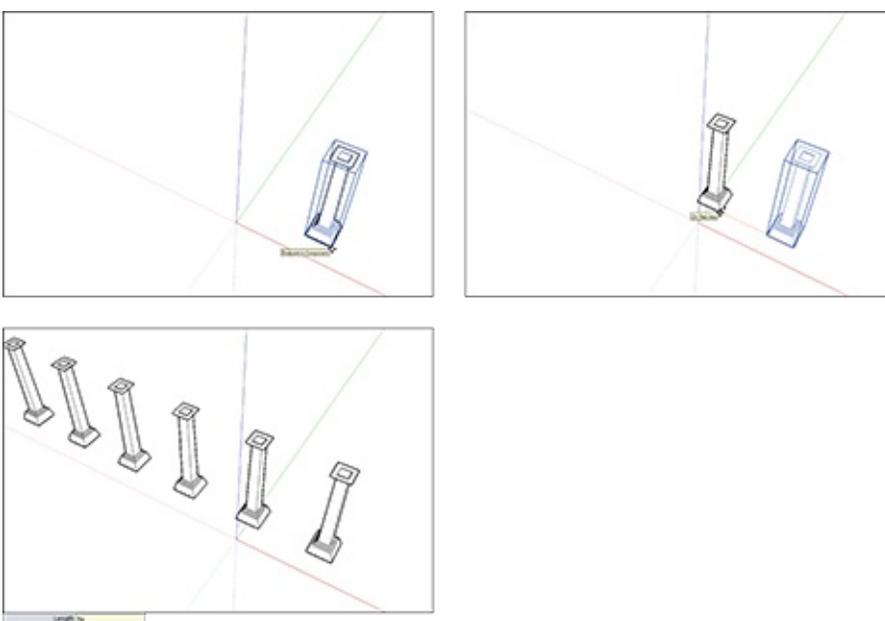


**Figure 2-23:** Make evenly spaced copies by typing the number of copies you want followed by a slash (/) and press Enter.

## *Rotating the right way*

Using SketchUp's Rotate tool is a lot like using the Move tool. Despite the fact that rotation is pretty straightforward, I include a section about it in this chapter for one specific reason: The Rotate tool has a trick up its sleeve that most new modelers don't discover until hours after they could've used it. First things first, though:

- ✓ **It's better to preselect.** As with the Move tool, rotating something you've already selected is usually easier.
- ✓ **The Rotate tool can make copies, too.** Press the Ctrl key (Option on a Mac) to switch between rotating your original or rotating a copy. You can also make several copies at once; check out the earlier section "[Making copies with the Move tool](#)," to read about using *x* and */* to create multiples while you rotate.
- ✓ **You can be precise.** Feel free to use your keyboard and the Measurements box to type exact angles while you're rotating. Take a look at "[Injecting accuracy into your model](#)" (earlier in this chapter) to find out more.



**Figure 2-24:** To make multiple copies in a row, type the number of copies you want, type an x, and press Enter.

### ***Using Rotate: The basic method***

Follow these steps to rotate things in your model:

- 1. Select everything you want to rotate.**
- 2. Activate the Rotate tool.**

The default keyboard shortcut for Rotate is Q, just in case you're wondering.

- 3. Click once to establish an axis of rotation.**

Your *axis of rotation* is the theoretical line around which your selected entities will rotate; picture the axle of a wheel. Although it'd be nice if SketchUp drew the axis of rotation in your model, you just have to imagine it.



As you move the Rotate tool's big protractor cursor around your screen, notice that the cursor sometimes changes orientation and color. When you hover over a face, the cursor realigns itself to create an axis of rotation that's perpendicular to that face. When the cursor is red, green, or blue, its axis of rotation is currently parallel to that colored axis.



You can (and should) use *inference locking* when you're using the Rotate tool. Just hover over any face in your model that's perpendicular to the axis of rotation you want, hold down the Shift key to lock in that orientation, and click where you want your axis to be. See [“Using inferences to help you model”](#) (earlier in this chapter) to read all about it.

- 4. Click again to start rotating.**

Clicking part of the thing you're rotating is helpful, especially if you're rotating visually

instead of numerically (by typing an angle).

**5. Move your mouse; then click again to finish rotating.**

If you like, now is a good time to type a rotation angle and press Enter. As with everything else in SketchUp, you can be as precise as you want — or need — to be.

### ***Using Rotate: The not-so-basic method***

The basic method of using Rotate is fine when you need to rotate something on the ground plane, but this method isn't as useful when your axis of rotation isn't vertical. Finding a face to use to orient your cursor can be tricky or impossible, and that's where a lot of SketchUp modelers get hung up.

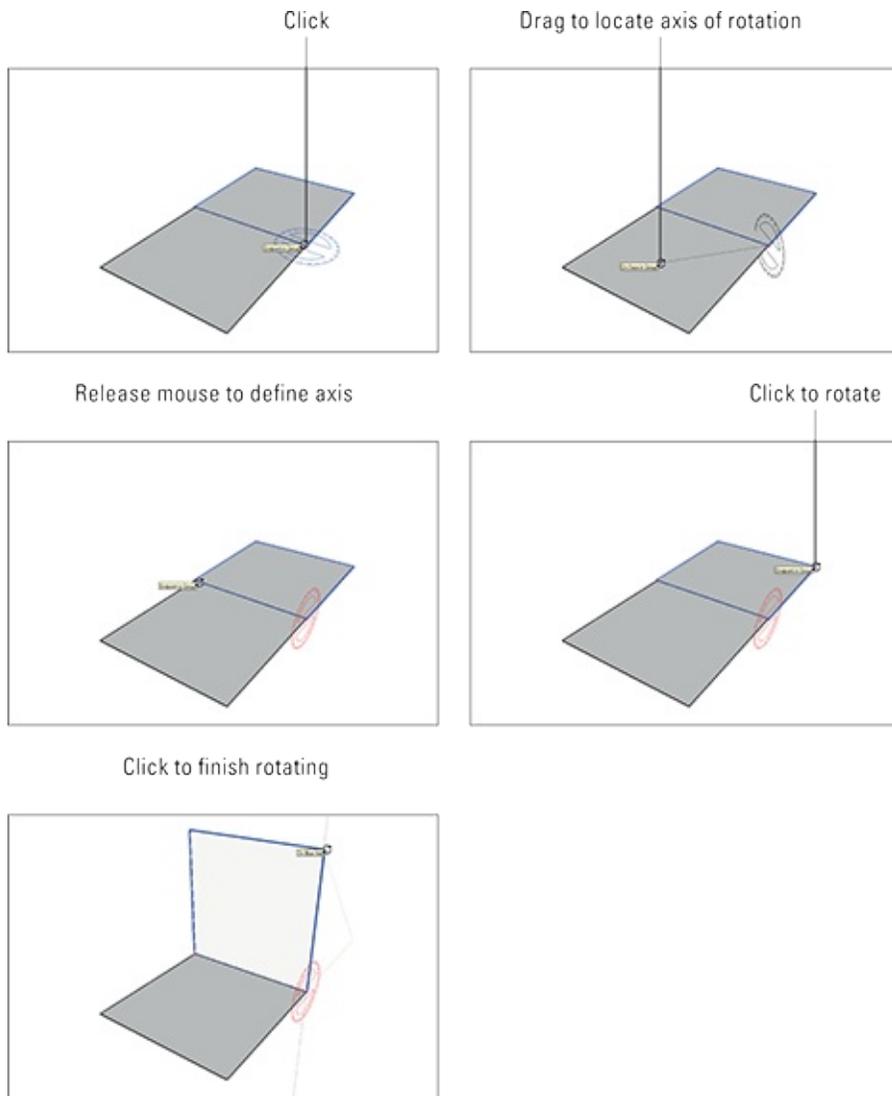
In version 6 of SketchUp, the software's designers introduced a feature that pretty much everybody realizes is great: You can establish a precise axis of rotation (the invisible line around which you're rotating) *without having any pre-existing faces to use for orientation*. This makes rotating things about a million times easier, and regular SketchUp users danced little jigs (albeit awkwardly) when we heard the news.

In this case, using Rotate goes from being a five-step operation to a seven-step one. Check out Figure [2-25](#) for a visual explanation:

- 1. Select everything you want to rotate.**
- 2. Activate the Rotate tool (Tools⇒Rotate).**
- 3. Click once to establish your axis of rotation, but *don't let go* — keep your finger on your mouse button.**
- 4. Drag your cursor around (still holding down the mouse button) until your axis of rotation is where you want it.**

As you drag, notice your Rotate protractor changes orientation; the line from where you clicked to your cursor is the axis of rotation.

- 5. Release your mouse button to set your axis of rotation.**
- 6. Click (but don't drag) the point at which you want to “pick up” whatever you're rotating.**
- 7. Click again to drop the thing you're rotating where you want it.**



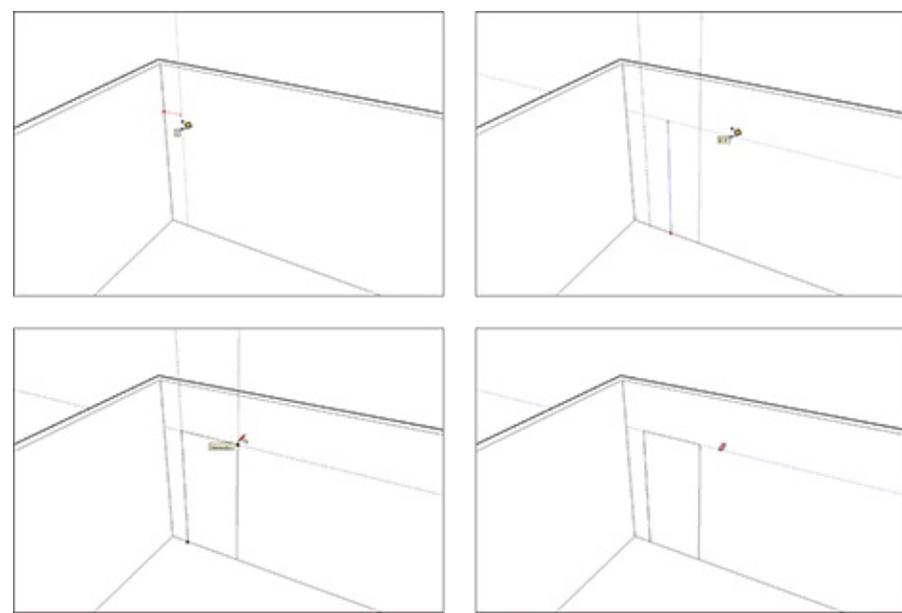
**Figure 2-25:** Define a custom axis of rotation by click-dragging your mouse.

## ***Making and using guides***

Sometimes you need to draw temporary lines while you model. These temporary lines, or *guides*, are useful for lining up things, making things the right size, and generally adding precision and accuracy to what you're building.

In previous versions of SketchUp, guides were called *construction geometry* because that's basically what they are: a special kind of entity that you create when and where you need them. They aren't part of your model because they're not edges or faces. This means that you can choose to hide them or delete them — like other annotations, they don't affect the rest of your geometry.

Figure [2-26](#) shows an example of guides in action. I use guides positioned 12 inches from the wall and 36 inches apart to draw the sides of a doorway. I use another guide 6 feet, 8 inches from the floor to indicate the top, and then I draw a rectangle, bounded by my guides, which I know is exactly the right size. When I'm done, I erase my guides with the Eraser tool, as I explain in a moment.

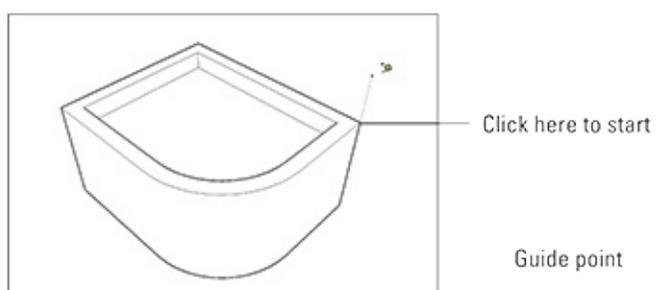
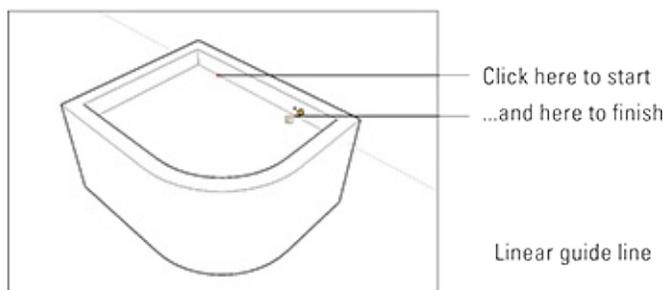
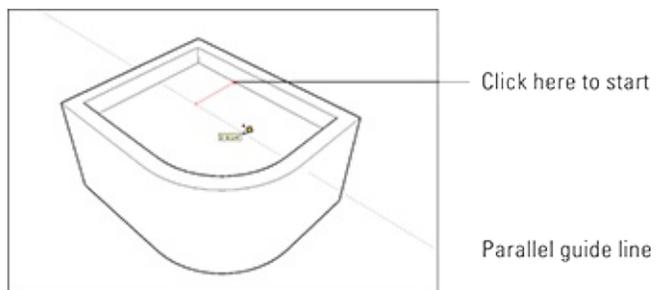


**Figure 2-26:** Use guides to measure things before you draw.

### ***Creating guides with the Tape Measure tool***

You can create three kinds of guides, and you use the Tape Measure tool to make them all, as shown in Figure 2-27.

✓ **Parallel guide lines:** Clicking anywhere (except the endpoints or midpoint) along an edge with the Tape Measure tool tells SketchUp that you want to create a guide parallel to that edge; see Figure 2-27. Just move your mouse and you see a parallel, dashed line; click again to place the line wherever you want.



**Figure 2-27:** Use the Tape Measure tool to create guide lines and points.

- ✓ **Linear guide lines:** To create a guide along an edge in your model, click anywhere along the edge *except* on either of the endpoints, and then click again anywhere else along the edge.
- ✓ **Guide points:** You may want to place a point somewhere in space; you can do exactly that with guide points. With the Tape Measure tool, click an edge's endpoint, and then click again somewhere else. A little x appears at the end of a dashed line — that's your new guide point.



Here's an important point about the Tape Measure tool: It has two modes, and it creates guides in only one of them. Pressing the Ctrl key (Option on a Mac) toggles between the modes. When you see a + next to your cursor, your Tape Measure can make guides; when there's no +, it can't.

## *Using guides to make your life easier*

As you're working along in this software, you'll find yourself using guides all the time; they're an indispensable part of the way modeling in SketchUp works. Here's what you need to know about using them:

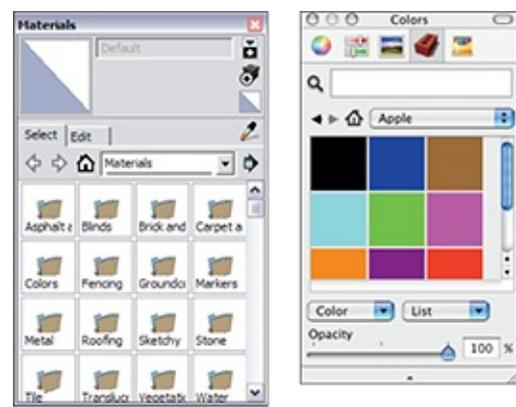
- ✓ **Position guides precisely using the Measurements box.** Check out the section "[Injecting accuracy into your model](#)," earlier in this chapter, to find out how.
- ✓ **Erase guides one at a time.** Just click or drag over them with the Eraser tool to delete guides individually. You can also right-click them and choose Erase from the context menu.
- ✓ **Erase all your guides at once.** Choosing Edit⇒Delete Guides does just that.
- ✓ **Hide guides individually or all at once.** Right-click a single guide and choose Hide to hide it, or deselect View⇒Guides to hide them all. It's a good idea to hide your guides instead of erasing them, especially while you're still modeling.
- ✓ **Select, move, copy, and rotate guides just like any other entity in your model.** Guides aren't edges, but you can treat them that way a lot of the time.

## *Painting your faces with color and texture*

When adding colors and textures — collectively referred to in SketchUp as *materials* — to your model, there's really only one place you need to look, and one tool you need to use — the Materials dialog box and the Paint Bucket tool, respectively.

### *The Materials dialog box*

To open the Materials dialog box (or Colors dialog box on the Mac), choose Window⇒Materials. Figure 2-28 shows what you see when you do. The Materials dialog box is radically different in the Windows and Mac versions of SketchUp, but that's okay — they do basically the same thing.



**Figure 2-28:** The Materials dialog box in Windows (left) and on the Mac.

In SketchUp, you can choose from two kinds of materials to apply to the faces in your model:

- ✓ **Colors:** These are simple — colors are always solid colors. You can't have *gradients* (in which one color fades into another), but you can pretty much make any color you want.
- ✓ **Textures:** Basically, a SketchUp texture is a tiny image — a photograph, really — that gets tiled over and over to cover the face you apply it to. If you paint a face with, say, a brick texture, what you're really doing is telling SketchUp to cover the surface with however many “brick photo” tiles it takes to do the job. The preview image you see in the Materials dialog box is actually a picture of a single texture image tile.

SketchUp comes with a whole bunch of textures, and you can always go online and choose from thousands more available for sale. And if that's *still* not enough, you can make your own (though the process is well beyond the scope of this humble tome).



On the Mac, you have to click the little brick icon in the Materials (Colors) dialog box to see the textures libraries that ship with SketchUp; it's the drop-down list next to the little house icon.

The following facts about SketchUp materials are also handy to know as you work with them:

- ✓ **Materials can be translucent.** Sliding the Opacity slider makes the material you've selected more or less translucent, which makes seeing through windows in your model a lot easier. On Windows, you'll find the Opacity slider in the Edit tab.
- ✓ **Textures can have transparent areas.** If you take a look at the materials in the Fencing library, you'll notice that a lot of them look kind of strange; they have areas of black that don't seem right. These black areas are areas of transparency: When you paint a face with one of these textures, you can see through the areas that look black.
- ✓ **You can edit materials and even make your own.** I'd consider this to be a pretty advanced use of SketchUp, so I don't talk about it in this book, but I thought you should at least know it's possible.



There's actually a third thing (besides colors and textures) you can apply to the faces in your models: photos. In fact, *photo-texturing* is an incredibly important part of some SketchUp workflows. As such, I dedicate a good portion of Chapter [8](#) to the subject of modeling with photographs.

### ***The Paint Bucket tool***

The Paint Bucket tool looks just like — you guessed it — a bucket of paint. Activating it (Tools⇒Paint Bucket) automatically opens the Materials dialog box so it's handy. Here's everything you need to know about the Paint Bucket tool:

- ✓ **You fill it by clicking in the Materials dialog box.** Just click a material to load your bucket and then click the face you want to paint. It's as simple as that.
- ✓ **Holding down the Alt key (Command on a Mac) switches to the Sample tool.** With the Sample tool, you can click any face in your model to load your Paint Bucket with that face's material. Release the Alt key to revert to the Paint Bucket tool.
- ✓ **Holding down the Shift key paints all similar faces.** If you hold down Shift when you click to paint a face, all faces in your model that match the one you click are painted, too. If things don't turn out the way you want, just choose Edit⇒Undo to go back a step.

## Chapter 3

# Getting a Running Start

---

### *In This Chapter*

- ▶ Starting at the right place in SketchUp
  - ▶ Building a simple model
  - ▶ Changing the way the model looks
  - ▶ Exporting a JPEG file that you can e-mail
- 

If you can't wait to get your hands dirty (so to speak), you've come to the right chapter. Here I help you make a simple model step by step, spin it around, paint it, and even apply styles and shadows. You don't need to read another word of this book to be able to follow along, although I do refer you to chapters where you can find out more. Above all, these pages are about *doing* and about the basics of putting together the various SketchUp features to produce a knockout model in no time.

So what are you going to build? Perhaps a doghouse. The nice thing about doghouses is that they're a lot like peoplehouses in the ways that count: They have doors and roofs, and just about everybody has seen one.



One last thing: Just about every other piece of this book is written so that you can jump around to the bits you need; you don't have to follow a particular order. This chapter is the exception to that rule. If you want to follow along, start on this page and work your way to the end. Otherwise, the steps just won't make sense.

## Setting Things Up

I know — setup is boring. Who wants to flip through menus and options dialog boxes instead of jumping in? I completely agree, so I keep this short and sweet. This section is just about making sure you start at the right place. That's it.

Follow these steps to get ready:

1. **Launch SketchUp.**
2. **Choose your default settings.**

If you've never launched SketchUp on your computer before, the Welcome to SketchUp dialog box appears, as shown in Figure [3-1](#). Here's what to do if it pops up:

- a. *Click the Choose Template button in the upper right.*
- b. *Choose one of the Architectural Design templates — it doesn't matter if you prefer Feet*

and Inches or Millimeters.

- c. Click the *Start Using SketchUp* button to close the dialog box and open a new SketchUp file.

If the Welcome to SketchUp dialog box doesn't appear, someone (maybe you) has told the dialog box not to show up automatically on startup. Don't worry — just follow these steps to set things straight:

- a. Choose *Help*⇒*Welcome to SketchUp* from the menu bar.
- b. Follow Steps a and b in the preceding step list.
- c. Open a new file by choosing *File*⇒*New*.



If you're using the Pro version of SketchUp, the Welcome to SketchUp dialog box looks a little different — it includes information about your software license. The best place to go for help when you're having trouble with your license is the SketchUp Knowledge Center. Choose *Help*⇒*Knowledge Center* to go there directly from SketchUp.



**Figure 3-1:** The Welcome to SketchUp dialog box, which pops up the first time you launch SketchUp.

### 3. Make sure that you can see the Getting Started toolbar.

Figure 3-2 shows the Getting Started toolbar. If it's not visible in your modeling window, choose *View*⇒*Toolbars*⇒*Getting Started* to make it show up. If you're on a Mac, choose *View*⇒*Show Toolbar*.



**Figure 3-2:** The Getting Started toolbar lives at the top of your modeling window.

### 4. Clear your modeling window.

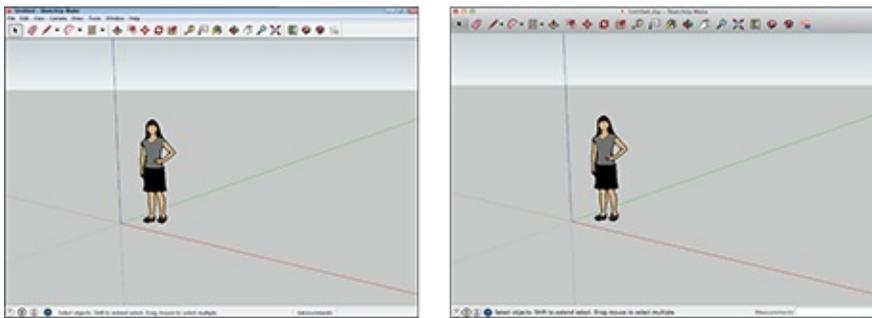
If this isn't the first time your computer has run SketchUp, you may see dialog boxes all over

the place. If that's the case, put everything back where it belongs by resetting your workspace:

- a. If you're using Windows, choose *Window⇒Preferences ...* On a Mac, choose *SketchUp⇒Preferences ...*
- b. Select the *Workspace* panel (it's last in the list on the left of the *Preferences* dialog box).
- c. Click the *Reset Workspace* button.

## Making a Quick Model

Figure 3-3 shows what your computer screen looks like at this point. You should see a row of tools across the top of your modeling window, a little person, and three colored *modeling axes* — red, green, and blue lines.



**Figure 3-3:** This is what your screen should look like in Windows (left) and on a Mac (right).



Follow these steps to build a doghouse (and if you get stuck, check out the video demo of these steps available via [www.dummies.com/extras/sketchup2014](http://www.dummies.com/extras/sketchup2014)):

### 1. Delete the little person on your screen.

Using the *Select* tool (the arrow on the far left of your toolbar), click the little person to select her (her name is *Sophie*, in case that matters to you) and then choose *Edit⇒Delete*.

### 2. Choose *Camera⇒Standard Views⇒Iso*.

This command switches you to an *isometric (3D)* view of your model, which allows you to build something without having to “move around.”

### 3. Draw a rectangle on the ground.

Use the *Rectangle* tool (refer to Figure 3-2) to draw a rectangle by doing the following:

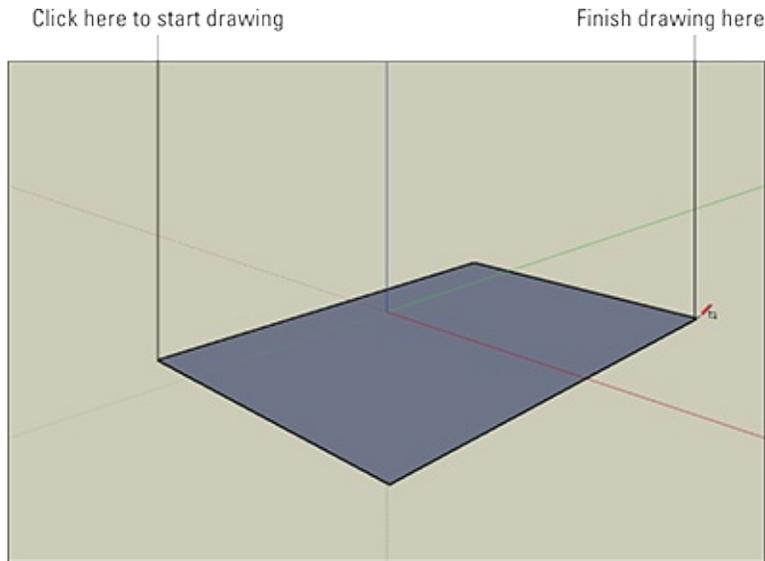
- a. Click once to place one corner on the left side of your screen.
- b. Click again to place the opposite corner on the right side of your screen.

Remember that you're in a 3D *perspective*, or view of the world, so your rectangle looks more like a diamond — 90-degree angles don't look like 90-degree angles in perspective. Figure 3-4

shows what you should aim for in this step.



It's important to draw the right kind of rectangle for this example (or for any model you're trying to create in Perspective view), so try it a few times until it looks like the rectangle in Figure 3-4. To go back a step, choose Edit⇒Undo Rectangle; the last thing you did is undone. You can use Undo to go back as many steps as you like.



**Figure 3-4:** Draw a 3D rectangle on the ground.

#### 4. Use the Push/Pull tool to extrude your rectangle into a box.

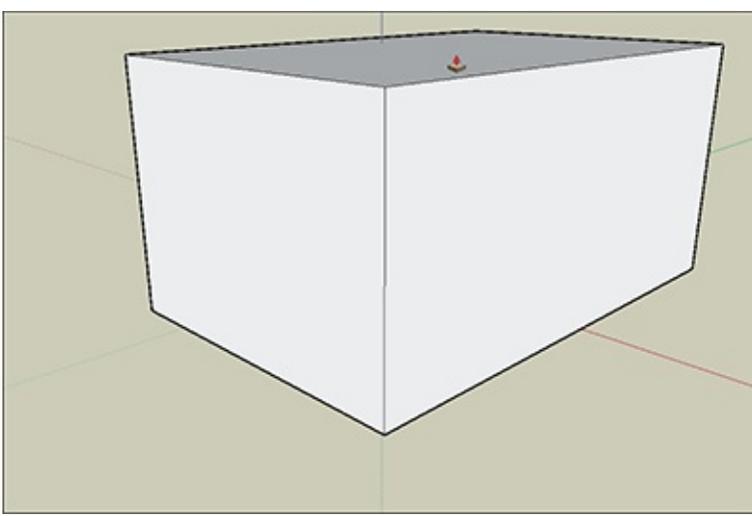
The Push/Pull tool looks like a brown box with a red arrow coming out the top. Use it to pull your rectangle into a box by following these steps:

- a. *Click the rectangle once to start the push/pull operation.*
- b. *Click again, somewhere above your rectangle, to stop pushing/pulling.*

At this point, your model should look like Figure 3-5; if it doesn't, use Push/Pull again to make your box look about the right height.



If you're happily pushing/pulling away on your box and everything suddenly disappears, you pushed/pulled the top of your box all the way to the ground. Just choose Edit⇒Undo and keep going.



**Figure 3-5:** Use the Push/Pull tool to extrude your rectangle into a box.

## 5. Draw a couple diagonal lines for your roof.

Use the Line tool (it's shaped like a pencil) to draw two diagonal edges (lines) that will form your peaked roof, as shown in Figure [3-6](#). Follow these steps:

- Click once at the midpoint of the top of your box's front face to start your line.*

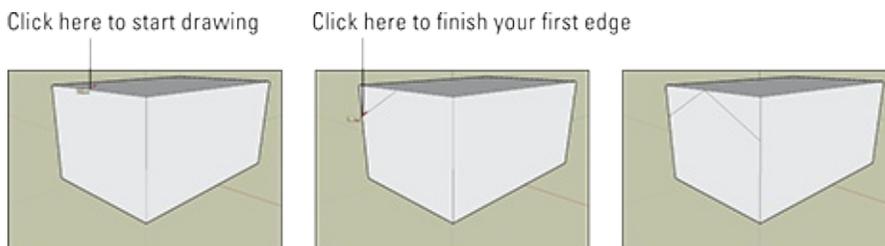
You know you're at the midpoint when you see a small, light blue dot and the word *Midpoint* appears. Move slowly to make sure that you see it.

- Click again somewhere along one of the side edges of your box's front face to end your line.*

Wait until you see a red *On Edge* square (just like the Midpoint one in the last step) before you click; if you don't, your new line won't end on the edge like it's supposed to.

- Repeat the previous two steps to draw a similar but opposite line from the midpoint to the edge on the other side of the face.*

Don't worry about making your diagonal lines symmetrical; for the purposes of this exercise, it's not important that they are.



**Figure 3-6:** Draw two diagonal lines that will become your peaked roof.

## 6. Push/pull the triangles away to leave a sloped roof.

Use the Push/Pull tool (the same one you use in Step 4) to get rid of the triangular parts of your box, leaving you with a sloped roof. Have a look at Figure [3-7](#) to see this in action and then follow these steps:

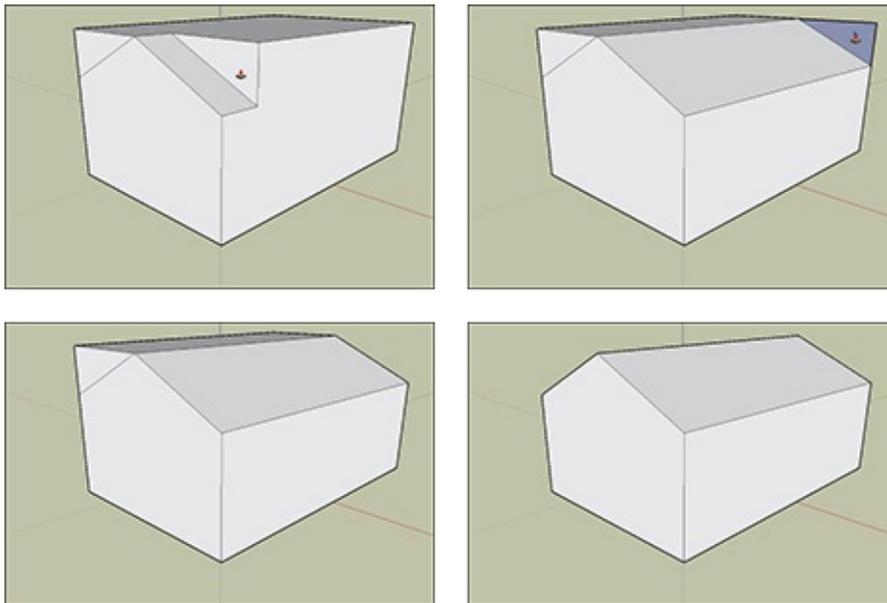
- a. Choose *Edit*⇒*Select None* to make sure you don't have anything selected in your model. If this menu option is grayed out, you're good to go.
- b. Select the *Push/Pull* tool and then click the right triangular face once to start the push/pull operation.
- c. Move your cursor to the right to push the triangle as far as it will go (so that it's even with the end of your box).
- d. Click again (on the triangle) to end the push/pull operation and to make the triangular face disappear.
- e. Still using the *Push/Pull* tool, double-click the left triangular face to repeat the previous push/pull operation, making that face disappear as well.

## 7. Draw a rectangle on your front face.

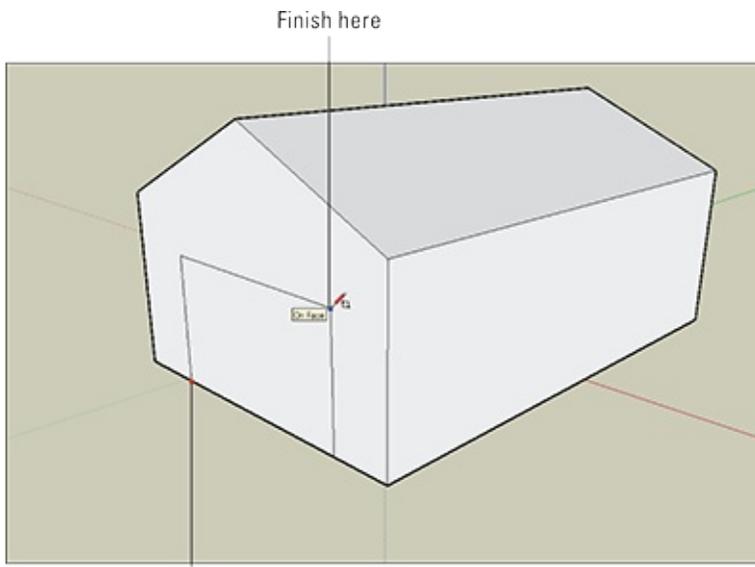
Switch back to the Rectangle tool (which you used in Step 3) and draw a rectangle on the front face of your pointy box. Make sure that the bottom of your rectangle is flush with the bottom of your box by watching for the red On Edge hint to appear before you click. Figure 3-8 shows what it looks like when you're done.



Using the Rectangle tool is a two-step process: You click once to place one corner and again to place the opposite corner. Try not to draw lines and shapes in SketchUp by *dragging* your cursor; doing so makes things more difficult. Practice clicking once to start an operation, such as drawing a rectangle, and clicking again to stop.



**Figure 3-7:** Use the Push/Pull tool to form a peaked roof on your box.



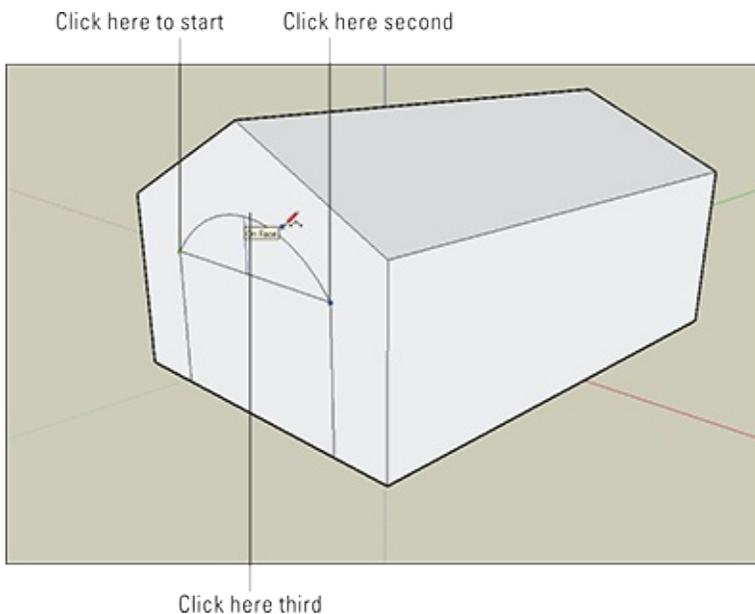
Click here to start drawing

**Figure 3-8:** A rectangle drawn on the front of your pointy box.

**8. Draw an arc on top of the rectangle you just drew.**

Use the Arc tool to draw an arc on top of your rectangle, as illustrated in Figure 3-9. Follow these steps to draw an arc:

- a. *Click the upper-left corner of the rectangle to place one endpoint of your arc. Make sure that you see the green Endpoint hint before you click.*
- b. *Click the upper-right corner of the rectangle to place the other endpoint of your arc.*
- c. *Move your cursor up to bow out the line you're drawing into an arc and then click when you're happy with how it looks.*



Click here third

**Figure 3-9:** Draw an arc on top of your rectangle.

9. **Select the Eraser tool and then click the horizontal line between the rectangle and the arc to erase that line.**
10. **Push/pull the doorway inward.**

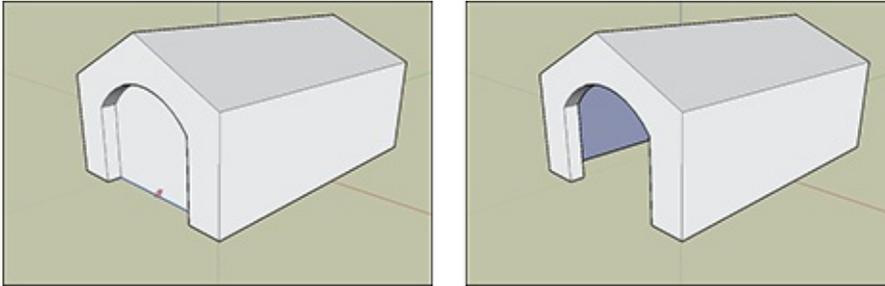
Use the Push/Pull tool (which you're an old hand with by now) to push in the "doorway" face you created in Steps 7 through 9 just a bit.



Use the Push/Pull tool by clicking a face once to start, moving your cursor to push/pull it in or out, and then clicking again to stop.

**11. Erase the horizontal line at the bottom of the doorway by clicking it with the Eraser tool.**

This makes the line (and the whole face above it) disappear. Figure 3-10 shows what your finished doghouse looks like.



**Figure 3-10:** Create the door opening by erasing its bottom edge.

For a more detailed introduction to drawing lines and working with midpoints, angles, and more, flip to Chapter 2.

## *Slapping on Some Paint*

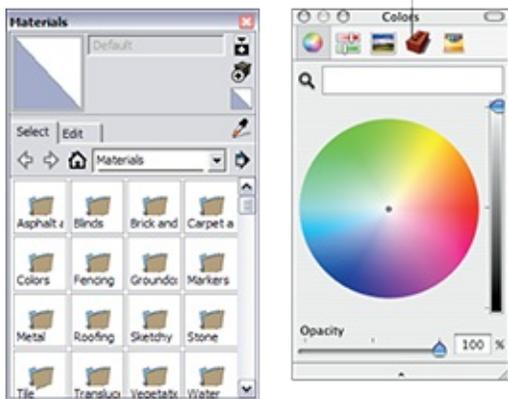
I have an ulterior motive for getting you to paint your doghouse: To color it, you have to understand how to spin it around first. Moving around your model is *the most important* skill to develop when you're first figuring out SketchUp. Run through these steps to apply colors (and textures) to the faces in your model, and to find out about moving around while you're doing it:

- 1. Choose Window⇒Materials to open the Materials dialog box shown in Figure 3-11 and then click a color or texture you like.**

When you do, you automatically pick up the Paint Bucket tool and fill it with your chosen material.

- 2. Paint some of the faces in your model by clicking any face with the Paint Bucket tool, which is on the toolbar.**
- 3. Switch materials.**

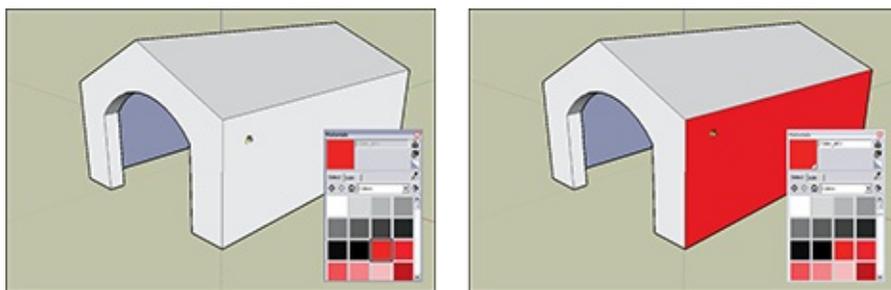
Choose another material from the Materials dialog box by clicking it.



**Figure 3-11:** The Materials dialog box in Windows (left) and on a Mac.

**4. Paint the rest of the faces you can see. See Figure 3-12.**

Loop through Steps 2 to 4 for as long as you like. Finding the Materials dialog box in SketchUp is just like getting a brand-new box of crayons when you were little (you know, the big box, with the built-in sharpener).



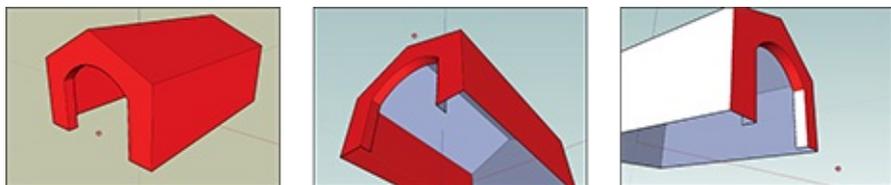
**Figure 3-12:** Use the Paint Bucket tool to paint everything you can see.

- 5. Choose the Orbit tool; it's just to the left of the creepy white hand on the toolbar.**
- 6. Click somewhere on the left side of your screen and *drag* your cursor over to the right, as shown in Figure 3-13. Release your mouse button when you're done.**

Your model spins, or *orbits*! Orbit around some more, just to get the hang of it.



If you're orbiting, and you've dragged your cursor over as far as it will go, and you haven't orbited as much as you wanted to, don't fret. Just release the mouse button, move your cursor over to where it was when you started orbiting, and orbit some more by clicking and dragging. To see what you want to see, you usually need a bunch of separate drags (separate orbits, I guess).



**Figure 3-13:** Choose the Orbit tool and drag your cursor to spin your model.

**7. Zoom in and out if you need to by selecting the Zoom tool and dragging your cursor up and down in your modeling window.**

The Zoom tool looks like a magnifying glass, and it's on the other side of the creepy white hand. Dragging up zooms in, and dragging down zooms out.



You can also zoom in and out by rolling the scroll wheel on your mouse, if you're using one.

**8. If needed, move around in two dimensions with the Pan tool by selecting it and then clicking and dragging the Pan cursor inside your modeling window.**

The Pan tool is the white hand between Orbit and Zoom. Use Pan to slide your model around inside your modeling window without spinning it or making it look bigger or smaller. You can pan in any direction.

**9. Use the Orbit, Zoom, Pan, and Paint Bucket tools to finish painting your doghouse.**

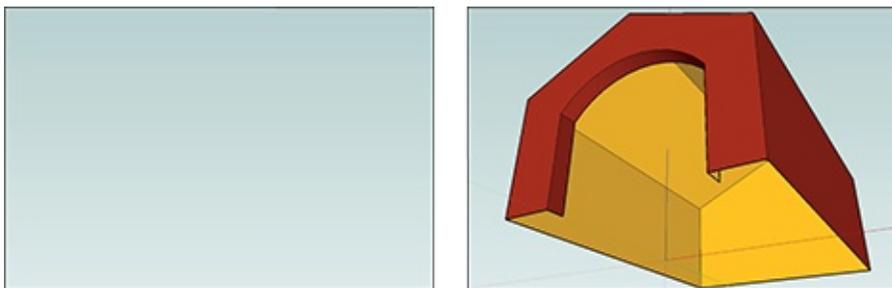
Now that you know how to move around your model, here's how I want you to paint it. Color Plate 8 shows what it should look like:

- Paint the exterior walls red-brown.
- Paint the roof light blue.
- Paint the interior yellow-orange.

When you're just starting out, it's easy to get a little lost with the navigation tools (Orbit, Zoom, and Pan). If you find yourself in a pickle, choose Camera ⇒ Zoom Extents. This tells SketchUp to plunk your model right in front of you; check out Figure 3-14 to see Zoom Extents in action. Just so you know, Zoom Extents is also a button on the toolbar; it's right next to the Zoom tool.



Chapter 2 is the place to look for extra tips and tricks on orbiting, zooming, and panning, as well as for details about using the Materials dialog box to paint the faces of an object. To see a video of the preceding steps, visit [www.dummies.com/extras/sketchup2014](http://www.dummies.com/extras/sketchup2014).



**Figure 3-14:** Use Zoom Extents anytime you can't figure out where your model went.

# Giving Your Model Some Style

SketchUp Styles allow you to change your model's appearance — the way it's drawn, basically — with just a few mouse clicks. You can create your own styles, of course, but SketchUp also comes with a library of premade ones that you can use without knowing anything about how they work.

Follow these steps to try a couple styles on your doghouse:

1. **Choose Window⇒Styles.**

The Styles dialog box opens.

2. **Click the Select tab to show the Select pane.**

3. **In the Libraries drop-down list shown in Figure [3-15](#), choose the Assorted Styles library.**



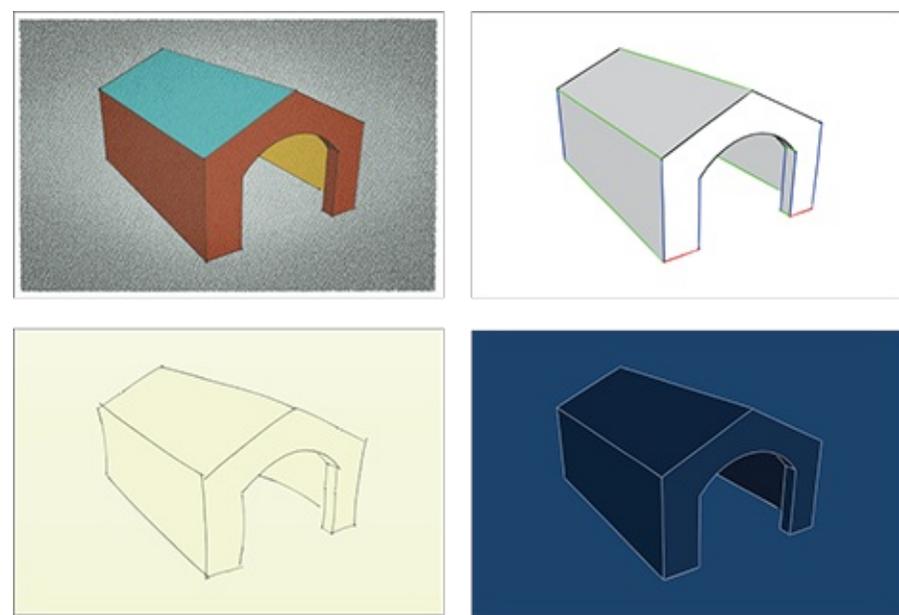
**Figure 3-15:** The Assorted Styles library is a sampler of ready-mixed SketchUp styles.

4. **Click through the different styles to see what they're about.**

When you click a style in the Styles dialog box, that style is applied to your model. Figure [3-16](#) shows the doghouse with a few styles applied — can you figure out which ones?

5. **Go back to your original style.**

Click the little house icon in the Styles dialog box to see a list of all the styles you've applied to your model. Find the Architectural Design Style (it should be first in the list) and click to choose it. Chapter [10](#) explains styles in more detail.



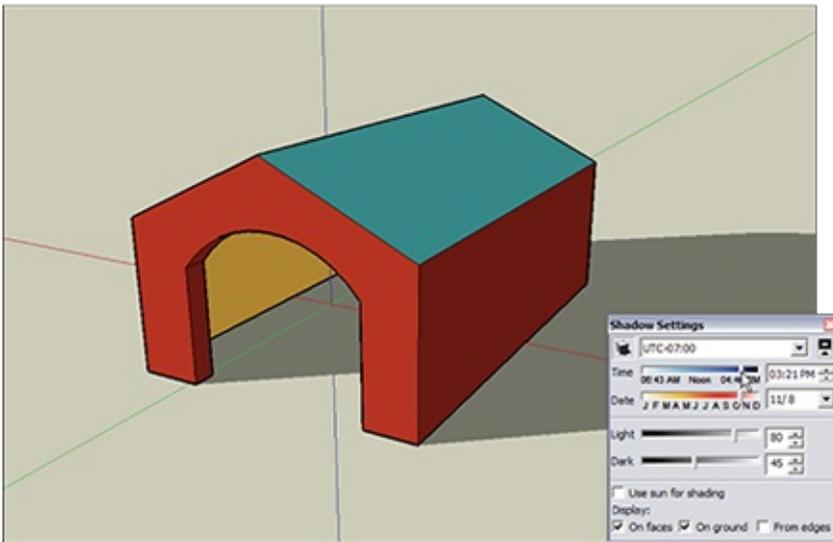
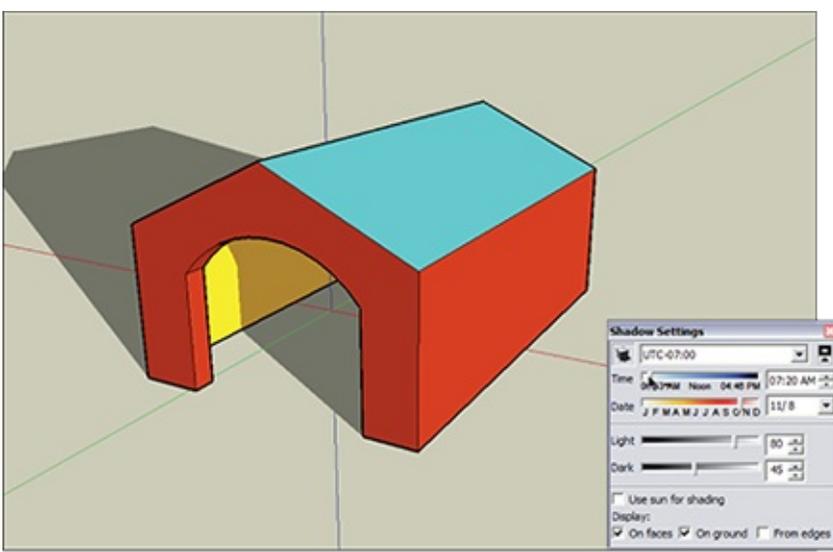
**Figure 3-16:** The same doghouse with four very different styles applied to it.

## Switching on the Sun



You're about to use what I consider to be one of SketchUp's best features: Shadows. When you turn on Shadows, you're activating SketchUp's built-in sun. The shadows you see in your modeling window are *accurate* for whatever time and location you set. For the purposes of this example, though, don't worry about accuracy. Go through these steps (or check out the video at [www.dummies.com/extras/sketchup2014](http://www.dummies.com/extras/sketchup2014)) to let the light shine in:

1. **Use Orbit, Zoom, and Pan to get an aerial, three-quarter view of your doghouse, sort of like the one shown in Figure 3-17.**



**Figure 3-17:** Use Orbit, Zoom, and Pan to navigate around until your model looks something like this.

**2. Choose Window⇒Shadows.**

This opens the Shadow Settings dialog box shown in Figure 3-18.



**Figure 3-18:** The Shadow Settings dialog box controls the position of SketchUp's built-in sun.

**3. Click the Display Shadows button (in the upper-left corner of the dialog box) to turn on the sun.**

Your doghouse casts a shadow on the ground.

**4. In the Shadow Settings dialog box, move the Time slider back and forth.**

Changing the time of day means that you're moving SketchUp's sun around in the sky. When the sun moves around, so do your shadows. Chapter [10](#) explains what I mean and explains more about fine-tuning light and shadows.

## *Sharing Your Masterpiece*

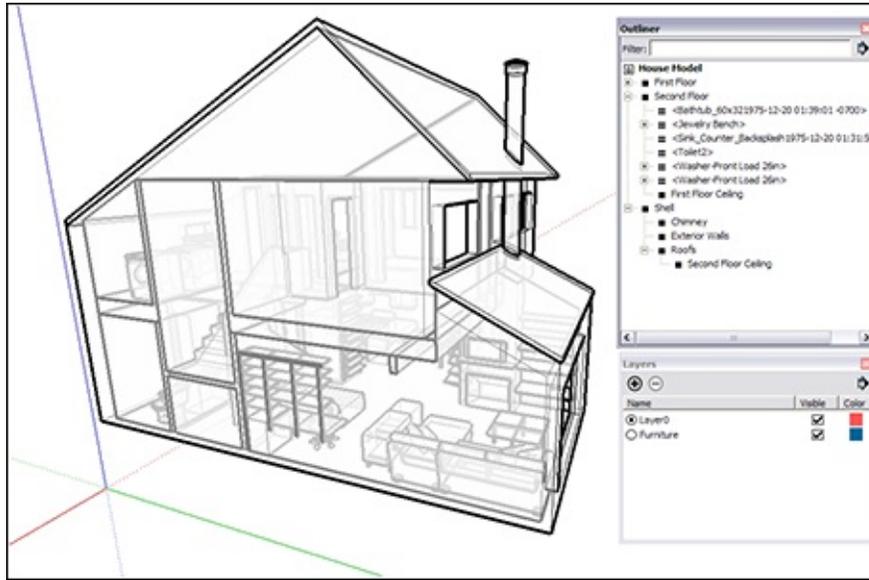
Now that you have a model that looks about the way you want it to, you probably want to show it to someone. The easiest way is to export a JPEG image that you can attach to an e-mail. Follow these steps, and you're on your way:

- 1. Navigate around (using Orbit, Zoom, and Pan) until you like the view of your model that you see in your modeling window.**
- 2. Choose File⇒Export⇒2D Graphic.**
- 3. In the Export dialog box that opens, choose JPEG from the Export Type drop-down list.**
- 4. Pick a location on your computer and give your exported image a name.**
- 5. Click the Export button to create a JPEG image of what's visible in your modeling window.**

Exporting a JPEG file is just one way to share models. To find out about all your options, see Part [IV](#), which explains how to share your model on the SketchUp 3D Warehouse, as a printout, as an image or animation, as part of a multipage document, or as a slick presentation that will (hopefully) impress all your friends.

# Part II

## Modeling in SketchUp



Discover handy links and video demonstrations of the steps in this part. Just point your browser to [www.dummies.com/extras/sketchup2014](http://www.dummies.com/extras/sketchup2014).

## *In this part ...*

- ✓ Dive right into using SketchUp to make buildings, with an emphasis on drawing and extruding simple plans, modeling stairs, and constructing roofs.
- ✓ Find out how to use groups and components, two of the most important elements in any SketchUp model you make.
- ✓ Discover advanced techniques for modeling things like terrain, characters, and other non-boxy objects.
- ✓ Manage big models with SketchUp's tools and some techniques I've learned in my years using the program.
- ✓ Incorporate existing information into your SketchUp models: photos, geo-location data, and imported CAD drawings (if you have SketchUp Pro).
- ✓ Check out how you can use SketchUp to build models for 3D printing — welcome to the future!

# Chapter 4

## Building Buildings

---

### *In This Chapter*

- ▶ Drafting a simple floor plan
  - ▶ Going from a 2D plan to a 3D model
  - ▶ Adding floors, doors, and windows
  - ▶ Modeling stairs
  - ▶ Building a roof
- 

Even though SketchUp lets you make (just about) anything you can think of, certain forms are easier to make than others. Fortunately, these kinds of shapes are exactly the ones that most people want to make with SketchUp, most of the time. That's no accident; SketchUp was designed with architecture in mind, so the whole *paradigm* — the models made of faces and edges, and the kinds of tools SketchUp offers — is perfect for making things like buildings.

But what about curvy, swoopy buildings? You can use SketchUp to make those, too, but they're a little harder, so I don't think they're a good place to start. Because *most* people live in boxy places with right-angled rooms and flat ceilings, that kind of architecture is relatively easy to understand.

In this chapter, I introduce you to some of the fundamentals of SketchUp modeling in terms of making simple, rectilinear buildings. By writing about how to build certain kinds of things, instead of just describing what the individual tools do, I hope to make it easier for you to get started. Even if you're not planning to use SketchUp to model any of the things I describe, you can still apply these concepts to your creations.



One more thing: Just about every page in this chapter relies heavily on the stuff I introduce in Chapter 2. Working with the colored drawing axes, making selections, navigating around your model, and drawing things accurately are pretty key to making anything in SketchUp, so be prepared to flip back and forth while you're getting used to how things work. I like to use paper clips as bookmarks, but I'm sure you have your own method... .

## *Drawing Floors and Walls*

Most floors and walls are flat surfaces, so it's easy to model them with straight edges and flat faces in SketchUp. In fact, chances are good that the first thing you ever model in SketchUp looks a lot like the floor and walls of a building.

I can think of two kinds of architectural models that most people want to create in SketchUp; how you approach modeling floors and walls depends entirely on the type of model you're making:

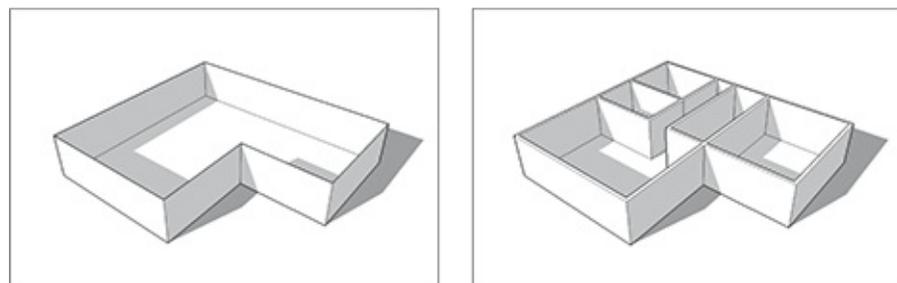
- ✓ **Exterior:** An exterior model of a building is basically just an empty shell; you don't have interior walls, rooms, or furniture to worry about. This type of model is a slightly simpler proposition for folks who are new to SketchUp.
- ✓ **Interior:** An interior model of a building is significantly more complicated than an exterior-only one; dealing with interior wall thicknesses, floor heights, ceilings, and furnishings involves a lot more modeling prowess.



Here's the thing: Because everything in SketchUp is made of super-flat faces (they have no thickness), the only way to model a wall that's, say, 8 inches thick is to use two faces side by side and 8 inches apart. For models in which you need to show wall thicknesses — namely, interior models — you have to use this two-face approach. Exterior models are easier to make because you can use single faces to represent walls. Figure 4-1 shows what I mean.

Single-face walls

Double-face walls



**Figure 4-1:** Use single faces for exterior models and double faces for interior ones.



One of the biggest mistakes new SketchUp users make is attempting an inside-outside model right off the bat. Making a model that shows both the interior and the exterior of a building at the same time is, to be honest, way too hard when you're just getting started. Instead, build two separate models if you need both interior and exterior views. If you need a combination model later on, you can build it in a quarter of the time it took you to build either of the first two — I guarantee it.

## Starting out in 2D

Of course, you can make a 3D model of a building's interior in lots of ways, but I'm going to show you the one I think makes the most sense. Basically, you draw a two-dimensional floor plan that includes all your interior and exterior walls, and then pull it up to the right height. In my method, you don't worry about doors, windows, or stairs until after your model is extruded; you put them in after, which I think is an easier and more logical way to work.



The thing to keep in mind is that SketchUp isn't a full-fledged drafting program, and it probably never will be. If you're an architect-type who needs to do heavy-duty CAD (computer-aided drawing) work, you should probably be drafting in another piece of software and importing your work into SketchUp when you need 3D. If you're just drawing your house or the place where you work, look no further — SketchUp should do just fine.

## Switching to a 2D view

If you're going to use SketchUp to draw a 2D plan, the first thing you need to do is orient your point of view. It's easiest to draw in 2D when you're directly above your work, looking down at the ground plane. You also want to make sure that you're not seeing things in perspective, which distorts your view of what you have.



Follow these simple steps to set up things (and find tutorial videos on this book's companion website at [www.dummies.com/extras/sketchup2014](http://www.dummies.com/extras/sketchup2014)):

### 1. Create a new SketchUp file by choosing File⇒New.

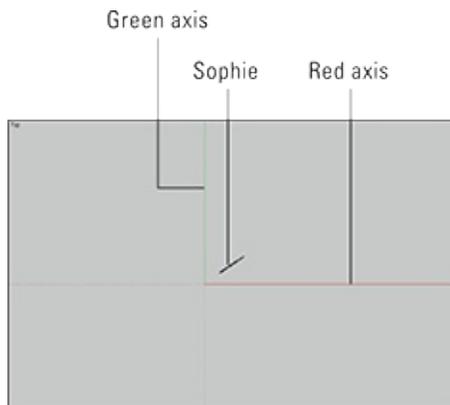
Depending on the template you have set to open when you create a new SketchUp file, you may already be in a 2D view. If all you see are the red and green axes on a white background, you can skip Step 2. Remember that you can always switch templates by choosing Help⇒Welcome to SketchUp and clicking the Templates section of the dialog box that pops up.

### 2. Choose Camera⇒Standard⇒Top.

This changes your viewpoint so that you're looking directly down at the ground.

### 3. Choose Camera⇒Parallel Projection.

Switching from Perspective to Parallel Projection makes it easier to draw plans in 2D. At this point, your modeling window should look like the one shown in Figure 4-2.



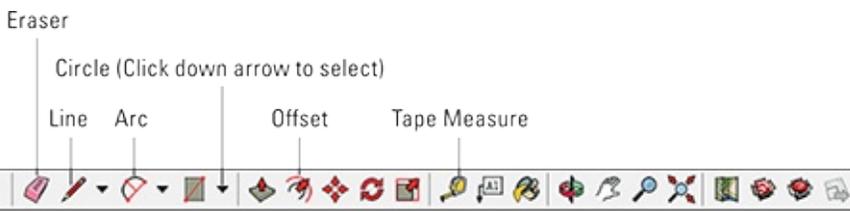
**Figure 4-2:** Your modeling window should look like this before you start drawing in 2D.



Feel free to delete Sophie. That little diagonal line that's visible in your modeling window when you're in Top view is a top view of Sophie — the 2D person who appears in every new SketchUp 2014 file you create. To get rid of Sophie, just right-click her and choose Erase.

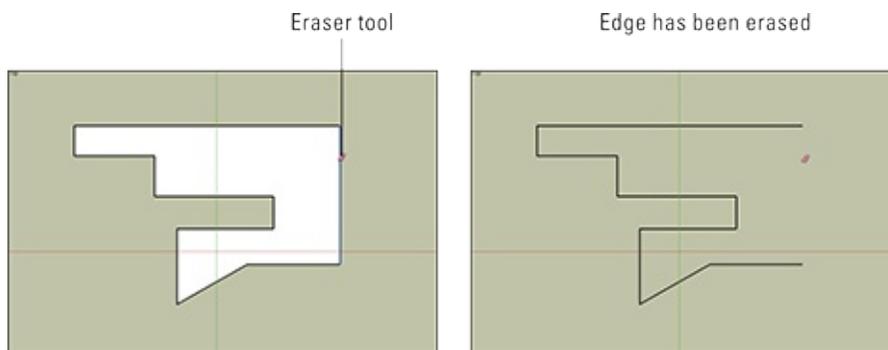
## Dusting off SketchUp's drafting tools

Here's some good news: You don't need many tools to draft a 2D plan in SketchUp. Figure 4-3 shows the basic toolbar; everything you need is right there:



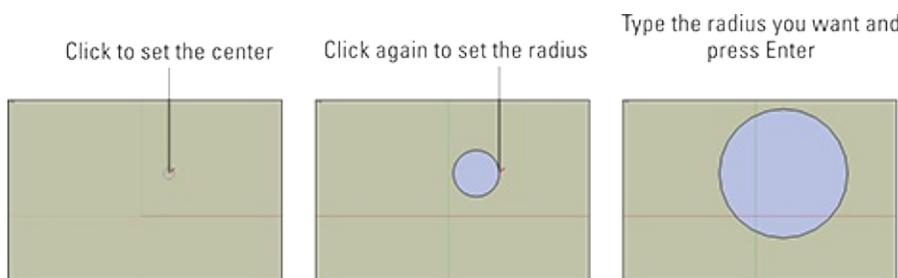
**Figure 4-3:** All the tools you need to draft in 2D in SketchUp are on the basic toolbar.

- ✓ **Line tool:** You use the Line tool (which looks like a pencil) to draw *edges*, which are one of the two basic building blocks of SketchUp models. Fundamentally, you click to start drawing an edge and click again to finish it. (You can find lots more information about drawing lines in Chapter 2.)
- ✓ **Eraser tool:** Use the Eraser to erase edges; see Figure 4-4. Keep in mind that you can't use the Eraser to delete faces, though erasing one of the edges that defines a face automatically erases that face, too. Take a look at the section about edges and faces at the beginning of Chapter 2 for more detail on using the Eraser tool on edges. You can use the Eraser in two ways:
  - *Clicking:* Click edges to erase them one at a time.
  - *Dragging:* Click and drag over edges to erase them; this is faster if you have lots of edges you want to erase.



**Figure 4-4:** Use the Eraser tool to erase edges. Erasing an edge that defines a face erases that face, too.

- ✓ **Circle tool:** You'll find the Circle tool hiding under Rectangle on the Getting Started toolbar. Drawing circles in SketchUp is pretty easy: Click once to define the center and again to define a point on the circle (which also defines the radius). To enter a precise radius, just draw a circle, type a radius, and press Enter; see Figure 4-5. For more information on typing while you draw, check out the section on model accuracy in Chapter 2.

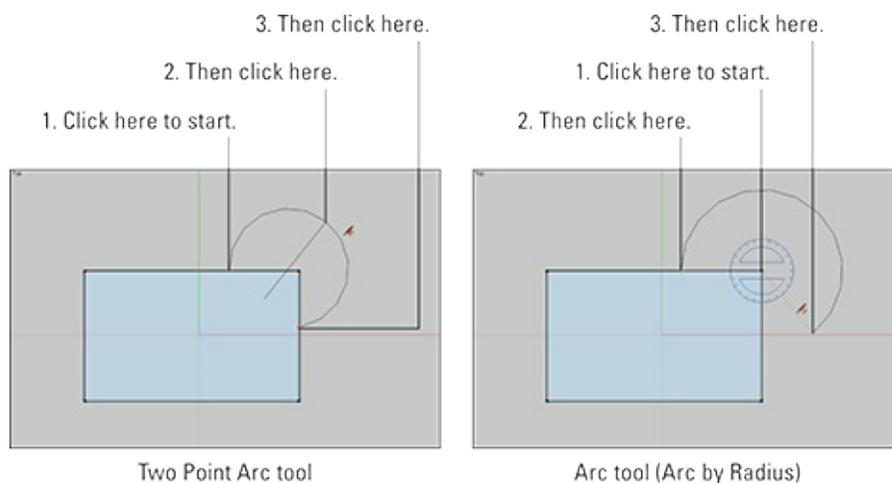


**Figure 4-5:** Drawing circles is easy with the Circle tool.



- ✓ **Arc tools:** As of version 2014, SketchUp has three tools for making arcs (it used to have only one). See Figure 4-6. Here they are, in order:

- **2-Point Arc:** This is the arc-making tool that's familiar to longtime SketchUp modelers. To use this tool, click once to define one end, again to define the other end, and a third time to define the *bulge*, or how much the arc sticks out. If you want, you can type a radius after you draw your arc by entering the radius, the units, and the letter *r*. If you want an arc with a radius of 4 feet, draw it however big, type **4'r**, and press Enter.
- **Arc:** This tool behaves the way you probably expect: To use it, click once to define the center point, again to define the first endpoint, and a third time to finish the arc. The result is an arc made of straight-edge segments.
- **Pie:** The Pie tool is exactly the same as the Arc tool, but with a useful twist. It yields a pie-shaped face and all three of its perimeter edges. I'm not 100 percent sure when I'd use this tool, but I think it's nice to have options, don't you?

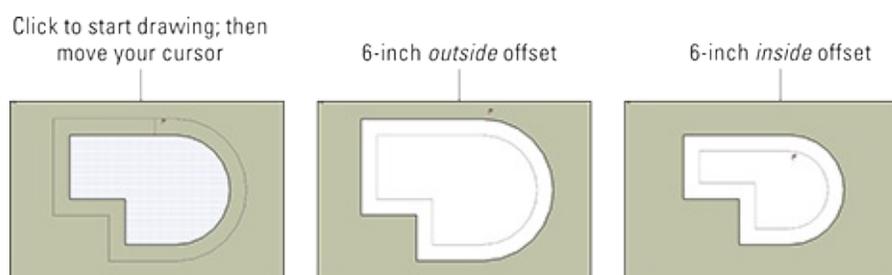


**Figure 4-6:** Using the Arc tool is a three-step operation.

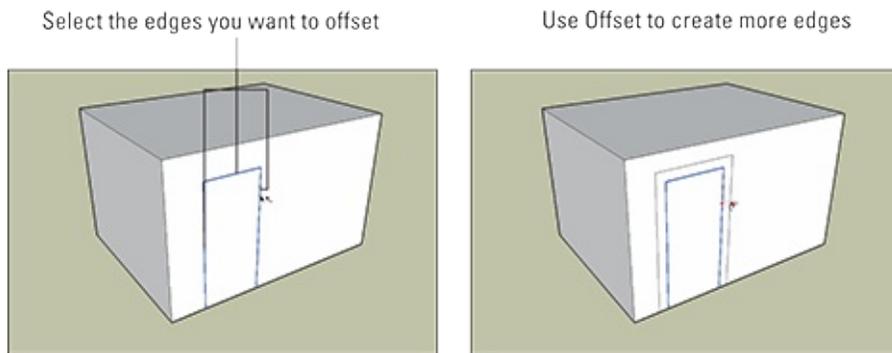
✓ **Offset tool:** The Offset tool helps you draw edges that are a constant distance apart from edges that already exist in your model. Pictures are usually better than words, so take a look at Figure 4-7. Using Offset on the shape I've drawn lets me create another shape that's exactly 6 inches bigger all the way around (middle image), or 6 inches *smaller* all the way around (right image). Offsetting edges is a useful way to create things like doorways and window trim.

You can use Offset in two ways; for both ways you click once to start offsetting and again to stop:

- *Click a face to offset all its edges.* If nothing is selected, clicking a face with the Offset tool lets you offset all that face's edges by a constant amount, as shown in Figure 4-7.
- *Preselect one or more coplanar (on the same plane) edges and then use Offset.* If you have selected edges, you can use Offset on just those edges; this comes in handy for drawing things like door frames and balconies, as shown in Figure 4-8.



**Figure 4-7:** Offset lets you create edges based on other edges.

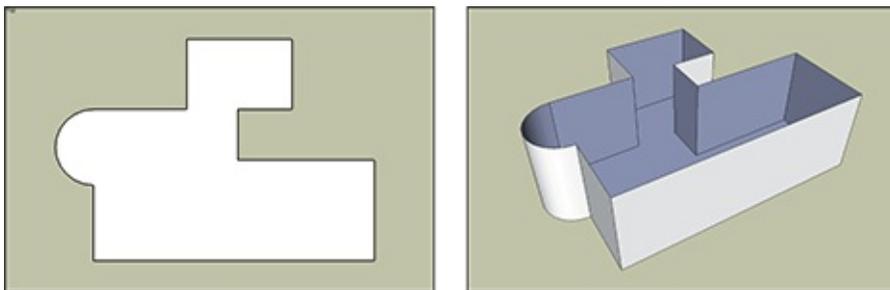


**Figure 4-8:** Using Offset on a set of preselected edges is handy for drawing things like door frames.

✓ **Tape Measure tool:** The Tape Measure does a bunch of things. To measure a distance, click any two points in your model. The distance readout is in the Measurements box, in the lower-right corner of your modeling window. You can also use it to size a model and to create guides, as I explain in Chapter 2.

## Coming up with a simple plan

If all you're trying to do is model an exterior view of a building, just measure around the actual building's perimeter, draw the outline of the building in SketchUp, and proceed from there; see Figure 4-9. Your walls will be only a *single-face thick* (meaning paper-thin), but that's okay — you're interested only in the outside, anyway.



**Figure 4-9:** To make an exterior model, just measure the outside of your building to draw an outline in SketchUp.



Creating an *interior* view is a bit more complicated. The business of measuring an existing building so that you can model it on the computer is easier said than done — even experienced architects and builders often get confused when trying to create *as-builts*, which are drawings of existing buildings. Closets, ventilation spaces, interior walls, and all kinds of other obstructions inevitably get in the way of getting good measurements; most of the time, you just have to give it your best shot and then tweak things a bit to make them right. The following sections walk you through the process, and check out the videos (available via [www.dummies.com/extras/sketchup2014](http://www.dummies.com/extras/sketchup2014)) that demonstrate the steps in each section.

## Drawing an interior outline

Because the main goal of making an interior model of a building is to end up with accurate interior spaces, you need to work from the inside out. If your tape measure is long enough, try to figure out a way to get the major dimensions first — this means the total interior width and length of the inside of your building. You may not be able to, but do your best. After that, just work your

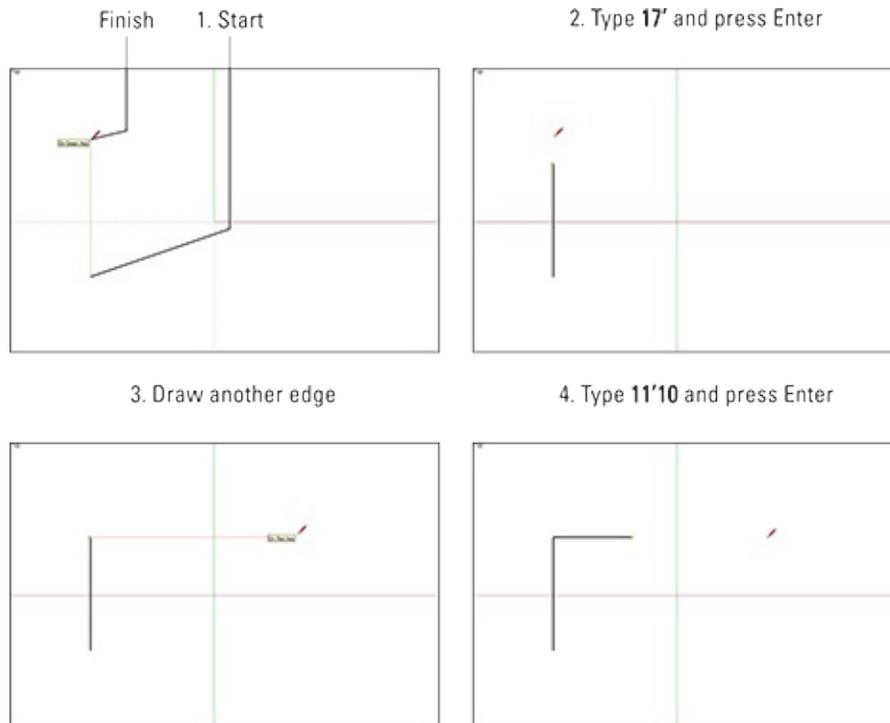


right in the red direction. See Figure 4-11, bottom right.

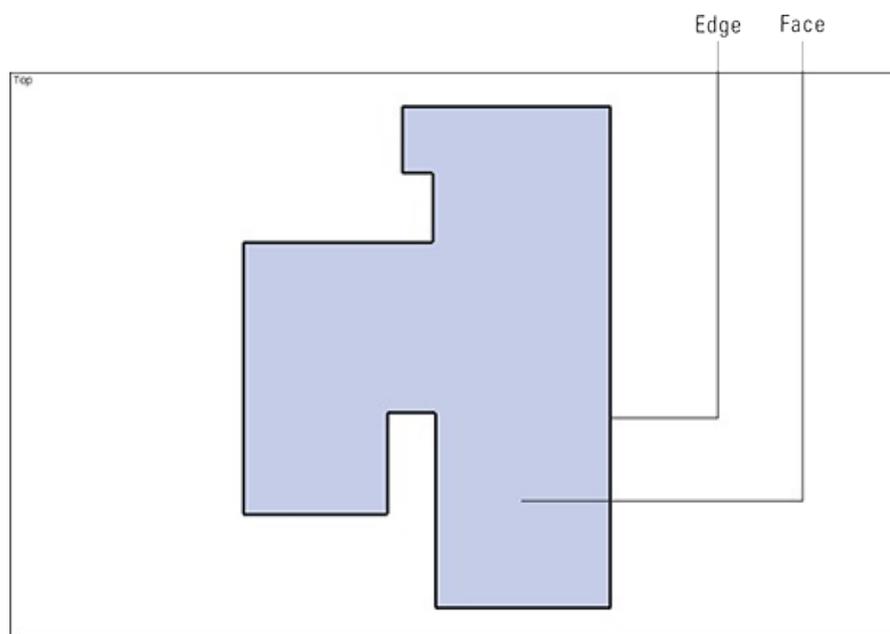
To do this, do exactly what you did to draw the first edge, except that you move parallel to the red axis this time, type **11'10**, and then press Enter.

4. **Keep going all the way around the house, until you get back to where you started. See Figure 4-12.**

If you make a mistake, either use the Eraser to get rid of edges you're unhappy with or choose Edit⇒Undo to go back a step or two.



**Figure 4-11:** Start by drawing an edge 17 feet long; then draw a perpendicular edge 11 feet, 10 inches long.



**Figure 4-12:** The completed interior perimeter of my house.

5. **If all your measurements don't add up, adjust things so that they do — a few extra inches here and there never killed anyone, after all.**

After you complete the outline (forming a closed loop of edges that were all on the same plane), a face automatically appears. Now you have a total of 11 edges and 1 face.



When you draft in 2D, whatever you do, don't use the Orbit tool; you need only to use Zoom and Pan to navigate your drawing (see Chapter 2). If you accidentally orbit your model into a 3D view, return to 2D by following the steps in the section "[Switching to a 2D view](#)," earlier in this chapter.



If you get lost, and no amount of zooming and panning gets you back to a view of your floor plan, choose Camera⇒Zoom Extents — think of it as an emergency lever you can pull to fill your modeling window with your geometry.

### ***Offsetting and grouping an exterior wall***

I decided to *offset* (using the Offset tool) an exterior wall thickness, just to make it easier to visualize my spaces. Here's how you do it:

- 1. Using the Offset tool, offset your closed shape by 8 inches to the outside. See Figure 4-13, upper left.**

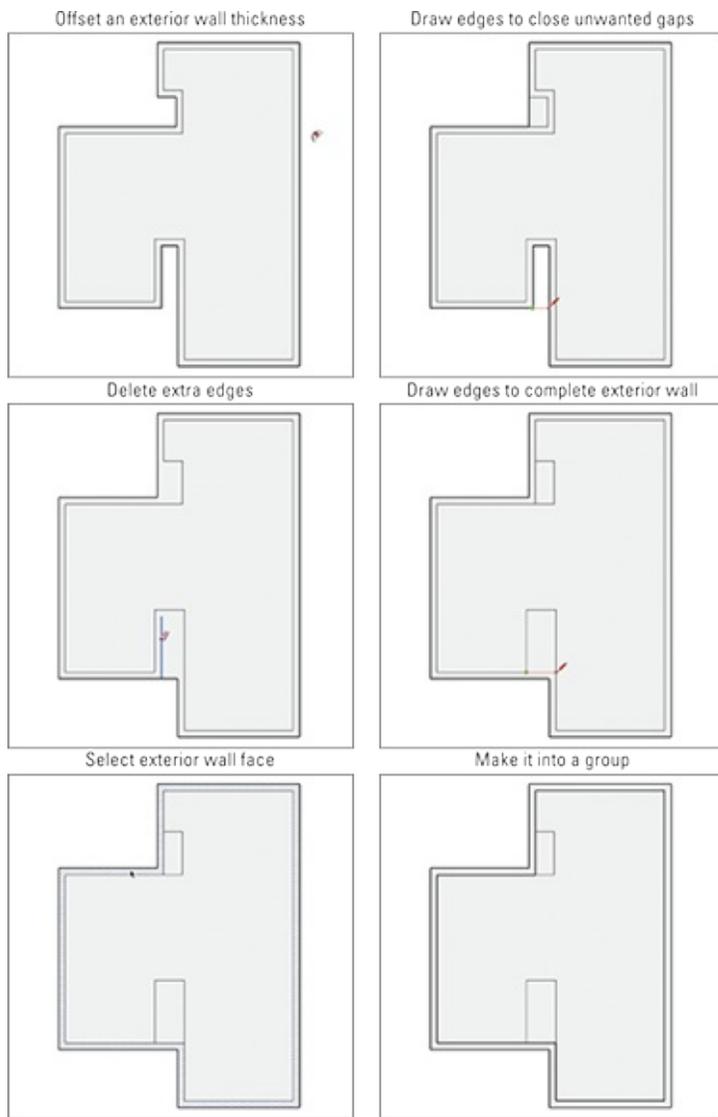
An offset of 8 inches is a pretty standard thickness for an exterior wall, especially for houses in my neck of the woods. This is how you use the Offset tool:

- Make sure that nothing is selected by choosing Edit⇒Select None.*
  - Click once inside your shape.*
  - Click again outside your shape to make a second, bigger shape.*
  - Type 8 and then press Enter.*
- 2. Because the exterior of the house doesn't actually have any alcoves, use the Line tool to close them off, creating pockets of wall that are thicker than the rest. See Figure 4-13, upper right.**
  - 3. Use the Eraser tool to get rid of the extra edges. See Figure 4-13, middle left.**

By deleting the extra edges, you have only two faces: one that represents the floor and one that represents the wall.

- 4. With the Line tool, draw edges that define the thickness of your exterior wall. See Figure 4-13, middle right.**

In the case of this house, this means separating the *bulges* (which actually represent a fireplace and a mechanical closet) from the part of the wall that goes all the way up to the roof, two stories up.



**Figure 4-13:** Use Offset to create an exterior wall thickness and then clean up using the Line and Eraser tools. Finally, make the exterior wall into its own group.

When you're done, you end up with several faces: one for the floor, one for the exterior wall (whose thickness should be more or less uniform), and a few for the bulges.

**5. Select the face that defines the exterior wall. See Figure 4-13, lower left.**

The easiest way to do this is to click once on the face with the Select tool.

**6. Make the face you just selected into a group. See Figure 4-13, lower right.**

Chapter 5 is all about these groups (and their über-useful cousins, components), but here's all you need to know for now: Making groups lets you separate different parts of your model. Turning your exterior wall into a separate group makes it easier to edit, hide, and move. Groups also simplify the process of adding more levels to your building, if that becomes necessary.

To turn the face you selected in Step 5 into a group, choose Edit⇒Make Group. You see a perimeter of blue lines around your face; that's the group you just created. Congratulations — you're now officially an intermediate SketchUp user.

## Putting in the interior walls

For this part of the process, I use guides a lot. If you haven't done so already, check out the section on guides in Chapter [2](#). There, you find a full description of guides and how to use them.



When I draft a floor plan in SketchUp, I find it really helps to ignore things like doors and windows — where a doorway should be in a wall, I just draw a solid wall. I like to add doors and windows after I extrude my floor plan into a 3D figure.

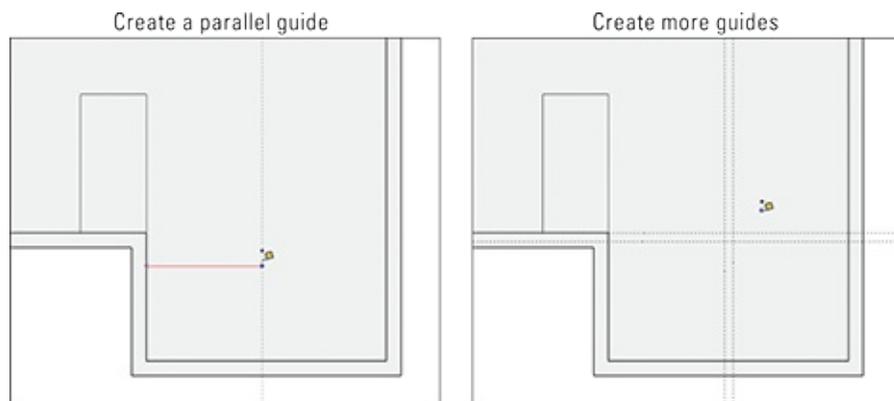
Here's how you put in the few interior walls on the first floor of this house:

1. **With the Tape Measure tool, drag a parallel guide 5 feet, 3½ inches from the inside of my entryway. See [Figure 4-14](#), left.**

To do this, just click the edge from which you want to draw the guide, move your cursor to the right (to tell SketchUp which way to go), type 5'3.5, and press Enter.

2. **Draw a few more guides the same way you drew the first one.**

Working from my pencil drawing, figure out the location of each interior wall and create guides to measure the space. See [Figure 4-14](#), right.



**Figure 4-14:** Draw a guide to help you locate your first interior wall, and then draw a bunch more.

3. **Switch to the Line tool, and draw edges to represent the interior walls.**

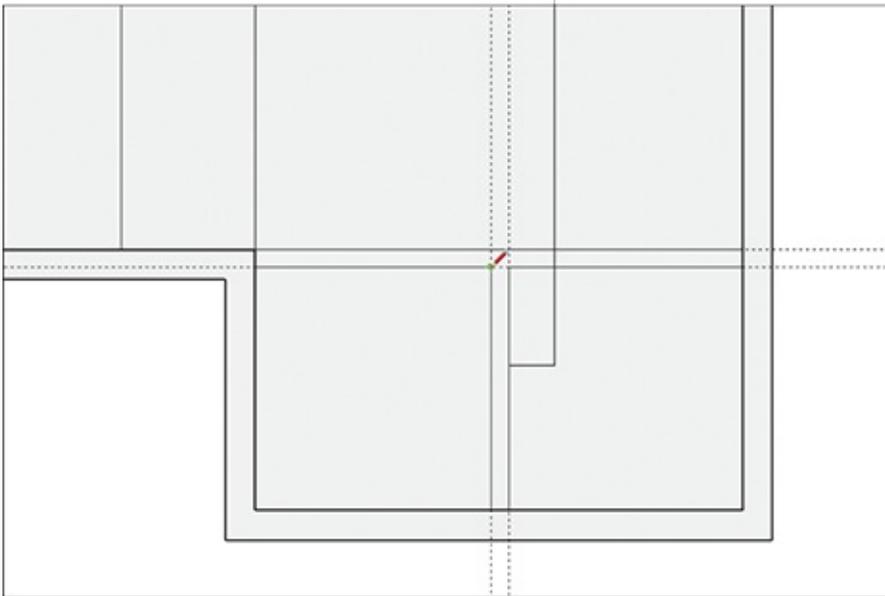
By using the guides as, er, guides, it's easy to draw your edges correctly. [Figure 4-15](#) shows what you have so far.



Don't forget to zoom! When you have a jumble of edges and guides and you can't see what you're doing, just zoom in. Many folks forget to change their point of view while they work, and zooming makes all the difference.

4. **Use the Eraser to delete your guides.**

Solid lines are edges



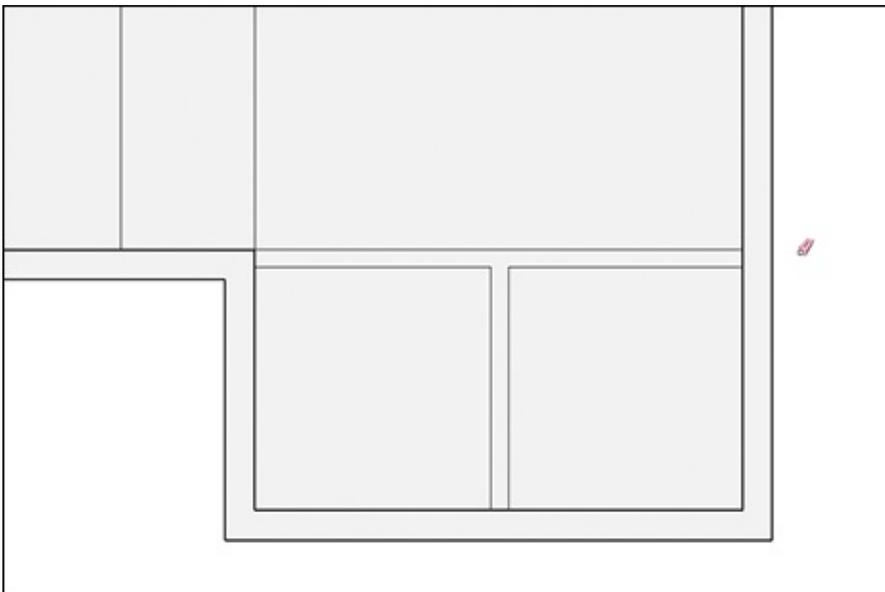
**Figure 4-15:** Use the Line tool to create edges where guides come together.

5. **Use the Eraser to get rid of any extra edge segments. See [Figure 4-16](#).**

The goal is to have the smallest-possible number of 2D faces to extrude into 3D walls, a little later on.



Because the exterior-wall face — and the edges that define it — is part of a separate group, accidentally nicking it with the Eraser deletes the whole thing at once. If this happens, just choose Edit⇒Undo to go back a step, zoom in a little bit, and try again.



**Figure 4-16:** Using the Eraser, delete your guides and any little edge segments left over from drawing the interior walls.

## Going from 2D to 3D



With a 2D plan in hand, the next step is to extrude it into a 3D model. This is an

enormously enjoyable process, and it involves the tool that made SketchUp famous: Push/Pull. In the following sections, you take a simple floor plan (the one you draw earlier in this chapter) and turn it into 3D walls. At [www.dummies.com/extras/sketchup2014](http://www.dummies.com/extras/sketchup2014), you find links to videos that demonstrate the steps in each section.

## Getting a good view

Before you pop up your plan into the third dimension, change your point of view to get a better view of what you're doing. See Figure 4-17 and follow these steps:

### 1. Choose Camera⇒Perspective.

This turns on SketchUp's perspective engine, meaning that now you can see things more realistically — the way people really see things in 3D.

### 2. Choose Camera⇒Standard⇒Iso.

This switches you from a top view to an *isometric* (three-quarter) one. You can do this with the Orbit tool, too — you always have more than one way to do everything in SketchUp.

### 3. Choose Camera⇒Zoom Extents.

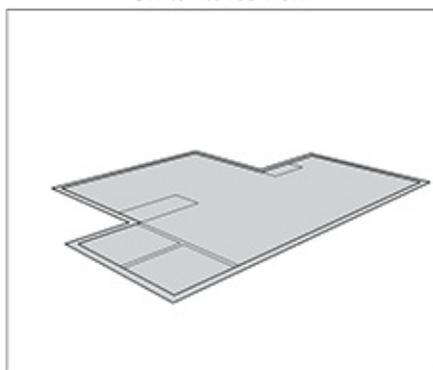
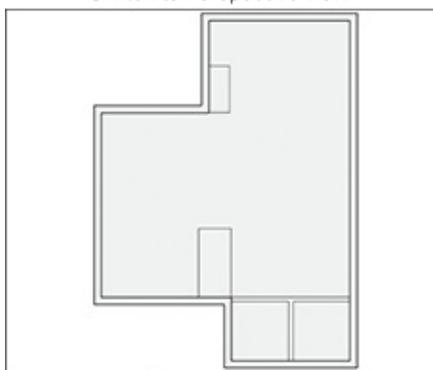
Zoom Extents has its own button on the basic toolbar, but I want to stick with the Camera menu theme, just for consistency.

### 4. Choose Camera⇒Field of View, type 45, and press Enter.

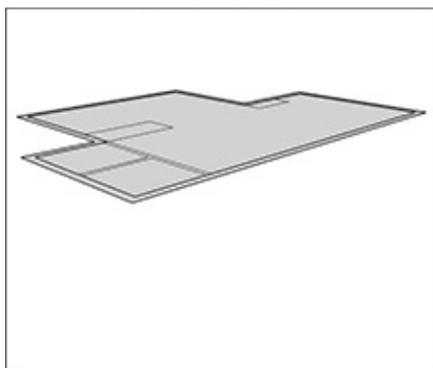
You've changed the field of view from 35 to 45 degrees. By default, SketchUp's field of view is set to 35 degrees. (For more information on what this means, check out Chapter 11.)

Switch to Perspective view

Switch to Iso view



Zoom extents



**Figure 4-17:** Before you start work in 3D, switch over to a 3D view.

## Pushing/pulling your way to happiness

The Push/Pull tool is a simple creature; use it to extrude flat faces into 3D shapes. It works (like everything else in SketchUp) by clicking. You click a face once to start pushing/pulling it, move your cursor until you like what you see, and then click again to stop pushing/pulling. That's it. I doubt that any software tool has ever been so satisfyingly easy to use and understand. For more detail on Push/Pull, see the nearby sidebar, "[More fun with Push/Pull](#)."



Push/Pull works only on flat faces; if you need to do something to a curved face, you have to use something else. Read about the Intersect Faces feature in the section "[Getting to know Intersect Faces](#)," later in this chapter — it may be what you're looking for.

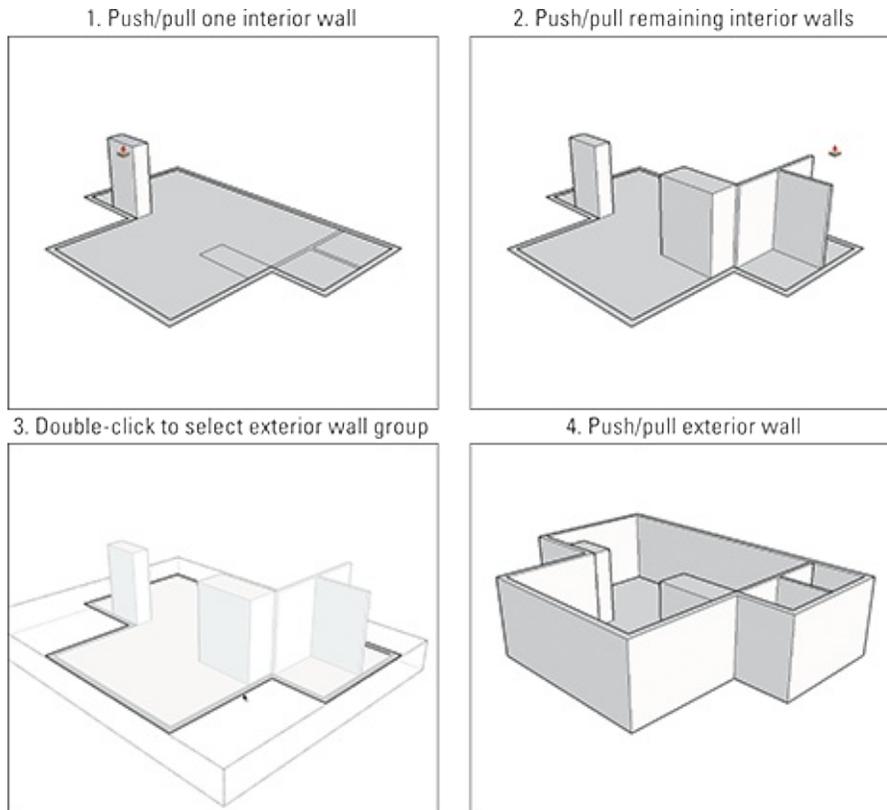
The following steps outline how to use Push/Pull to extrude my house's first floor plan into a 3D model, as shown in [Figure 4-18](#):

### 1. Select the Push/Pull tool from the toolbar.

The tool looks like a little box with a red arrow coming out the top.

### 2. Click an interior wall's face once to start extruding it.

If you click the "floor" face, you'd extrude that, instead. If you choose the wrong face by accident, press Esc to cancel the operation and try again.



**Figure 4-18:** Use Push/Pull to extrude faces into all the walls in my house. Presto!

### 3. Move up your cursor to pull up the wall; click to stop extruding.

How much you extrude the face doesn't matter, because you add precision in the next step.

#### 4. Type 8' and press Enter.

When you do this, the push/pull distance is revised to be exactly 8 feet — the height of the ceilings in this house.

#### 5. Repeat Steps 2 through 4 for all the interior walls in the house.

Using Orbit helps you view what you're doing as you work around the model.

#### 6. Push/pull the exterior wall to match the height of these interior walls.

Because the exterior wall face is part of a group (I made it that way on purpose), you need to edit the group before you can do anything to it. Right-click the exterior wall face and choose Edit Group from the context menu to get “inside,” where you can follow Steps 2 through 4 in the preceding steps to make the exterior wall group 3D. Click anywhere in space to exit the group when you're done.

## More fun with Push/Pull

Because Push/Pull is the tool that most people think of when they think of SketchUp, I thought you might appreciate knowing more about what it can do. The people who invented this software (back in the last millennium) *started* with the idea for Push/Pull — that's how closely linked SketchUp and Push/Pull are. Here are five things about Push/Pull that aren't immediately obvious when you start using it:

- ✓ **Double-click with the Push/Pull tool to extrude a face by the last distance you pushed/pulled.**
- ✓ **Press the Ctrl key (Option on a Mac) to push/pull a copy of your face.** As shown in the first graphic in the following figure, instead of using Push/Pull the regular way, you can use a modifier key to extrude a copy of the face you're pushing/pulling. This comes in super-handly for modeling things like multistory buildings quickly.
- ✓ **While pushing/pulling, hover over other parts of your geometry to tell SketchUp how far to extrude.** Take a look at the second graphic. Perhaps you want to use Push/Pull to extrude a cylinder that's exactly the same height as this box. Before you click the second time to stop pushing/pulling, hover over a point on the top of the box; now the cylinder is exactly that tall. To complete the operation, click while you're still hovering over the box. It's pretty simple and saves you hours of time after you're used to doing it.
- ✓ **Pushing/pulling a face into another, coplanar face automatically cuts a hole.** In fact, this is how you make openings (like doors and windows) in double-face walls. The last graphic shows this in action.
- ✓ **You can push/pull preselected faces.** Push/Pull works just like Move, Rotate, Offset, and Scale: You can preselect a face before you start using the tool. This comes in handy when you need to extrude a face that you can't see — a rare case, but handy nonetheless.

Press Ctrl  
(Option on Mac)  
to copy your face



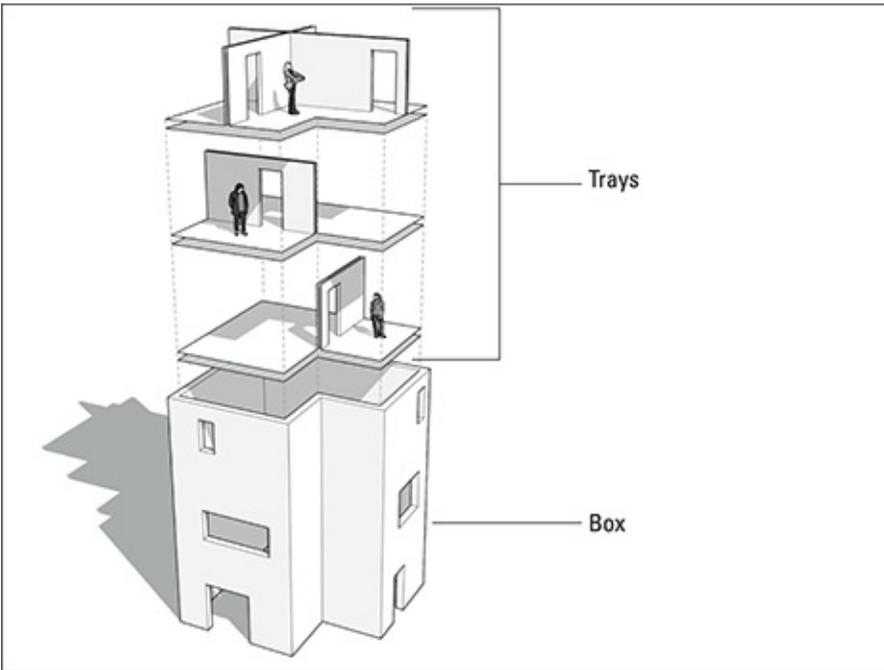
Click while  
you're hovering



Push/pull a face all the  
way into another one  
to make both disappear



Adding a second (and third, and fourth) floor to your model isn't as hard as it may seem. The key is to think of each level as a separate “tray” consisting of interior walls, a floor surface, and the ceiling of the level below. You model each floor as an individual group, making it easier to hide, edit, and move. For the same reasons, you also make the exterior walls a separate group; they act kind of like a “box” into which your floor levels stack. Figure 4-19 illustrates what I mean.



**Figure 4-19:** Floor levels are like trays stacked inside a box consisting of your exterior walls.

### ***Making groups to keep things separate***

If you've been following along since the beginning of this chapter, the edges and faces that make up your exterior walls are already enclosed in a group by themselves. If they're not, seriously consider doing that now. If you take the time to group your exterior walls before you add floors to your building, you save hours of headache later. Trust me.



Otherwise-well-meaning people who have worked with other CAD or 3D modeling programs often take this opportunity to bring layers into the discussion. Yes, SketchUp has a Layers feature. And yes, floor “trays” are a lot like layers, at least conceptually. But you should *not* use Layers when modeling multiple levels of the same building. Layers in SketchUp simply don't work the way you might think they do — skip ahead to Chapter 7 if you want to read all about it.

Provided your exterior walls are already a group, the next step is to turn the rest of your first floor's geometry into *another* group. This is how you do just that:

#### **1. Select the floor and interior walls of the first level.**



You can accomplish this efficiently with the Select tool: Just triple-click a face on any interior wall to select everything that's attached to it. Take a look at Chapter 2 for plenty of tips on selecting things.

## 2. Make a group by choosing Edit⇒Make Group from the menu bar.

Chapter 5 is all about groups and components; peruse the first few pages if you're utterly confused about what just happened.

### *Drawing the next floor*

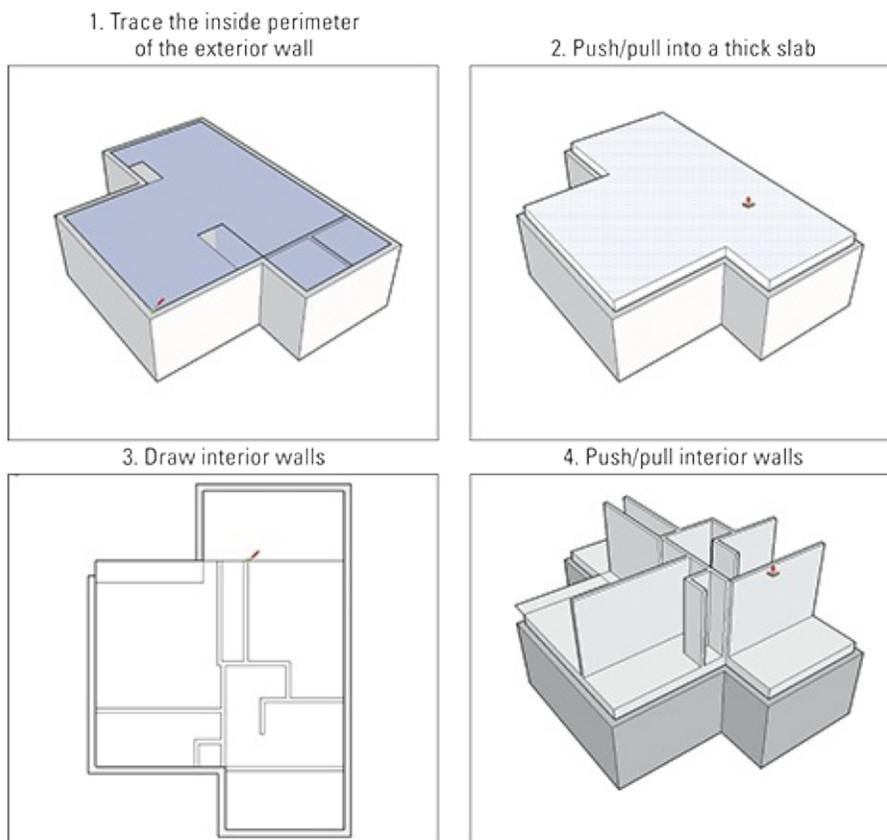
Modeling each new floor directly on top of the one underneath guarantees that everything in your building lines up. Some folks advocate for working “off to the side” and putting things together later, but I think that's a recipe for trouble. Here's how you add a second floor to the house model. Check out Figure 4-20 to see the steps as pictures:

#### 1. Trace the inside perimeter of the exterior wall to create a new face.

I like to use the Line tool to do this. Keep in mind that this works only if everything you touch is already part of another group; if it isn't, your new edges stick to your existing ones, and your model becomes very, very messy.

#### 2. Push/pull your new face into a thick slab.

How thick? It depends on your building, but a reasonable ceiling-to-floor distance between levels for houses is about a foot. You can figure yours out with a tape measure and a calculator.



**Figure 4-20:** Draw right on top of the lower floor; then push/pull the interior walls to ceiling height.



The underside of the new slab is the ceiling of the first floor. I prefer to model buildings this way because it improves visibility when I hide a floor group to see the one

below it.

### 3. Draw the interior walls of the new floor.

This is just like drawing the first floor. Switch to the Top view (Camera⇒Standard Views⇒Top) and then use the Tape Measure, Eraser, and Line tools to draft your floor plan. Just start at the very beginning of this chapter for a refresher.



If the floor you're drawing is bigger than the one below it, its outline overlaps the exterior walls. That's okay — just pay special attention to where your edges and faces end up as you draw. Orbit every once in a while to check that everything's copacetic.

In the event that your new floor is *smaller* than the one underneath, represent the inside boundary of the new exterior walls with a single edge. The next section deals with what to do when your first and second floor plans don't match up exactly.

### 4. Push/pull your interior walls to the correct height.

That's 8 feet, in this example.

### 5. Group together your interior walls, your floor, and the ceiling of the level below.

If you're unsure of how to do this, take a look at the steps in “Making groups to keep things separate,” a few pages back.

### 6. If your upper floor isn't bigger or smaller than your lower floor, pull up your exterior walls to match your interior ones.

Here you're extending the box that holds your floor trays up another level. Follow these steps:

- a. *Edit your exterior wall group by double-clicking it with the Select tool.*
- b. *Use the Push/Pull tool to extrude it up.*
- c. *Exit (stop editing) the group by clicking somewhere off to the side of your model.*



Chances are your newest floor doesn't line up exactly with the one below it. Keep reading to find out what to do.

## ***Creating additional exterior walls***

Most buildings aren't simple extrusions; they bump in and out as they rise. Second-floor decks sit atop first-floor garages; bedrooms cantilever over gardens; intermediate roofs shelter new room additions. Buildings — especially multilevel houses — are complicated assemblies. Figuring out where walls, floors, and ceilings come together takes time, trial and error, and a good dose of spatial reasoning. It's best not to attempt the steps in this section when you're tired or distracted.



If your building does happen to be one of the few with perfectly aligned floor plans, you can skip this section entirely. Congrats; you're a lucky devil.

I'm not so lucky — in the house I model for this chapter, the second floor both overhangs and, um, underhangs (hooray for neologisms) the first floor. Wherever this happens, you need to add a new section of exterior wall. Take a look at the photograph in Figure 4-21 to see what I mean.

Second floor bumps out



First floor bumps out

**Figure 4-21:** The outline of the second floor doesn't exactly match that of the first.

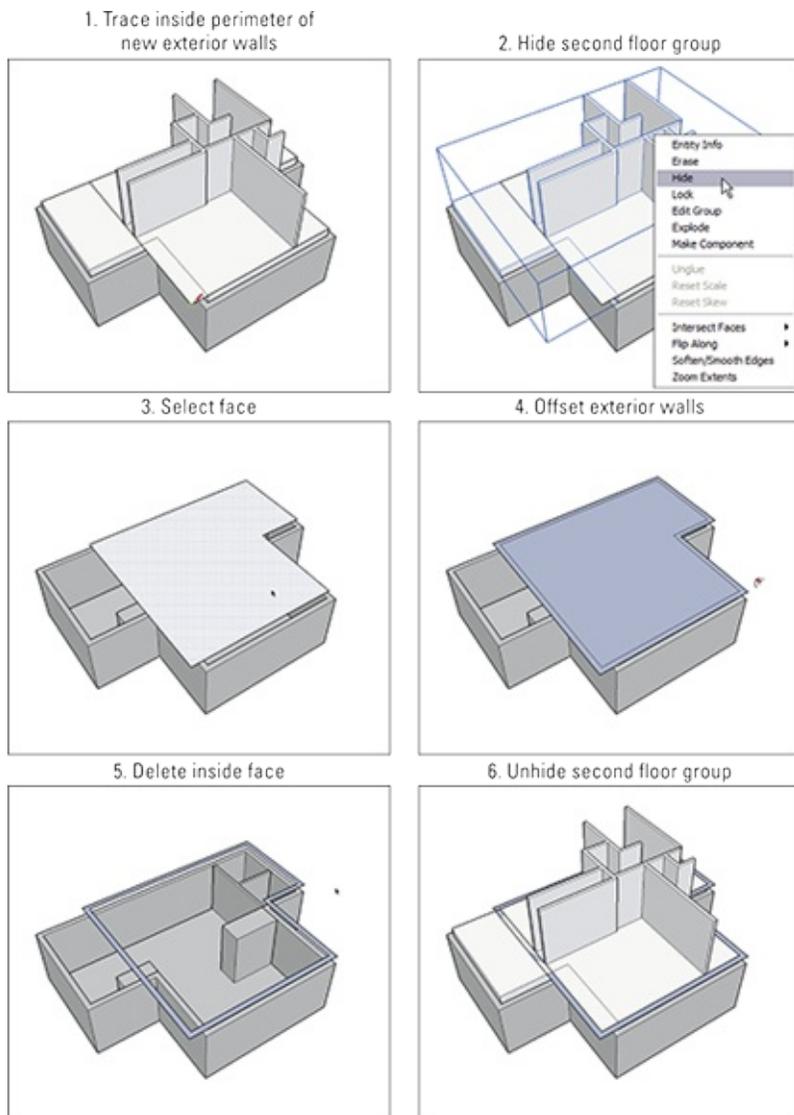
Follow along to watch how to solve this tricky problem:

**1. Draw faces to define any new exterior walls; see Figure 4-22:**

- a. *Use the Line tool to trace the inside perimeter of your new exterior walls.*
- b. *Hide the group that includes your second-floor interior walls by right-clicking it and choosing Hide.*
- c. *Select the face that you created when you traced the inside perimeter in Step a. Don't see a face? Maybe you forgot to draw an edge somewhere.*
- d. *Use the Offset tool to offset the edges of your selected face by the thickness of your exterior walls.*

In this case, it's 8 inches.

- e. *Delete the face in the center, leaving only a face that represents your new exterior wall thickness.*
- f. *Unhide the group you hid in Step b by choosing Edit⇒Unhide⇒Last from the menu bar.*



**Figure 4-22:** Use Offset to draw faces that represent new exterior walls.

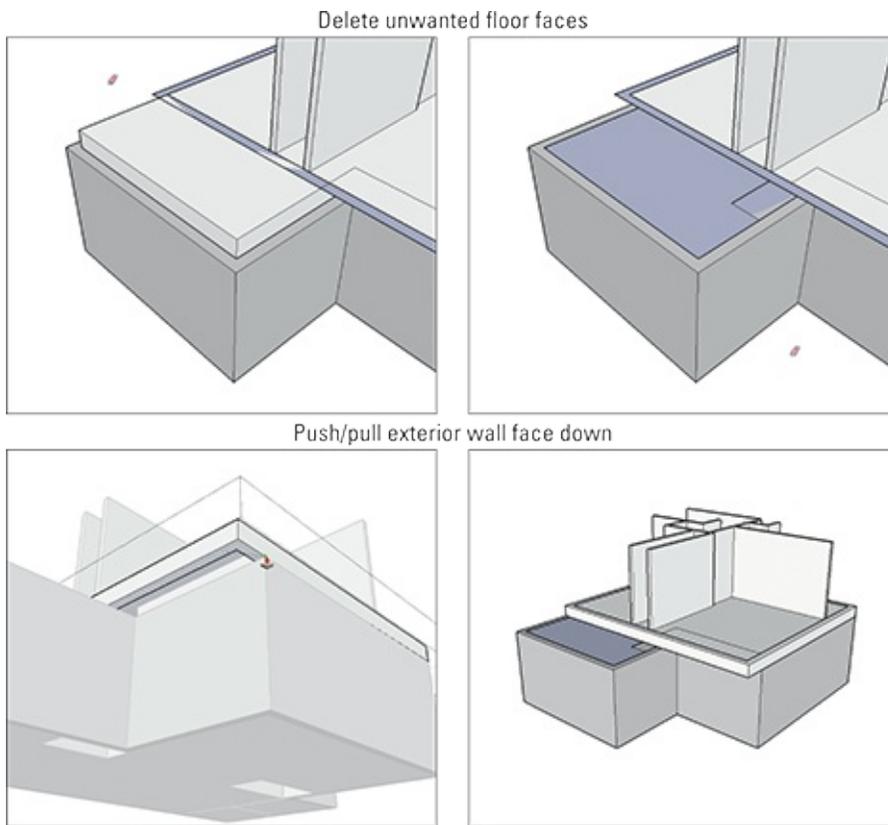
2. **Make a group out of your new exterior wall face by selecting it and then choosing Edit⇒Make Group.**
3. **Delete any floor geometry that doesn't belong. See the top of Figure 4-23.**

In this example, part of the floor extends past the exterior wall on the left side of the figure. Double-click the group with the Select tool to edit it, and then use the Eraser to take away only the geometry that doesn't belong on your new floor, being careful to leave the ceiling that covers the first floor.

4. **Push/pull down any wall faces to meet the top of the lower floor's exterior wall. See the bottom of Figure 4-23.**

Double-click a group with the Select tool to edit it; you need to do this before you can push/pull any of the faces you created in Step 1.

5. **Make all your exterior walls part of the same group:**
  - a. *Select the group that contains your new exterior walls and then choose Edit⇒Cut.*



**Figure 4-23:** Delete extra floor faces; then push/pull down the walls.

b. *With the Select tool, double-click the group containing your lower exterior walls.*

You're "inside" that group.

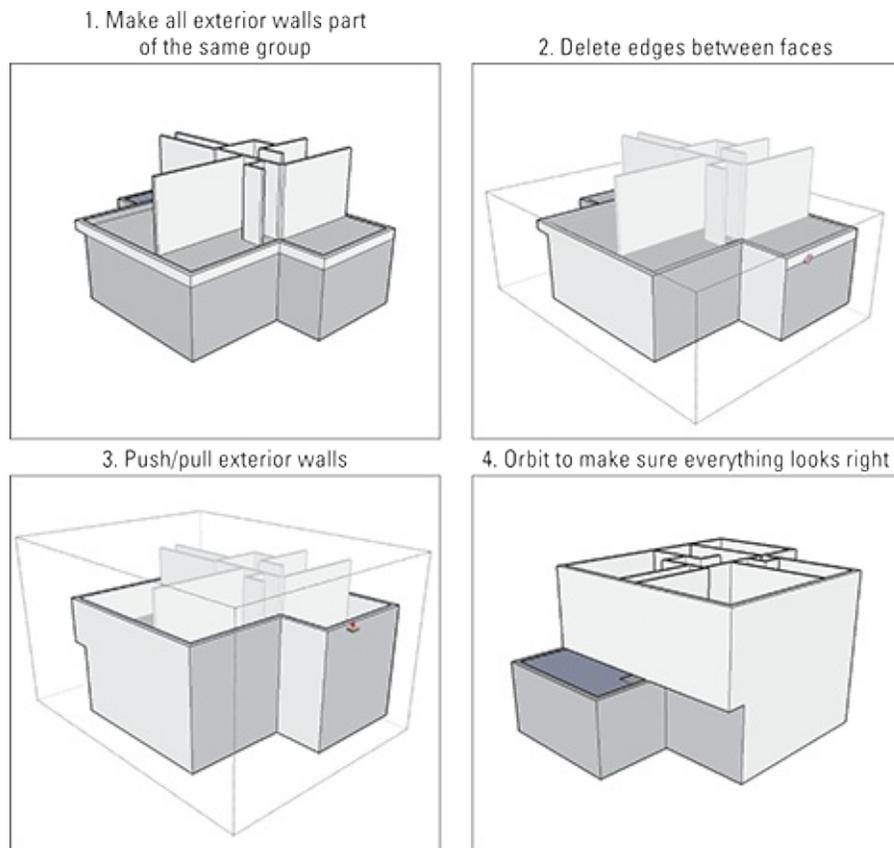
c. *Choose Edit⇒Paste in Place.*

d. *Choose Edit⇒Group⇒Explode to ungroup the edges and faces in the selected group, sticking them to those in the lower group.*

Whew.

6. **Use Line, Erase, and Push/Pull to extrude your exterior walls up to the height of your interior walls, as shown in [Figure 4-24](#).**

After everything's in the same group, adding necessary edges, deleting extraneous ones, and pushing/pulling faces all at once is easier. Using your SketchUp virtuosity, watch the colors as you draw, use the Shift key to lock inferences, and remember to zoom in on what you're doing. Skimming [Chapter 2](#) provides useful pointers on these actions.



**Figure 4-24:** Do what you need to do to make your exterior walls look right.

## *Up, up, and away*

Now that you're privy to my favorite technique for modeling multilevel buildings, you can build up as high as you like. As you proceed, the following tidbits may be helpful:

- ✓ **See the results in living color.** To see what a finished building model looks like, check out “Anatomy of a Completed House Model,” in the color section somewhere toward the middle of this book.
- ✓ **Hide things to get a clearer view for your current task.** When you right-click any entity and choose Hide, it's often easier to see what you're doing. This is particularly true of groups, which is why I go to so much trouble to create them in the first place. To see stuff that's hidden, choose View⇒Hidden Geometry. To unhide something that's hidden, right-click and choose Unhide.
- ✓ **Better yet, use the Outliner.** Chapter 7 is all about making your SketchUp life easier by using certain tools to work more efficiently. If you're up for it, skip ahead and read the stuff about the Outliner — it's hyper-relevant to what you do here.
- ✓ **There's gold in Model Info.** Choose Window⇒Model Info and then click the Components tab on the left. Clicking the Hide check box next to Fade Rest of Model automatically hides everything outside the group you're editing currently. Smart modelers (such as yourself) make liberal use of this gem when cutting doors and windows in interior walls, which is the topic of the next section... .

## *Inserting doors and windows*



You can make openings in your walls in a couple ways. The best option depends on what kind of building you're modeling, whether you're using single-face or double-face walls, and how much detail you plan to include in your model. You have two options, both of which I demonstrate in videos available via [www.dummies.com/extras/sketchup2014](http://www.dummies.com/extras/sketchup2014):

- ✔ **Use SketchUp components that cut openings.** The SketchUp 3D Warehouse (read all about it in Chapter 5) contains scores of doors and windows that you can download and use in your models. Some of them cut their own openings when you insert them in a face. Here's the catch, though: SketchUp's cut-opening components work only on single-face walls, which means that they're only really useful for exterior building models. If you're building an interior model, you have to cut your own openings.
- ✔ **Cut openings yourself.** For double-face walls, this is your only option; luckily, it's easy to do. Basically, draw the opening's outline and then use Push/Pull to create the opening. The process is the same for doors and windows.

### Using SketchUp's handy-dandy components

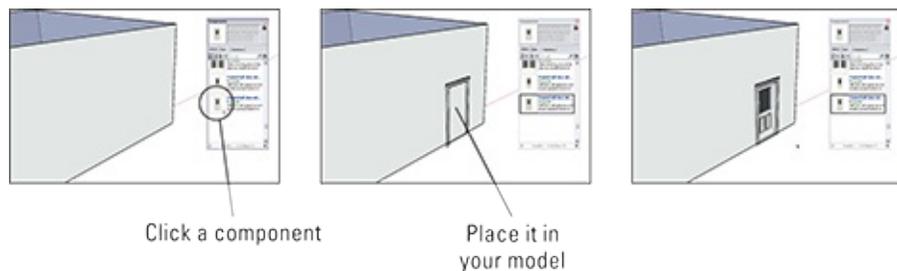
As long as you're making an exterior model, you can use some of the doors and windows stored online on SketchUp's 3D Warehouse. These are components, which you can read more about in Chapter 5. Without going into a ton of detail, here's what you need to know about them:

- ✔ **Components are accessible from the Components dialog box.** Choose Window⇒Components to open the dialog box and then choose the Architecture collection from the Navigation drop-down list (it looks like an upside-down triangle). The Doors, Windows, and DC Doors and Windows collections are in there somewhere. Components that can cut their own openings generally contain *gluing* or *cutting* in their descriptions. Keep in mind that you need to be online to access the 3D Warehouse.
- ✔ **You can find hundreds more online.** If you're connected to the Internet, you can type any search query (such as *revolving door*) into the little search area at the top of the Components dialog box. This scours the 3D Warehouse for whatever you're looking for and shows the results below. Some advice: The 3D Warehouse holds so much stuff that making your query specific helps you sort through the results.
- ✔ **Components are editable.** You find details in Chapter 5, but here's the gist: If you don't like something about a component you find online, you can change it.
- ✔ **Some components are dynamic.** Dynamic Components have special capabilities that make them easier to resize and otherwise reconfigure. You can read all about Dynamic Components in Chapter 5.
- ✔ **When components cut their own openings, the openings aren't permanent.** When you move or delete a hole-cutting door or window component you've placed in a model, the opening goes with the component.

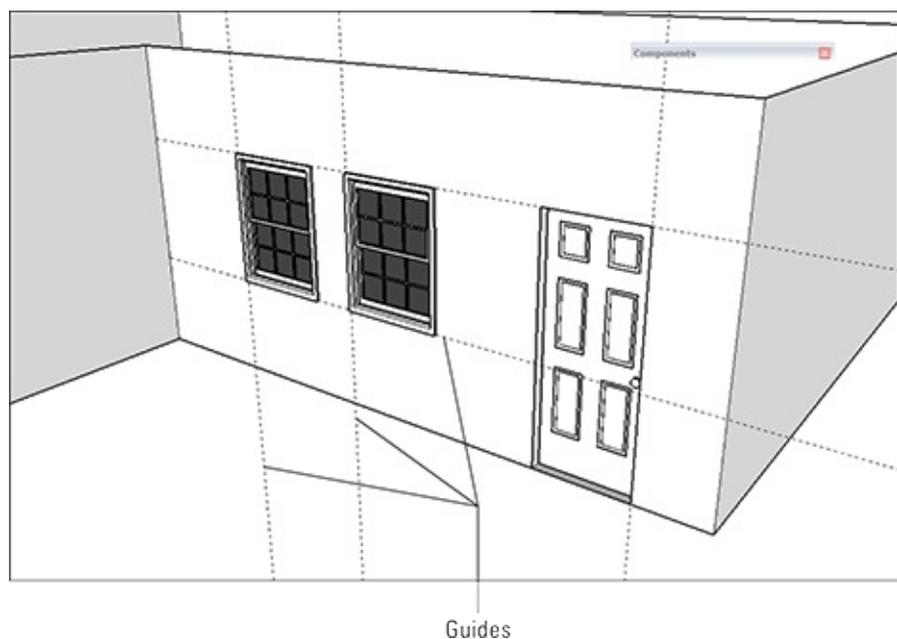
Follow these steps to add a hole-cutting component to your model. See Figure 4-25:

1. **In the Components dialog box, click the component that you want to place in your model.**
2. **Place the component where you want it to be.**
3. **If you don't like where your component is, use the Move tool (read all about it in [Chapter 2](#)) to reposition your component.**

Figure [4-26](#) shows a simple building to which I added a door and a couple window components. Notice how I use guides to line up things. Guides are the best way to ensure that everything's in the right spot.



**Figure 4-25:** Placing window and door components in your model is a breeze.



**Figure 4-26:** Use guides to help you line up components you add to your model.

### ***Making your own openings***

Most of the time, you can't get away with using SketchUp's built-in door and window components. Because these components can't cut through two-faced walls, they're limited to external use only. That's okay though; cutting your own holes in walls is quick and easy, and you end up with exactly what you want.

To cut a precise opening in a double-face wall, here's what you need to do; Figure [4-27](#) shows the basic steps:

1. **Mark where you want your opening to be with guides.**

For a refresher on using guides, have a look at [Chapter 2](#).



If you're drawing on a wall that's part of a group, you need to edit that group in order to punch holes in the wall. To edit a group, double-click it with the Select tool. To stop editing, click somewhere off to the side of your model. Check out the first part of Chapter 5 for more info about working with groups.

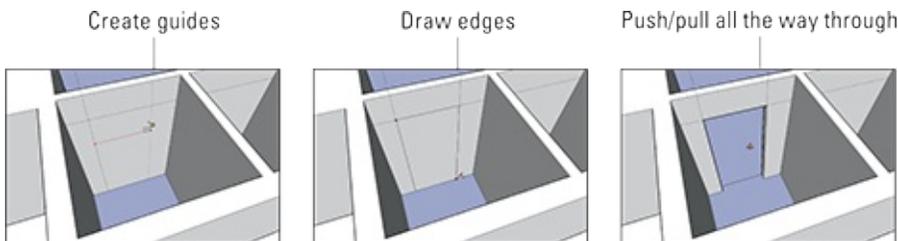
2. **Draw the outline of the opening you want to create, making sure to create a new face in the process.**

You can use any of the drawing tools to do this, though I recommend sticking with the Line tool when you're starting. Remember to pay close attention to what you're drawing; keep an eye out for the colored inferences, which let you know where you are.

3. **Use Push/Pull to extrude your new face back into the thickness of the wall until it touches the face behind it.**

If everything goes well, your face disappears, taking with it the corresponding area of the face behind it. Now you have an opening in your wall. If your face doesn't disappear, and no opening is created, it's probably for one of the following reasons:

- *Your faces aren't parallel to each other.* This technique works only if both faces are parallel. Keep in mind that just because two faces *look* parallel doesn't mean that they are.
- *You hit an edge.* If you push/pull your face into a face with an edge crossing it, SketchUp gets confused and doesn't cut an opening. Use Undo, get rid of the pesky edge (if you can), and try again.



**Figure 4-27:** Use guides to plan where you want an opening and then push/pull all the way through both faces.



Don't forget to orbit! If you can't quite push/pull what you mean to push/pull, orbit around until you can see what you're doing.

## Staring Down Stairs



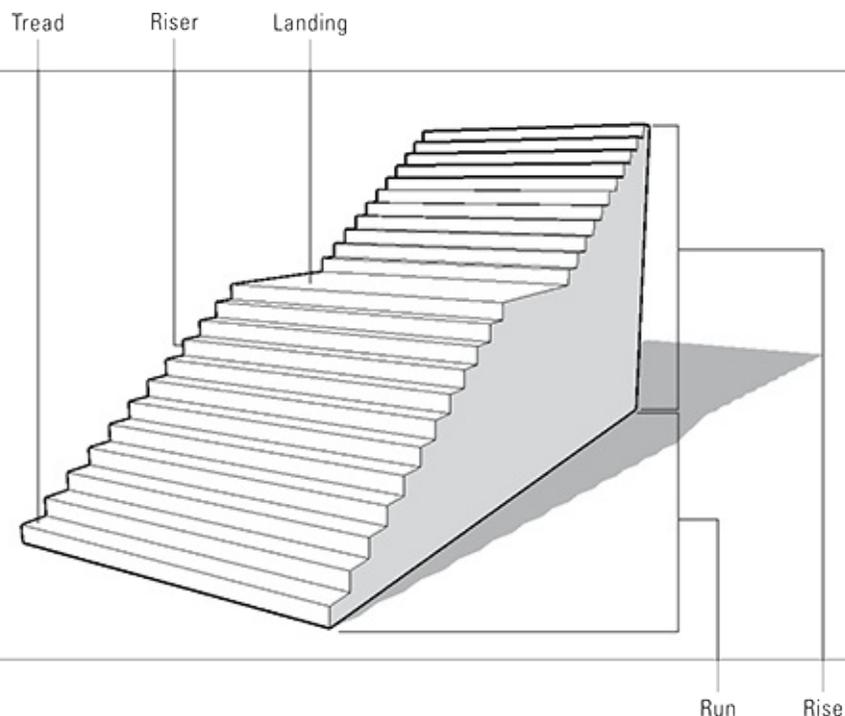
You can make stairs probably a million different ways in SketchUp, but (naturally) I have my favorites. In the following sections, you find two methods that work equally well; take a look at them both and then decide which works best for your situation. (To see each method in

action, watch the videos available via [www.dummies.com/extras/sketchup2014](http://www.dummies.com/extras/sketchup2014).) In the last part of Chapter 5, I describe a third, slightly trickier (but way more powerful) way of making stairs using *components*; feel free to take a look if you're feeling more advanced.

SketchUp's Dynamic Components have some pretty neat implications for models that need stairs. A so-called *dynamic stair component* automatically adds or subtracts individual steps as you make it bigger or smaller with the Scale tool. Depending on what you want to accomplish, a premade dynamic stair component may save you a bunch of time. Find out more about them in Chapter 5.

Before I dive in, here's some simple stairway vocabulary, just in case you need it; take a look at Figure 4-28 for a visual reference:

- ✓ **Rise and run:** The *rise* is the total distance your staircase needs to climb. If the vertical distance from your first floor to your second (your *floor-to-floor* distance) is 10 feet, that's your rise. The *run* is the total *horizontal* distance of your staircase. A set of stairs with a big rise and a small run would be really steep.
- ✓ **Tread:** A *tread* is an individual step — the part of the staircase you step on. When someone refers to the size of a tread, he's talking about the *depth* — the distance from the front to the back of the tread. Typically, this is anywhere from 9 to 24 inches, but treads of 10 to 12 inches are most comfortable to walk on.
- ✓ **Riser:** The *riser* is the part of the step that connects each tread in the vertical direction. Risers are usually about 5 to 7 inches high, but that depends on your building. Not all staircases have actual risers (think of steps with gaps between treads), but they all have a *riser height*.
- ✓ **Landing:** A *landing* is a platform somewhere around the middle of a set of stairs. Landings are necessary in real life, but modeling them can be a pain; figuring out staircases with landings is definitely more complicated. Sometimes, modeling a landing is easier if you think of it as a really big step.



**Figure 4-28:** The anatomy of a staircase.

# The Subdivided Rectangles method

The Subdivided Rectangles method is how most people think to draw their first set of stairs; it's intuitive and simple, but it's also a bit more time-consuming than the other methods I describe in this book.



The key to the Subdivided Rectangles method is to use a special trick you can do with edges: Called *Divide*, it lets you pick any edge and divide it into as many segments as you want. If you know how many steps you need to draw but not how deep each individual tread needs to be, this comes in really handy.

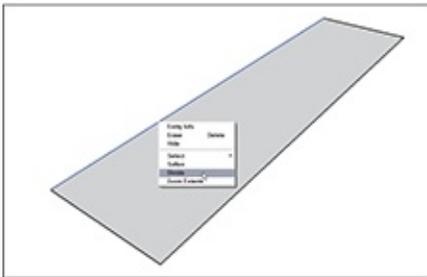
Here's how the Subdivided Rectangles method works. See Figure 4-29:

## 1. Draw a rectangle the size of the staircase you want to build.

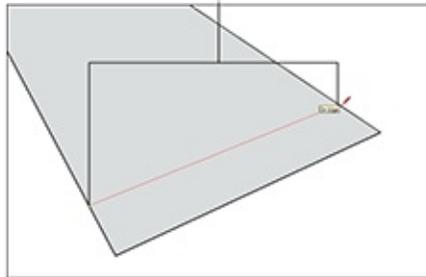


I strongly recommend modeling steps as a group, separate from the rest of your building, and moving them into position when they're done. You can read all about groups in Chapter 5.

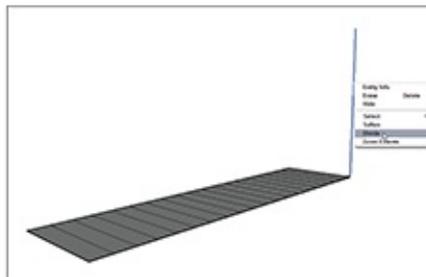
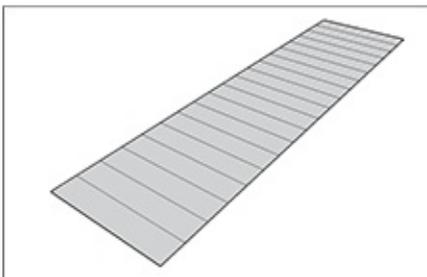
Divide edge into smaller edges,  
marking off treads



Connect new endpoints



Divide vertical edge marking off vertical risers



Infer to the endpoints on this divided edge

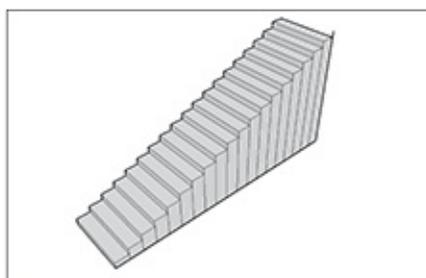
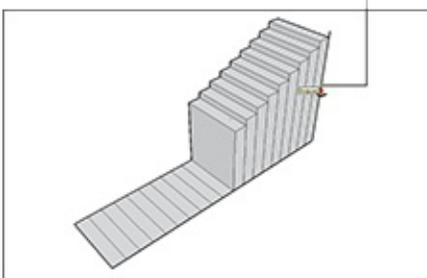


Figure 4-29: The Subdivided Rectangles method of building stairs.

2. **With the Select tool, right-click one of the long edges of your rectangle and choose Divide.**

If your staircase is wider than it is long, right-click one of the short edges, instead.

3. **Before you do anything else, type the number of treads you want to create and press Enter.**

This command automatically divides your edge into many more edges, eliminating the need to calculate how deep each of your treads needs to be. Essentially, each new edge becomes a side of one of your treads.

4. **Draw a line from the endpoint of each new edge, dividing your original rectangle into many smaller rectangles.**

You can use the Line or the Rectangle tool to do this; pick whichever one you're most comfortable with.

5. **From one of the corners of your original rectangle, draw a vertical edge the height of your staircase's total rise.**
6. **Use the Divide command to split your new edge into however many risers you need in your staircase (generally your number of treads, plus one).**

Repeat Steps 2 and 3 to do this. The endpoints of your new, little edges tell you how high to make each step.

7. **Push/pull the rectangle that represents your last step to the correct height.**

Here's where you need to use the hover-click technique that I describe in the sidebar "[More fun with Push/Pull](#)," earlier in this chapter. Just click once to push/pull, hover over the endpoint that corresponds to the height of that tread, and click again. Your step is automatically extruded to the right height.



Extrude your highest step first, but remember that it doesn't go all the way to the top. You always have a riser between your last step and your upper floor.

8. **Repeat Step 7 for each remaining step.**
9. **Use the Eraser to eliminate extra edges you don't need.**



Don't accidentally erase geometry on the part of your staircase you can't see. Turning on Back Edges (View⇒Edge Style⇒Back Edges) is a nice way to see "through" your model without resorting to X-Ray mode.

## The Copied Profile method

This method for modeling a staircase relies, like the last one, on using Push/Pull to create a 3D form from a 2D face, but I think you'll agree this method is more elegant. In a nutshell, draw the *profile* — the side view, sort of — of a single step and then copy as many steps as you need, create a single face, and extrude the whole thing into shape. The first time you do this is breathtakingly satisfying — one of those “guaranteed to make you smile” SketchUp operations you'll want to repeat for friends (assuming you have nerdy friends like me).

Follow these steps to make a staircase using the Copied Profile method, as shown in Figure 4-30:

1. **Start with a large, vertical face; make sure that it's big enough for the flight of stairs you want to build.**

You're going to end up pushing/pulling the whole shebang out of the side of this face, just so you know.

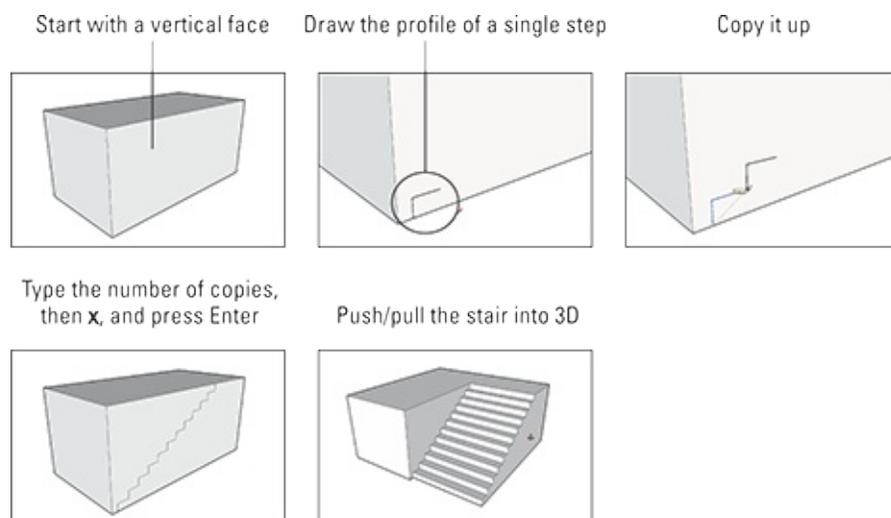


Figure 4-30: The Copied Profile method, in glorious grayscale.

2. **In the bottom corner of the face, draw the profile of a single step.**

I usually use the Line tool to do this, though you may want to use an arc or two, depending on the level of detail you need. For a refresher on drawing lines accurately, check out Chapter 2.

3. **Select all the edges that make up your step profile.**



You can hold down the Shift key while clicking with the Select tool to add multiple entities to your selection. Chapter 2 has lots of selection tips.

4. **Make a copy of your step profile and place it above your first one.**

If you're unfamiliar with how to make copies using the Move tool, see Chapter 2.

5. **Type the number of steps you want to make, type x, and then press Enter.**

For example, if you wanted ten steps, you'd type **10x**. This technique repeats the copy operation you just did by however many times you tell it to; the x after the number tells SketchUp to make copies.

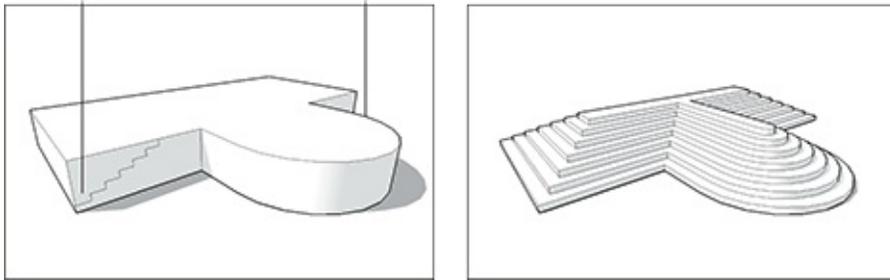
6. **If you need to, draw an edge to make sure that all your step profiles are part of a single face.**
7. **Push/pull the staircase face out to be the width you need it to be.**

This is the part that seems like magic to most folks; I don't think it ever gets old.



This method of stairway building also works great in combination with the Follow Me tool, which I talk about in Chapter 6. Figure 4-31 whets your appetite. Follow Me is cool beans, all the way around.

Profile      Extrusion path for Follow Me



**Figure 4-31:** Using Follow Me with the Copied Profile method produces some impressive geometry, indeed.

## Raising the Roof



If you're lucky, the roof you want to build is fairly simple. Unfortunately, home builders sometimes go a little crazy, creating roofs with dozens of different *pitches* (slopes), dormers, and other doodads that make modeling them a nightmare. For this reason, I keep things pretty simple: The following sections show you how to identify and model basic roof forms. After that, I tell you about a great tool — *Intersect Face* — that you can use to assemble complicated roofs from less-complicated pieces; I think you'll get a kick out of it. For additional help creating any roof I cover here, check out the videos available via [www.dummies.com/extras/sketchup2014](http://www.dummies.com/extras/sketchup2014).



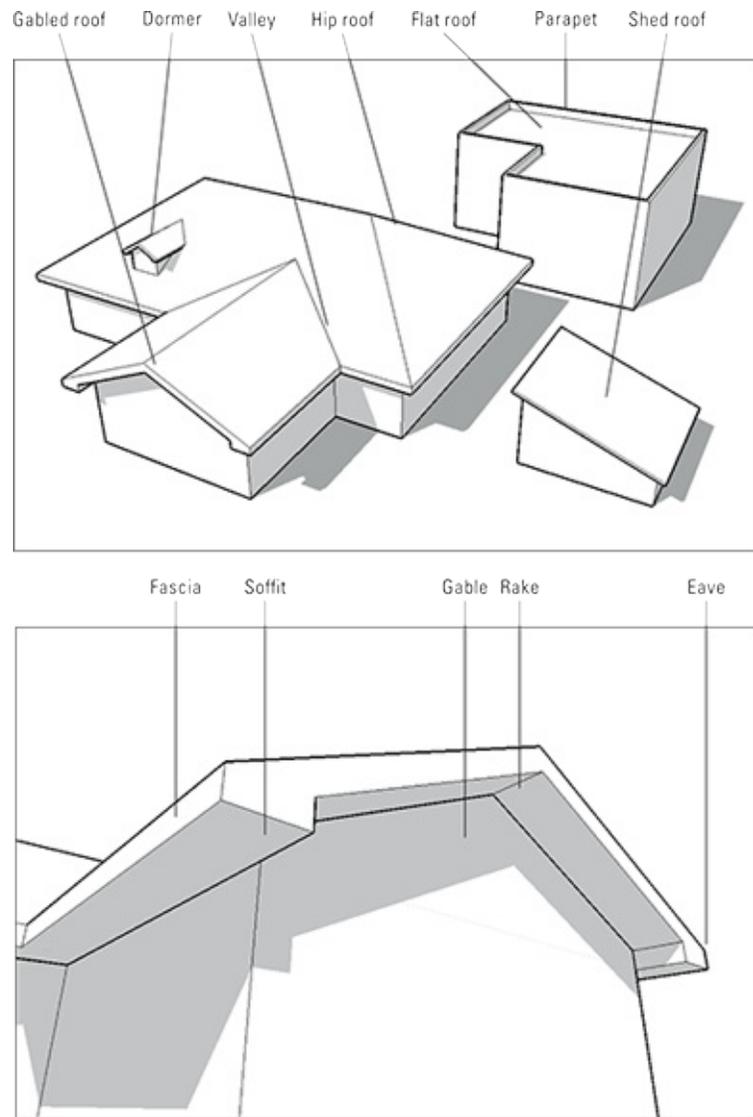
The tricky thing about roofs is that they're hard to see. If you want to make a model of something that already exists, it helps to get a good look at it — that's not always possible with roofs. One neat way to get a better view of a roof you're trying to build is to use a tool like Google Maps.



Always, *always* make a group out of your whole building before you work on your roof.

Before I dive in, what follows is a brief guide to general roof types and terminology; this may come in handy for the explanations I give later in this chapter. Figure [4-32](#) provides a visual accompaniment to my written descriptions:

- ✓ **Flat roof:** *Flat roofs* are just that, except they aren't — if a roof were really flat, it would collect water and leak. That's why even roofs that look flat are sloped very slightly.
- ✓ **Pitched roof:** Any roof that isn't flat is technically a *pitched roof*.
- ✓ **Shed roof:** A *shed roof* is one that slopes from one side to the other.
- ✓ **Gabled roof:** *Gabled roofs* have two planes that slope away from a central *ridge*.
- ✓ **Hip roof:** A *hip roof* is one where the sides and ends all slope in different directions.
- ✓ **Pitch:** The angle of a roof surface.
- ✓ **Gable:** A *gable* is the pointy section of wall that sits under the peak of a pitched roof.
- ✓ **Eave:** *Eaves* are the parts of a roof that overhang the building.
- ✓ **Fascia:** *Fascia* is the trim around the edge of a roof's eaves where gutters are sometimes attached.
- ✓ **Soffit:** A *soffit* is the underside of an overhanging eave.
- ✓ **Rake:** The *rake* is the part of a gabled roof that overhangs the gable.
- ✓ **Valley:** A *valley* is formed when two roof slopes come together; this is where water flows when it rains.
- ✓ **Dormer:** *Dormers* are the little things that pop up above roof surfaces. They often have windows and make attic spaces more usable.
- ✓ **Parapet:** Flat roofs that don't have eaves have *parapets* — extensions of the building's walls that go up a few feet past the roof itself.



**Figure 4-32:** Some different kinds of roofs, and their various and sundry parts.

## ***Building flat roofs with parapets***

Good news — SketchUp was practically made for modeling these kinds of roofs. By using a combination of the Offset tool and Push/Pull, you can make a parapet in less than a minute. Follow these steps, as shown in [Figure 4-33](#):

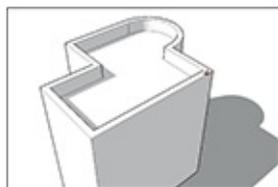
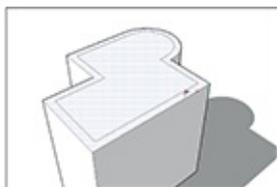
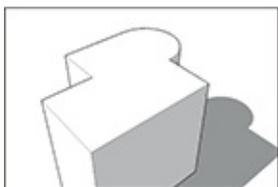
1. **With the Offset tool, click the top face of your building.**
2. **Click again somewhere inside the same face to create another face.**
3. **Type the thickness of your parapet and then press Enter.**

This redraws your offset edges to be a precise distance from the edges of your original face. How thick should your parapet be? It all depends on your building, but most parapets are between 6 and 12 inches thick.

4. **Push/pull your outside face (the one around the perimeter of your roof) into a parapet.**
5. **Type the height of your parapet and then press Enter.**

Offset to the inside

Push/pull your parapet up



**Figure 4-33:** Modeling parapets on flat-roofed buildings is easy.



## Pitched roofs can make you crazy

That fact notwithstanding, a few tips might make building your next pitched roof a little easier:

- ✓ **Start by making the rest of your building a group.** Always make a group out of your whole building before you start working on your roof. If you don't, your geometry starts sticking together, you end up erasing walls by accident, and eventually, you lose your mind. On top of that, the ability to separate your roof from the rest of your building whenever you want is handy. You can also group your roof, if that makes sense for what you're doing. Check out Chapter 5 for a full rundown on making and using groups.
- ✓ **Draw a top view of your roof on paper first.** I find this really helps me figure out things. Adding measurements and angles is even better — anything so that you know what you need to do when you get around to using SketchUp.
- ✓ **Figure out how to use the Protractor tool.** This tool (which is on the Tools menu) is for measuring angles and, more importantly, creating angled guides. Because sloped roofs are all about angles, you probably need to use the Protractor sooner or later. One way to find out how this tool works is to open the Instructor dialog box by choosing Window⇒Instructor and then activating the Protractor tool. Another way is to read “Rotating the right way,” in Chapter 2; the Protractor tool behaves just like the Rotate tool in many ways.

## Creating eaves for buildings with pitched roofs

My favorite way to create *eaves*, or roof overhangs, is to use the Offset tool. Follow these steps to get the general idea and see Figure 4-34:

1. **Make a group out of your whole building before you start modeling the roof.**

This keeps your roof separate, which in turn makes your model easier to work with.

2. **Use the Line tool to create an outline of the parts of your roof that will have eaves of the same height.**

The goal is a single face that you can offset. A lot of buildings have complex roofs with eaves of all different heights; for the sake of this step, just create a face that, when offset, will create roof overhangs in the right places.

3. **Use the Offset tool to create an overhanging face.**

For instructions on how to use Offset, see the section “[Dusting off SketchUp’s drafting tools](#),” earlier in this chapter.

#### 4. Erase the edges of your original face.

Here's a quick way to do this with the Select tool:

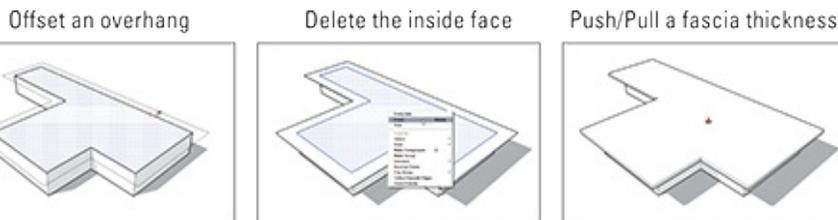
- a. *Double-click inside your first face.*

This selects both the face and the edges that define it.

- b. *Press Delete to erase everything that's selected.*

#### 5. Push/pull your overhanging roof face to create a thick fascia.

Different roofs have fasciae of different thicknesses; if you don't know yours, just take your best guess.

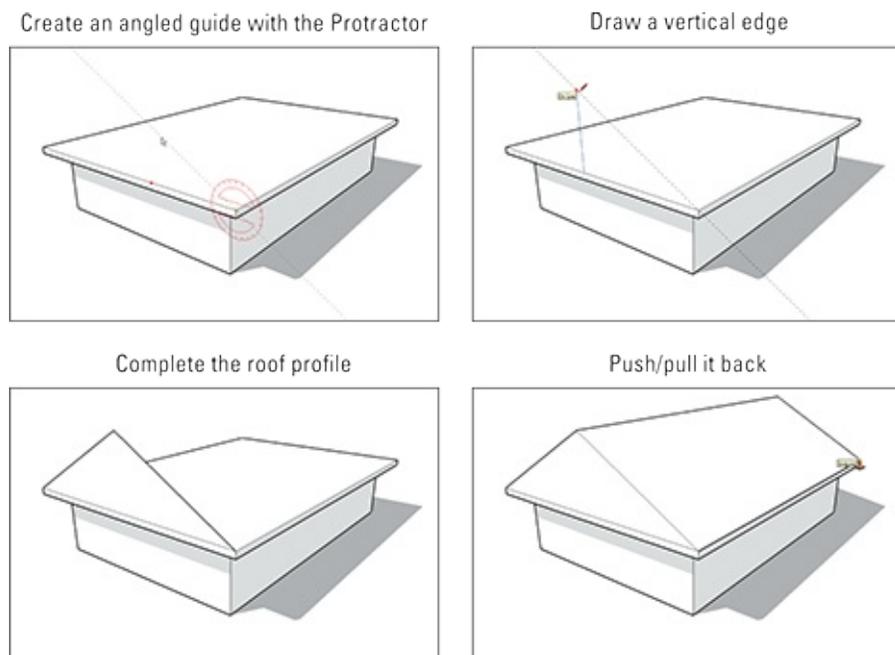


**Figure 4-34:** Eaves are the parts of the roof that overhang a building's walls.

### *Constructing gabled roofs*

You can approach the construction of a gabled roof in a bunch of ways (every SketchUp expert has her favorite), but I find one method in particular that works well consistently.

Follow these steps to build a gabled roof, which is shown in [Figure 4-35](#):



**Figure 4-35:** Gabled roofs are relatively easy to make in SketchUp.

#### 1. Create a roof overhang, following the steps in the preceding section.

Most gabled roofs have eaves, so you probably need to create them for your building.

## 2. Use the Protractor tool to create an angled guide at the corner of your roof.

See the nearby sidebar, “[Pitched roofs can make you crazy](#),” for more information about drawing angled guides with the Protractor.



Architects and builders often express angles as *rise over run ratios*. For example, a 4:12 (pronounced *4 in 12*) roof slope rises 4 feet for every 12 feet it runs — a 1:12 slope is very shallow, and a 12:12 slope is very steep. When using the Protractor tool, SketchUp’s Measurements box understands angles expressed as ratios as well as those expressed in degrees. Typing **6:12** yields a slope of 6 in 12.

## 3. Use the Line tool to draw a vertical edge from the midpoint of your roof to the angled guide you created in Step 2.

The point at which your edge and your guide meet is the height of your roof ridge.

## 4. Draw two edges from the top of your vertical line to the corners of your roof.

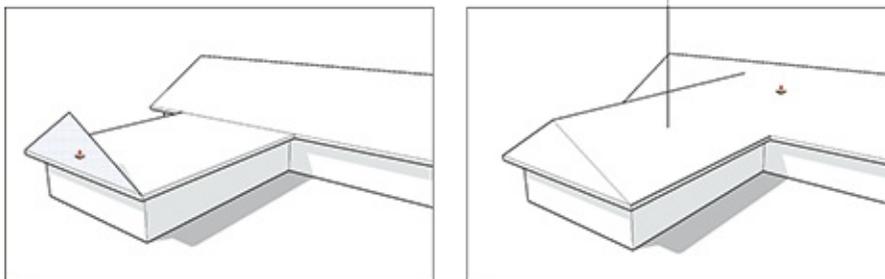
This creates two triangular faces.

## 5. Erase the vertical edge you drew in Step 3 and the guide you drew in Step 2.

## 6. Push/pull back your triangular gable.

If your gabled roof extends all the way to the other end of your building, push/pull it back that far. If your roof runs into another section of roof, as shown in Figure 4-36, extrude it back until it’s completely “buried.” The section “[Sticking your roof together](#),” later in this chapter, has more information on what to do when you make a complex roof.

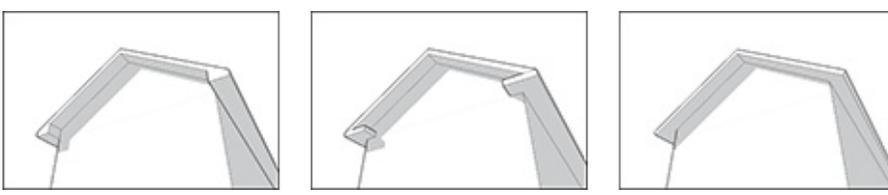
Push/pull it all the way into the other roof pitch



**Figure 4-36:** If your gabled roof is part of a larger roof structure, it may just run into another roof pitch. Let it.

## 7. Finish your eaves, fascia, soffit, and rake(s) however you want.

You find lots of kinds of gabled roof details, so I can’t cover them all, but Figure 4-37 shows a few common ones. Instead of writing about them (which would get confusing anyway), I let the pictures do the talking.



**Figure 4-37:** Some common gabled roof details.

## ***Making hip roofs***

Believe it or not, building a hip roof is easier than building a gabled one. *Hip roofs* don't have rakes, which makes them a lot less complicated to model. Follow these steps to find out what I mean; see Figure [4-38](#):

- 1. Follow Steps 1 through 5 in the preceding section “[Constructing gabled roofs.](#)”**
- 2. Measure the distance from the midpoint of the gable to the corner of the roof.**

Because hip roofs have pitches that are the same on all sides, you can use a simple trick to figure out where to locate the hip in your roof. It's a lot easier than using the Protractor.

- 3. With the Tape Measure, create a guide the distance you just measured from the end of the gable.**
- 4. Draw edges from the point on the ridge you just located to the corners of your roof.**

This does two things: It splits the sides of your roof into two faces each and creates a new face (which you can't see yet) under the gabled end of your roof.

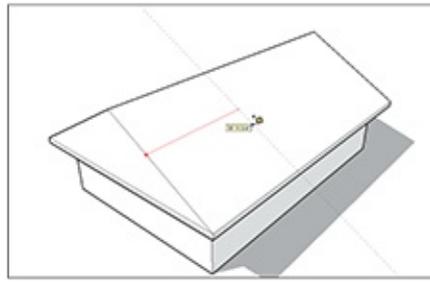
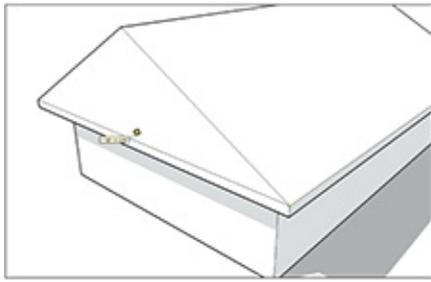
- 5. Erase the three edges that form the gabled end of your roof, revealing the “hipped” pitch underneath.**

Neat, huh? Now all three faces of your roof are the same pitch — just the way they should be.

- 6. If appropriate, repeat the process on the other end of your roof.**

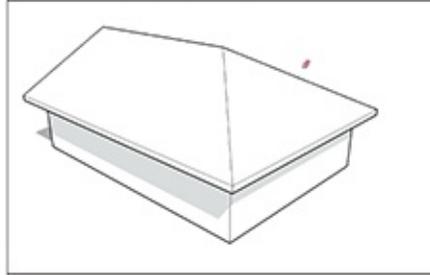
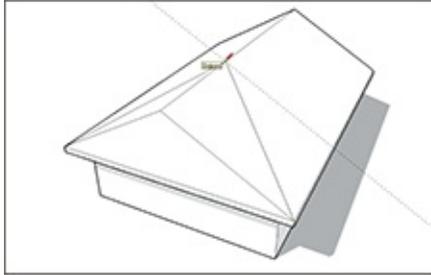
Measure half-width of your gable

Create a guide that distance from end of gable



Draw edges connecting ridge and corners and erase 3 edges that form gable

Now you have a hip



**Figure 4-38:** To make a hip roof, start with a gabled one.

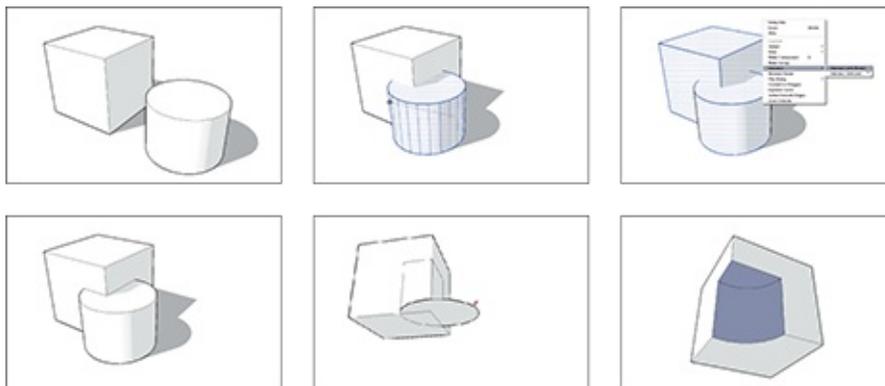
## Sticking your roof together

In general, the newer and more expensive a house is, the more roof slopes it has. Who knows why this is the case; it probably has something to do with folks thinking complex-roofed houses look more like French chateaus. Whether crazy roofs (there's my bias showing again) are a good thing isn't relevant to this book, but I know one thing for sure: They're a pain in the, um, gutters to model.

## Getting to know Intersect Faces

Luckily, SketchUp has a relatively little-known feature that often helps when it comes to making roofs with lots of pitches: *Intersect Faces*. Here's what you need to know about this terrific little tool:

✔ **Intersect Faces makes new geometry from existing geometry.** It takes faces you've selected and creates edges wherever they intersect. Figure [4-39](#) shows what I mean: Perhaps you want to make a model that's a cube with a cylinder-shaped chunk taken out of it. You'd model the cube and model the cylinder. After positioning them carefully, you can then use Intersect Faces to create edges where the two shapes' faces come together. After that, you'd use the Eraser to get rid of the edges you didn't want — the rest of the cylinder, in this case.



**Figure 4-39:** Using Intersect Faces to cut a partial cylinder out of a cube.

- ✓ **Intersect Faces and the Eraser tool go hand in hand.** Anytime you use Intersect Faces, you need to follow up by deleting the geometry you don't want. This isn't a bad thing, but it does mean that you need to be good at orbiting, zooming, and panning around your model. You also need to be handy with the Eraser.
- ✓ **Most of the time, choose Intersect Faces with Model.** This tool has three modes, but the majority of the time, you use the basic one. Here's what all three modes do:
  - *Intersect Faces with Model:* Creates edges everywhere your selected faces intersect with other faces in your model — whether the other faces are selected or not.
  - *Intersect Faces with Selection:* Only creates edges where *selected* faces intersect with other *selected* faces. This is handy if you're trying to be a little bit more precise.
  - *Intersect Faces with Context:* This one's a little trickier: Choosing this option creates edges where faces *within the same group or component* intersect; that's why it's available only when you edit a group or component.
- ✓ **Intersect Faces doesn't have a button.** To use it, you have to either
  - *Right-click and choose Intersect Faces.*
  - *Choose Edit⇒Intersect Faces.*

## Using Intersect Faces to make roofs

When creating roofs, you can use Intersect Faces to combine a whole bunch of gables, hips, dormers, sheds, and so on into a single roof. Doing so is no cakewalk, and it requires a fair amount of planning, but it works great when nothing else will.

Figure 4-40 shows a complicated roof with several elements. Gabled roofs have been pushed/pulled into the main hip roof at all different heights, but edges don't exist where all the different faces meet. In the steps that follow, use Intersect Faces to create the edges you want and then use the Eraser to clean up the mess:

### 1. Select the whole roof.



You can select the whole roof a number of ways, but the one that I find works the best is to first hide the group that contains the rest of your building and then draw a big selection box around the whole roof with the Select tool.

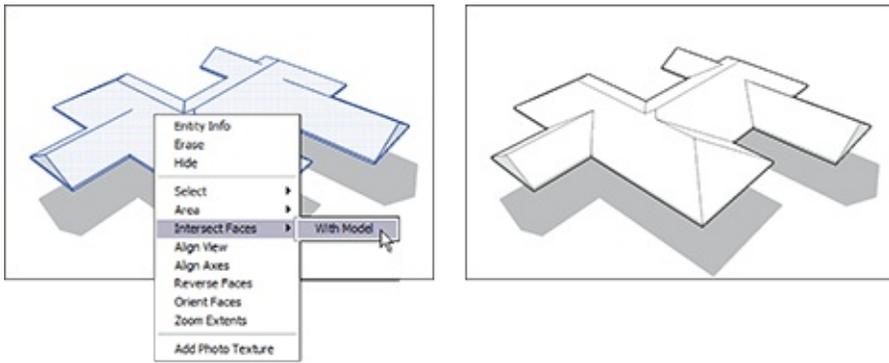
### 2. Choose Edit⇒Intersect Faces⇒With Selected.

This tells SketchUp to go through and create edges everywhere you have faces that *intersect* — everywhere they pass through each other without an edge.

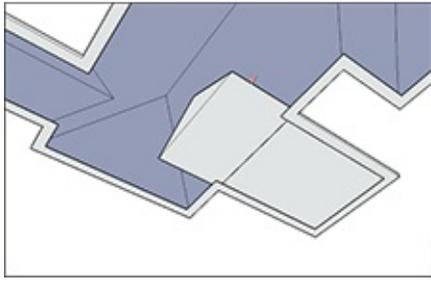
### 3. Get out your Eraser and *carefully* delete all the extra geometry on the inside of your roof.

I won't lie; this can be a lot of work, but it's a whole lot easier than using the Line tool and

SketchUp's inference engine to figure out where everything should go.



Erase from underside stuff that doesn't belong

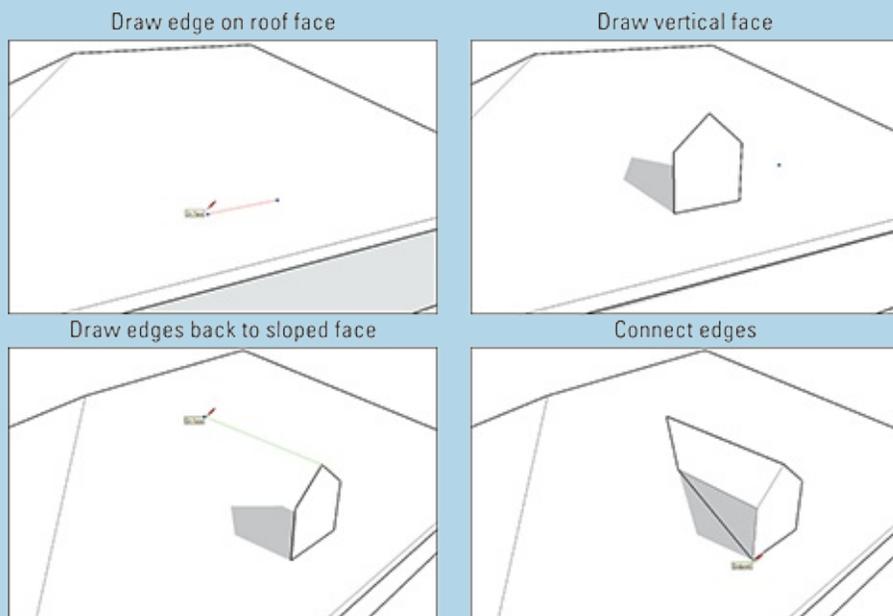


**Figure 4-40:** Here's a typically complex roof that could use Intersect Faces to unify.

## When all else fails, use the Line tool

Fancy tools like Follow Me and Intersect Faces are useful most of the time, but for some roofs, you just have to resort to drawing good old edges. If that's the case, you'd better get familiar with most of the stuff at the beginning of [Chapter 2](#) because you're going to be inferencing like there's no tomorrow. SketchUp users who really know what they're doing can draw *anything* with the Line and Eraser tools; it's a beautiful thing to watch. Unfortunately, it's not a beautiful thing to write (or read) about in a black-and-white book, so I can't show you as much "modeling from first principles" stuff as I want.

All the same, check out the following figure. In it, I use the Line tool and SketchUp's venerable inference engine to add a gabled dormer to a sloped roof surface. With practice, you can, too.



## Chapter 5

# Falling in Love with Components

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### *In This Chapter*

- ▶ Lumping together geometry into groups
  - ▶ Discovering the wonder and majesty of components
  - ▶ Getting familiar with Dynamic Components
  - ▶ Using components to make symmetrical models
  - ▶ Building stairs with component instances
- 

I wish I had a way to use the typography in this book to convey the relative importance of certain topics. If I had my way, the word *COMPONENTS* would be printed 4 inches high and colored neon green. Components are *that* important.

Making a component or a group is like gluing together geometry in your model. Edges and faces that are grouped together act like mini-models inside your main model; you use components and groups to more easily select, move, hide, and otherwise work with parts of your model that need to be kept separate. *Groups* are simple conglomerations of edges and faces. *Components* are basically groups with an all-important, added benefit: changes you make to one *instance* (copy) of a component automatically apply to all of the other instances in your model. Getting used to using groups and components is the single biggest thing you can do to get better at SketchUp.

This chapter is about creating and using SketchUp components to make your life a whole lot simpler. I begin by talking about groups (which have a lot in common with components). After that, I jump into components — finding them, managing them, and making your own.

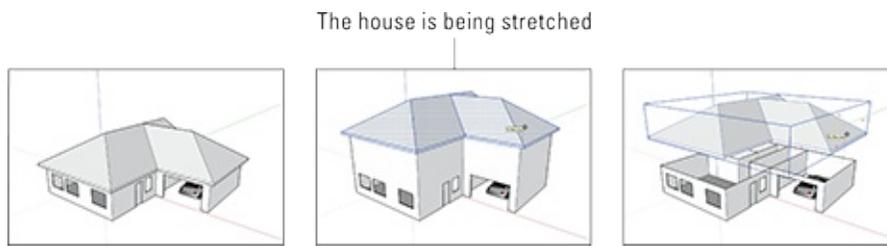
In the last section of this chapter, I show you a couple of modeling techniques that take advantage of component behavior. They're guaranteed to save you time and effort, and using them will make you feel like a rock star — one who makes 3D models, at least.

## Grouping Things Together



Anyone who has worked with SketchUp for even a short time has probably noticed something: SketchUp geometry (the edges and faces that make up your model) is *sticky*. In other words, stuff in your model wants to stick to other stuff. The people who invented SketchUp built it this way on purpose; the reasons why would take a while to explain. Suffice it to say, making and using groups are the keys to keeping the stuff in your model from sticking together. Here are a few reasons for you to make groups (reasons I illustrate in a video available via [www.dummies.com/extras/sketchup2014](http://www.dummies.com/extras/sketchup2014)):

- ✔ **Grouped geometry doesn't stick to anything.** Perhaps you've modeled a building, and you want to add a roof. You want to be able to remove the roof by moving it out of the way with the Move tool, but every time you try, you end up pulling the whole top part of the house along with it (like the middle image in Figure 5-1). Making the roof a separate group allows you to let it sit on top of your house without sticking there, making it easier to deal with, as shown in the right image in Figure 5-1.



**Figure 5-1:** Making the roof into a group means that it won't stick to the rest of your building.

- ✔ **Using groups makes working with your model easier.** You can select all the geometry in a group by clicking it once with the Select tool. You can move groups and make copies with the Move tool.
- ✔ **You can name groups.** If you turn a selection of geometry in your model into a group, you can give it a name. In the Outliner (which I talk about in Chapter 7), you can see a list of the groups (and components) in your model, and if you've given them names, you can see what you have.
- ✔ **Groups can be solids.** Basically, a *solid* is any group (or component) whose geometry can be thought of as *watertight* — continuous, with no holes. Solids are important for two reasons:
  - *If an object is a solid, SketchUp can calculate its volume.* You can see any solid's volume by looking in the Entity Info dialog box.
  - *The Solid Tools let you perform nifty modeling tricks using two or more solids.* You can read all about the Solid Tools toward the end of Chapter 6.

Follow these steps to create a group:

### 1. Select the geometry (edges and faces) you want to turn into a group.

The simplest way to select multiple *entities* (edges and faces) is to click them one at a time with the Select tool while holding down the Shift key. You can also use the Select tool to drag a box around the entities you want to select, but this can be tough, depending on where they are. For more information on making selections, check out Chapter 2.

### 2. Choose Edit⇒Make Group.

You can also right-click and choose Make Group from the context menu that pops up.



If you want to ungroup the geometry in a group, you need to explode it. Right-click the group and choose Explode from the context menu. The edges and faces that were grouped

together aren't grouped together anymore.



To edit the geometry inside a group, double-click it with the Select tool. You know you're in edit mode when the rest of your model appears to fade back, leaving only your grouped geometry clearly visible. To stop editing a group, click outside it, somewhere else in your modeling window.

## Working with Components

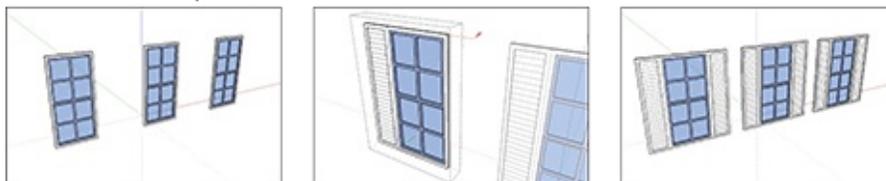
Even though components are incredibly important, there's nothing too magical about them. They're just groupings of geometry (edges and faces) that make working in SketchUp faster, easier, and more fun. In many ways, components are really just fancy groups — they do a lot of the same things. In the following sections, I talk about what makes components special and give some examples of what you can do with them. Next, I give a quick tour of the Components dialog box, pointing out where components live and how you can organize them. The last part of this section is devoted to making your own components; it's not hard, and after you can make components, you're on your way to SketchUp stardom. (Check out Chapter [12](#) for more on sharing your SketchUp models with the world.)

### What makes components so great?

By now, you've probably figured out that I'm a big fan of using components whenever you can. Here's why:

- ✓ **Everything that's true about groups is true about components.** That's right: Components do everything that groups do. Components don't stick to the rest of your model, you can give them meaningful names, and you can select them, move them, copy them, and edit them easily — just like you can with groups.
- ✓ **Components update automatically.** Unlike with groups, when you use multiple copies (called *instances*) of the same component in your model, they're all spookily linked. Changing one makes them all change, which saves loads of time. Consider a window component that I created and made two copies of, as shown in Figure [5-2](#). When I add something (in this case, shutters) to one instance of that component, *all* the instances are updated. Now I have three windows, and they all have shutters.

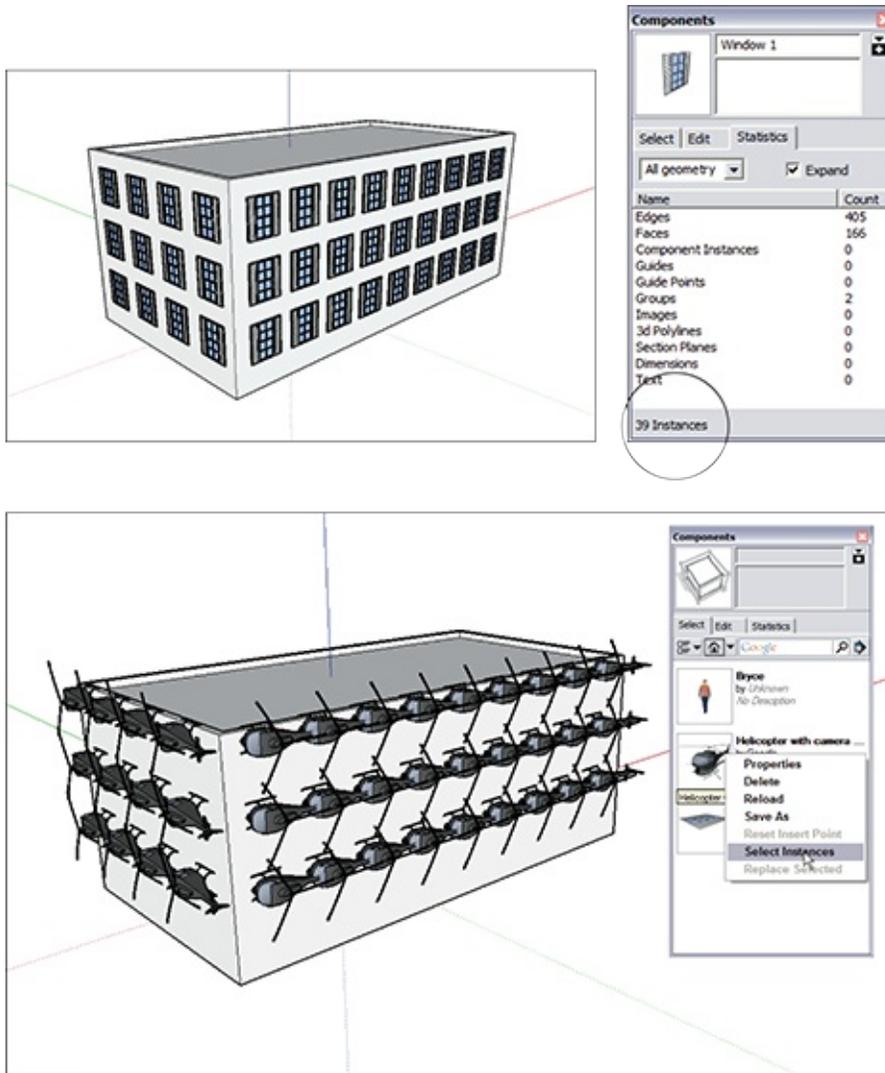
These windows are instances  
of the same component



**Figure 5-2:** Changing one instance of a component changes all the other instances, too.

- ✓ **Using components can help you keep track of quantities.** You can use the Components dialog box to count, select, substitute, and otherwise manage all the component instances in your model. Groups don't appear in the Components dialog box at all. Figure [5-3](#) shows a

great big (and ugly) building I designed to go with the window component I made. I have a lot more control than I would have otherwise because the windows are component instances. To illustrate what I mean, I changed all the windows to helicopters in a few clicks.



**Figure 5-3:** Quickly count all the window instances in your model (top), or even swap them out for another component. (I like helicopters, don't you?)

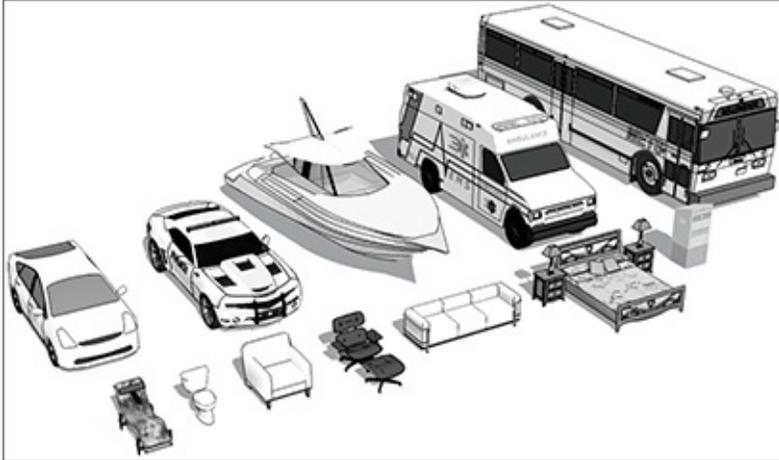
- ✓ **You can make a component cut an opening automatically.** Perhaps you've made a window (which I have), and you want that window to poke a hole through whatever surface you stick it to (which I do). You can set up SketchUp components to cut their own openings in faces. These openings are even dependent on the existence of the component; if you delete the component, the hole disappears.



Components that are set up to automatically cut openings can do so only through a single face. If your wall is two faces thick, your components will cut through only one of them.

- ✓ **You can use your components in other models.** It's simple to make any component you build available for use whenever you work in SketchUp, no matter what model you're working on. If you have a group of parts or other things you always use, making your own component collection can save you a lot of time and effort. For more information about creating your own component collections, see the later section, "[The Select tab.](#)"

✓ **Components are great for making symmetrical models.** Because you can flip a component instance and keep working on it, and because component instances automatically update when you change one of them, using components is a great way to model anything that's symmetrical. If you look around, you'll notice that most things people use are symmetrical. The “[Modeling symmetrically: Good news for lazy people](#)” section near the end of this chapter dives headlong into modeling symmetrical things like couches and hatchbacks; Figure 5-4 shows examples.



**Figure 5-4:** What do all these things have in common? They're symmetrical.



## The SketchUp 3D Warehouse

Imagine a place online where everyone in the world can share SketchUp models for free. That's the *3D Warehouse* in a nutshell. It's hosted by Trimble (SketchUp's new parent company), it's available in ten languages, and it's searchable — which is a very good thing because it's jam-packed with models. Millions of 'em.

You can get to the 3D Warehouse in a couple ways:

- ✓ **On the web:** Just type <http://3dwarehouse.sketchup.com> into your web browser.
- ✓ **Through SketchUp:** The Components dialog box is hooked up directly to the 3D Warehouse as long as you're online. You can also open the 3D Warehouse in a separate window by choosing File⇒3D Warehouse⇒Get Models.

Anything in the 3D Warehouse is available for you to download and use in your own models. You can also upload anything you make so that other people can use it. Find out more about sharing your work on the 3D Warehouse in Chapter [12](#).

## Exploring the Components dialog box

It's all fine and dandy that SketchUp lets you turn bits of your models into components, I suppose, but wouldn't it be nice if you had someplace to *keep* them? And wouldn't it be great if you could use components that other people made to spiff up your model instead of building everything yourself? As you've probably already guessed, both of these things are possible, and both involve the Components dialog box, which you can find on the Window menu.



You can bring any SketchUp model on your computer into your current file as a component. That's because components are really just SketchUp files embedded in other SketchUp files. When you create a component in your model, you're effectively creating a new, nested SketchUp file. Neat, huh?

The Components dialog box is made up of four major areas, which I describe in the following sections.

## Info and buttons

I don't really know what to call this part of the Components dialog box, so I call it like it is: It's for information and buttons. Figure 5-5 points out its elements, and here's what everything does:

- ✓ **Name:** The name of the component you select appears here. If your component is in your model, it's editable. If the component is in one of the default collections, it's not. A component is considered to be in your model if it appears in your In Model collection, which you can read about in the next section, "[The Select tab](#)."
- ✓ **Description:** Some, but not all, components have descriptions associated with them. You can write one when you create a new component, or you can add one to an existing component in your model. Just like the name, you can edit descriptions for models only in your In Model library.
- ✓ **Display Secondary Selection Pane button:** Clicking this button opens a second view of your collections at the bottom of the Components dialog box. Use this view to manage the components on your computer.

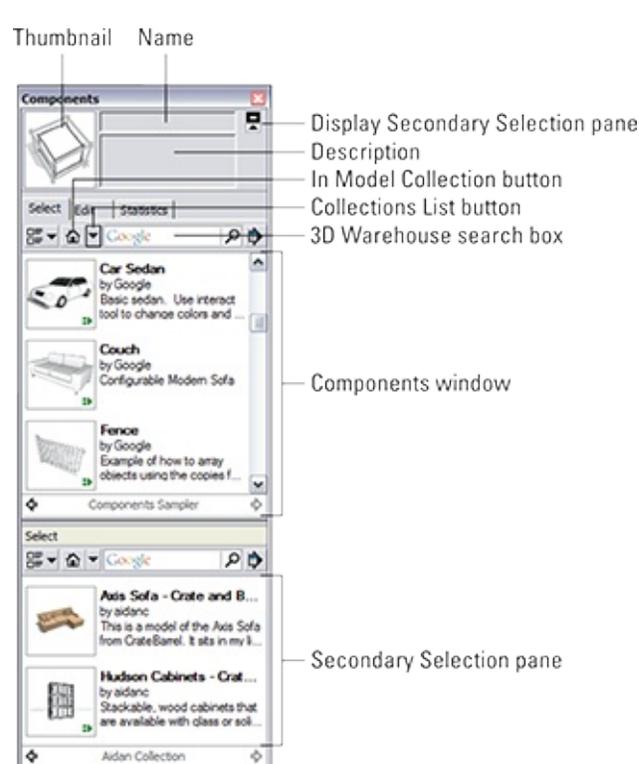


Figure 5-5: The Components dialog box is chock-full o' goodness.

## The Select tab

This is where your components live (if they can be said to live anywhere). Use the Select tab to

view, organize, and choose components. Refer to Figure [5-5](#) to see the Select tab in all its glory.

- ✓ **In Model Collection button:** SketchUp automatically keeps track of the components you've used in your model and puts a copy of each of them in your In Model collection. Each SketchUp file you create has its own In Model collection, which contains the components that exist in that model. Clicking the In Model Collection button displays the components in your In Model collection, if you have any.
- ✓ **Collections List button:** The components listed under the Favorites heading are a mix of two collection types:
  - *Local* collections are folders of components that live on your hard drive. You can access them anytime because they refer to files on your computer.
  - *Online* collections are groupings of components that live in the 3D Warehouse (which you can read lots more about in this book). Unlike local collections, you can access online collections only when you're — you guessed it — online.

Unfortunately, there's no way to tell just by looking at them in the list which collections are local and which are online. If you click the name of a collection and see a progress bar before you see any models, that collection is online.

- ✓ **3D Warehouse search box:** It works just like any regular search box: Type what you're looking for and press Enter. Models in the 3D Warehouse that match your search terms appear in the Components window below. Naturally, you need to be online for this to work.
- ✓ **Components window:** This window displays the components in the currently selected component collection, or the results of a 3D Warehouse search you've just performed. Click a component to use it in your model.



Components that have a little green arrow icon next to them are special; they're Dynamic Components. They have special abilities. You can read about DCs later in this chapter, in the "[Discovering Dynamic Components](#)" section.

- ✓ **View Options button:** Pretty simple, really. This is where you decide how to view the components (or subcollections) in the Components window.
- ✓ **Collection Details menu:** Here's where you manage your component collections. A bunch of options exist, so I'd better explain what most of them mean:
  - *Open a Local Collection:* Lets you choose a folder on your computer system to use as a component collection. Any SketchUp models in that folder show up in the Components window, ready to be used as components in your models.
  - *Create a New Collection:* Allows you to create a folder somewhere on your computer system that you can use as a component collection. A collection is handy if you have a number of components that you use all the time; putting them all in one place makes them easier to find.

- *Save as a Local Collection:* When you choose this option, SketchUp lets you save the components that currently appear in your Components window as a brand-new local collection. If the components you're viewing are online, copies of them get downloaded to your computer. If you're viewing your In Model collection, the contents are copied and included in a new folder. If you're already viewing a local collection, this option isn't available.
- *View in 3D Warehouse:* If you're viewing an online collection, this option opens that collection in a separate window that displays the 3D Warehouse in much more detail.
- *3D Warehouse Terms of Service:* Choose this option if you're having trouble sleeping. If you're wondering who owns the stuff on the 3D Warehouse, this is where it's at.
- *Add to Favorites:* Choosing this option adds whatever you're viewing in the Components window to the Favorites section of the Collections list. That goes for local collections (folders on your computer); online collections (from the 3D Warehouse); and 3D Warehouse searches. That's right — you can save a search as a favorite collection. The models in a Favorite Search collection are always different, depending on what's in the 3D Warehouse.

The next two options appear only when you're viewing your In Model collection:

- *Expand:* Because components can be made up of other, nested components, a component you use in your model may really be *lots* of components. Choosing Expand displays all the components in your model whether or not they're nested inside other components. Most of the time, you probably want to leave Expand deselected.



- *Purge Unused:* Choose this option to get rid of any components in your In Model collection that aren't in your model anymore. Be sure to use this before you send your SketchUp file to someone else; it significantly reduces your file size and makes the file a whole lot neater.



## Select and replace all your troubles away

On top of all the buttons, menus, and windows you can immediately see in the Select tab of the Components dialog box, you can also find hidden options tucked away on a context menu. The menu pops up when you right-click an In Model collection component:

- ✓ **Select Instances:** Perhaps you have 15 *instances* (copies) of the same component in your model, and you want to select them all. Just make sure that you're viewing your In Model collection and then right-click the component (in the Components dialog box) whose instances you want to select all. Choose Select Instances, and your work's done. This trick can save you tons of time, particularly if you have component instances all over the place. The feature even selects hidden instances and ones on layers that are turned off.
- ✓ **Replace Selected:** You may want to swap in a different component for one that's in your model. Simply select the component instances (in your modeling window) that you want to replace and then right-click the component (in the Components dialog box) that you want to use instead. Choose Replace Selected from the context menu to perform the swap.

Ready for an even better tip? Use Select Instances and Replace Selected together to help you work more efficiently. Instead of placing 20 big, heavy tree components in your model (which can slow down your work), use a smaller, simpler component instead (such as a stick). When you're finished modeling, use Select Instances to select all the stand-in components at once and then use Replace Selected to swap in the real component. Figure 5-3 (earlier in this chapter) shows the mechanics of this operation, albeit using windows and helicopters. A video available via [www.dummies.com/extras/sketchup2014](http://www.dummies.com/extras/sketchup2014) demonstrates all these component-based tricks.

## The Edit tab

Because the options in this part of the Components dialog box are similar to the ones you get when you make a new component, check out the section “[Creating your own components](#),” later in this chapter, for the whole scoop.



You can use the options in the Edit tab only on components in your In Model collection — everything is grayed out for components that live in any other place.

## The Statistics tab

Can you remember who won the 1975 Super Bowl? How many home runs did Hank Aaron hit in his career? Do you always check the nutrition information panel on food packaging? You may be a sucker for statistics, and if so, welcome home... .

Even if you're not, the Statistics tab is a useful place to spend some time. Use this tab to keep track of all the details related to whatever component you have selected in the Components dialog box. (See Figure 5-6.) This tab is especially useful for doing the following things:

- **Checking the size of your components:** The information in the Edges and Faces areas of this tab lets you know how much geometry is in a component. If you're worried about file size or your computer's performance, try to use small components — ones with low numbers of faces and edges.
- **Seeing what components are inside your components:** The Component Instances line lists how many component instances are in your selected component. If you switch from All Geometry to Components in the drop-down list at the top of the tab, you can see a list of all the constituent components: subcomponents within your main component.

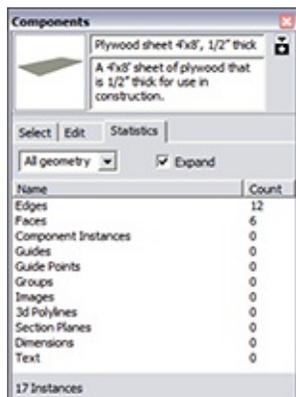


Figure 5-6: The Statistics tab of the Components dialog box: Geek out on numbers.



The Statistics tab *doesn't* show details for components you have selected in your actual model; it shows only information about the component that's selected in the Select tab of the Components dialog box. To see information about whatever component (or other kind of object) you have selected in your modeling window, use the Entity Info dialog box (located in the Window menu).

## Save time — go shopping

Why spend hours modeling an oak tree when you can buy a fantastic one for a reasonable price? If you can't find what you need among the zillions of components that you can download for free from the 3D Warehouse, try my favorite paid option: Form Fonts ([www.formfonts.com](http://www.formfonts.com)) is a website that sells components “all you can eat, buffet-style.” You pay a (surprisingly low) monthly fee, and you have access to *thousands* of high-quality models of just about anything. Form Fonts's international team of modelers even takes requests — if you need something that they don't have, they can probably make it if you ask nicely. Even if you're not interested in signing up, it's worth checking out the website just to see the beautiful models Form Fonts makes.

## Creating your own components

Now that I have you all jazzed up about the wonder and mystery of using components in your models, I bet you can't wait to start making your own. At least I hope so — using components is probably the single best SketchUp habit you can develop. Here's why:

- ✓ **Components keep file sizes down.** When you use several instances of a single component, SketchUp has to remember the information for only one of them. This means that your files are smaller, which in turn means you have an easier time e-mailing, uploading, and opening them on your computer.
- ✓ **Components show in the Outliner.** If you're at all interested in not wasting time hunting for things you've misplaced, create lots of components. Doing so means that you can see, hide, unhide, and rearrange them in the Outliner, which I cover in Chapter 7.
- ✓ **Components can save your sanity.** Hooray! You've finished a model of the new airport — and it took only three weeks! Too bad the daylighting consultant wants you to add a sunshade detail to every one of the 1,300 windows in the project. If you made that window a component, you're golden. If, on the other hand, that window *isn't* a component, you're going to spend a very long night holding hands with your computer mouse.
- ✓ **Components can be dynamic.** Dynamic Components are components with special abilities. They can be set up with multiple configurations, taught to scale intelligently, programmed to perform simple animations, and more. Anyone can use existing DCs, but only people with SketchUp Pro can create new ones. Check out “[Discovering Dynamic Components](#)” later in this chapter for the whole story.

## Making a new component



Creating simple components is a pretty easy process, but making more complicated ones — components that automatically cut openings, stick to surfaces, and always face the viewer — can be a little trickier. Follow these steps no matter what kind of component you're trying to make (and check out the corresponding video available via [www.dummies.com/extras/sketchup2014](http://www.dummies.com/extras/sketchup2014)):

**1. Select one or more entities you want to turn into a component.**

You can select edges, faces, images, guides, section planes — even other groups and components. For more information on making selections, see Chapter [2](#).

**2. Choose Edit⇒Create Component.**

The Create Component dialog box opens. (See Figure [5-7](#).)



**Figure 5-7:** The Create Component dialog box. So many options ...

**3. Give your new component a name and description.**



Of these two, the name is by far the most important. Choose a name that's descriptive enough that you'll understand it when you open your model a year from now.

**4. Set the alignment options for your new component.**

Wondering what the heck all this stuff means? I don't blame you — it can be confusing the first time. For a quick introduction to each option and tips for using it, check out Table [5-1](#).

**5. Select the Replace Selection with Component check box if it isn't already selected.**

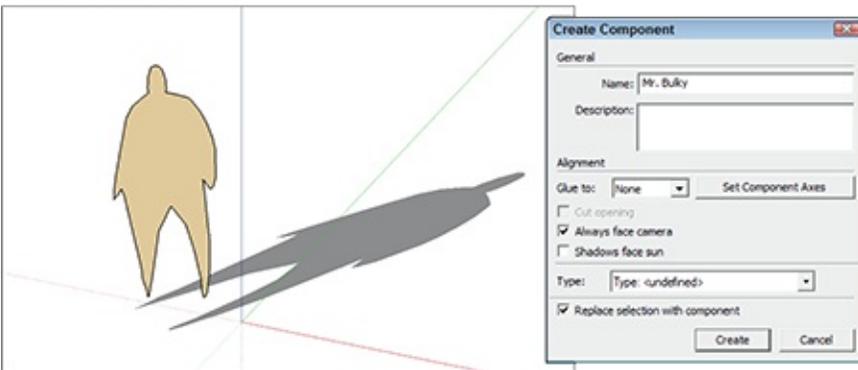
This step drops your new component into your model right where your selected geometry was, saving you from inserting it from the Components dialog box.

**6. Click the Create button to create your new component.**

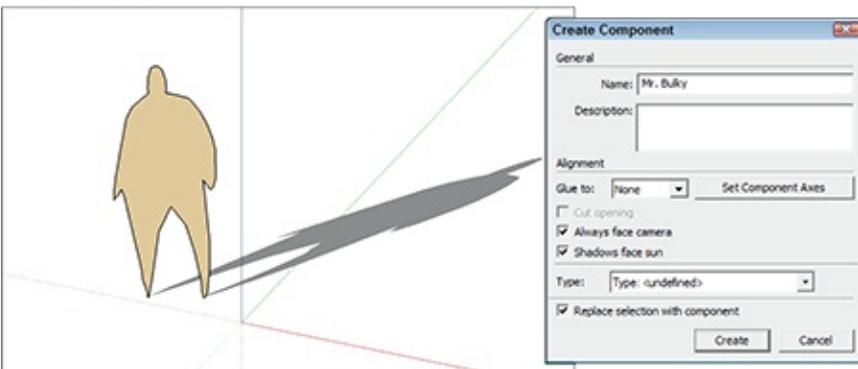
# Table 5-1 Component Alignment Options

| Option             | What It Does  | Tips and Tricks   |
|--------------------|---|---|
| Glue To            | Makes a component automatically stick to a specific plane. For example, a chair will almost always sit on a floor. It will almost <i>never</i> be stuck to a wall, turned sideways. When a component is glued to a surface, using the Move tool moves it only on that surface — never perpendicular to it (up and down, if the surface is a floor). | Use this feature for objects that you want to remain on the surface you put them on, especially objects you want to rearrange: Furniture, windows, and doors are prime examples. If you want to unstick a glued component from a particular surface, right-click it and choose Unglue from the context menu.  |
| Set Component Axes | Sets a component's <i>axis origin</i> and <i>orientation</i> . This option is important primarily if you have SketchUp Pro and plan to make this component into a Dynamic Component. If that isn't your plan, you can safely leave this option alone.   | Click the Set Component Axes button to choose where you want your component's axis origin to be (where the red, green, and blue axes meet). Click once to center your axes, again to establish the red direction, and again to establish the green and blue directions. If you're creating a Dynamic Component, this is something you absolutely must know how to do. |
| Cut Opening        | For components "in" a surface, select this check box to automatically cut an opening in surfaces you stick the component to.  | As with premade components, this opening is dependent on the component's existence: If you delete the component instance, the opening disappears. If you move the component instance, the opening moves too.  |
| Always Face Camera | Makes a component <i>always</i> face you no matter how you orbit around. To make your 2D Face-Me components (that's what they're called) work correctly, rotate your component-to-be so that it's perpendicular to your model's green axis before you choose Make Component.  | Using flat 2D components instead of complex 3D ones is a great way to have lots of people and trees in your model without bogging down your computer.   |
| Shadows Face Sun   | Available only when the Always Face Camera check box is selected. It is selected by default.  | Leave this check box selected unless your Face-Me component meets the ground in two or more separate places, as shown in <a href="#">Figure 5-8</a> .   |

Incorrect shadow



Correct shadow



**Figure 5-8:** Deselect the Shadows Face Sun check box if your component touches the ground in more than one place.



## Introducing the Classifier

If you're wondering what to do with the Type section of the Create Component dialog box, you're not alone. This harmless-looking little drop-down menu is actually a portal into SketchUp's deepest, darkest, nerdiest metadata soul.

Here's the short version: SketchUp Pro 2014 introduced a new tool called the Classifier. If you're using Pro, you can label groups and components (which are now collectively referred to as *objects*) with information about what they are. When you share your model with people who use sophisticated BIM (Building Information Modeling) software, they can more easily integrate it into their workflows. You can also use SketchUp Pro to generate a report (a tabular list) of all the objects in your model, including their associated labels.

*Type* is just another word for label. If there were a classification system (the technical word is *schema*) for fruit, *apple*, *orange*, and *banana* might be three of the types available in that system. SketchUp Pro only comes preloaded with one schema: IFC 2X3. If you want to use a different one (or even create your own), you can, but you'll have to load it first using the Classifications panel of the Model Info dialog box.

I don't go into any detail about the Classifier in this book because it's way too technical and because *how* you use it depends heavily on what you're using SketchUp to do.



Components can cut through only one face at a time. If your model's walls are two faces thick, you have to cut your window and door openings manually.

### ***Editing, exploding, and locking component instances***

Right-clicking a component instance in your modeling window opens a context menu that offers lots of useful choices. Here's what some of them let you do:

- ✓ **Edit Component:** To edit all instances of a component at once, right-click any instance and choose Edit Component from the context menu. The rest of your model fades back, and you see a dashed bounding box around your component. When you're done, click somewhere outside the bounding box to finish editing; your changes have been made in every instance of that component in your model.
- ✓ **Make Unique:** Sometimes you want to make changes to only one or a few of the instances of a component in your model. In this case, select the instance(s) you want to edit, right-click one of them, and choose Make Unique from the context menu. This option turns the instances you selected into a separate component. Now edit any of them; only those instances you made unique reflect your changes.
- ✓ **Explode:** When you explode a component instance, you're effectively turning it back into regular ol' geometry. Explode is a lot like Ungroup in other software programs (in SketchUp, you use Explode to disassemble both components and groups).
- ✓ **Lock:** Locking a group or a component instance means that nobody — including you — can mess with it until it's unlocked. You should use this on parts of your model you don't want to change accidentally. To unlock something, right-click it and choose Unlock.



# Making your own doors and windows

If you're kind of nerdy like I am, nothing beats making your own window and door components. Here's what you need to know (check out the illustration in this sidebar for visual instructions and watch the video at [www.dummies.com/extras/sketchup2014](http://www.dummies.com/extras/sketchup2014)):

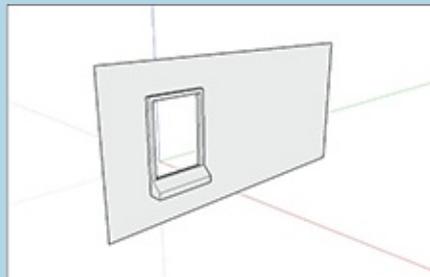
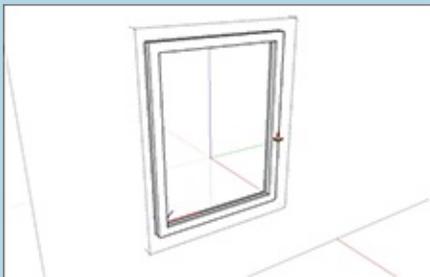
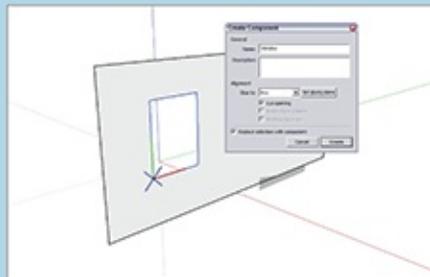
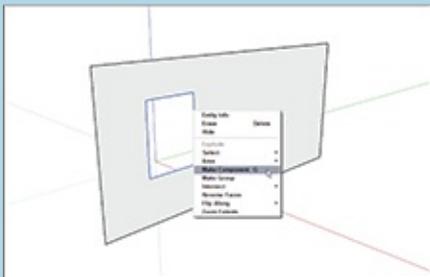
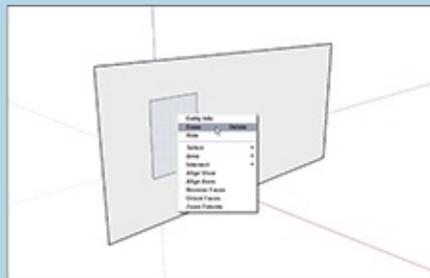
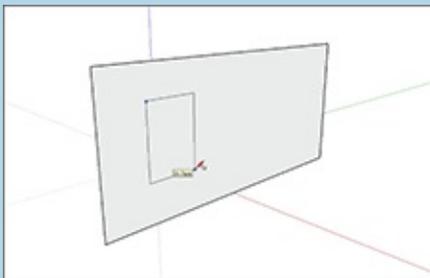
1. Draw a rectangle on a vertical surface, such as a wall.
2. Delete the face you just created to make a hole in your vertical surface.
3. Select all four edges of the hole you just created; then right-click one of the edges and choose **Make Component** from the context menu.
4. Make sure that **Glue to Any**, **Cut Opening**, and **Replace Selection with Component** are all selected; then click the **Create** button to create your new component.
5. With the **Select** tool, double-click your new component (in the modeling window) to edit it.

The rest of your model appears to fade back a bit.

6. Use the modeling tools just like you always would; keep building your door or window how you want.
7. When you're done, click outside your component to stop editing it.

If the opening you create ever closes, one of two things probably happened:

- ✓ **A new surface was created.** Try deleting the offending surface to see whether that fixes things; it usually does.
- ✓ **The cutting boundary was messed up.** The cutting boundary consists of the edges that define the hole your component is cutting. If you take away those edges, SketchUp doesn't know where to cut the hole anymore. Drawing them back in usually sets things straight.



## Discovering Dynamic Components

Once upon a time, the smartest thing a component could do was cut its own hole in a surface. “Wow!” all SketchUp aficionados thought, “Components are *geniuses!*” And so they were — until version 7 came along. With that release, the folks on the SketchUp team introduced an entirely new dimension to modeling: Dynamic Components are components with special powers.

Until version 7, SketchUp components were basically dumb. If you wanted to make a staircase longer, you had to make copies of the steps and place them in the right spot. If you needed to change the color of a car, you had to dig out the Paint Bucket and dive in to the geometry. The problem was that components didn’t know what they were supposed to represent; they were just groupings of faces and edges in the shape of an object.



*Dynamic Components (DCs)* are models that have an idea of what they are; they know what to do when you interact with them. This section (and the corresponding video available via [www.dummies.com/extras/sketchup2014](http://www.dummies.com/extras/sketchup2014)) outlines what DCs represent for SketchUp modelers and how to use them.



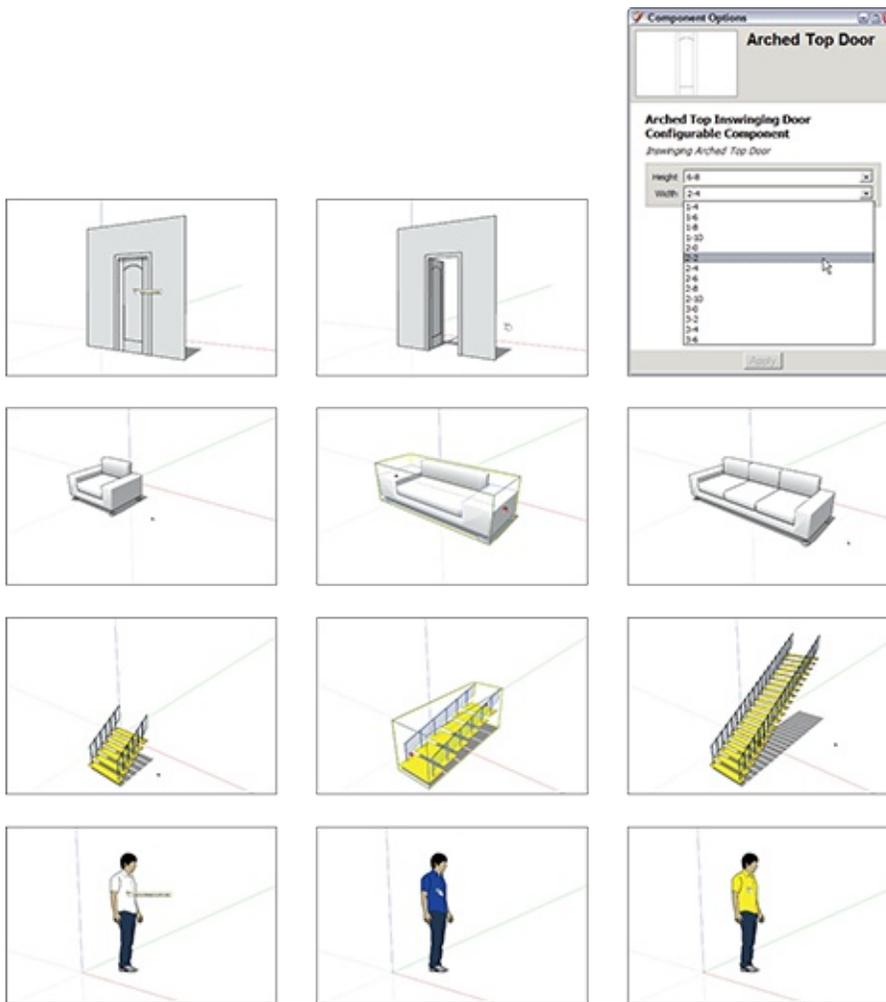
The second edition of this book included no fewer than 15 pages on authoring your own DCs; I removed that content from this edition to squeeze in new stuff about Solid Tools and LayOut, among other things. The good news: Everything I excised is available in Online Chapter [2](#) on this book’s website — see the Introduction for the URL.

## Getting acquainted with DCs

I have a lot to cover, so get ready to dive right in. Here’s what you need to know about Dynamic Components:

- ✓ **DCs are just like regular components but with extra information added.** That extra information makes them easier to deal with than other components because they know how they’re supposed to *behave* when you need to use them. More on that later.
- ✓ **They can do all sorts of things.** Describing what DCs *do* is tricky because they’re all different. The simple (but totally unsatisfying) answer is that they do what they’ve been programmed to do. I think some examples are in order (see Figure [5-9](#)):
  - A dynamic door component may be set up to swing open when you click it with the Interact tool.
  - The same dynamic door may also be configured into different sizes, styles, and finishes by using simple drop-down lists in the Component Options dialog box.
  - A dynamic chair may be scaled into a sofa but without stretching the arms — it would also add cushions as you make it longer.
  - A dynamic stair component may automatically add or remove steps as you use the Scale tool to make it taller or shorter.
  - Sophie (the little person who appears by default when you start a new SketchUp file) is

also dynamic: Click her shirt with the Interact tool to cycle through various colors. You can replace Sophie with another character, too, and his or her shirt also changes color.



**Figure 5-9:** Dynamic Components can do all kinds of things.

- ✓ **Anyone can use DCs.** Both the free and Pro versions of SketchUp can read and use Dynamic Components. The SketchUp team invented them (at least partially) to make SketchUp easier for new modelers to pick up.
- ✓ **You need Pro to make your own DCs.** If you need to build your own Dynamic Components (or modify ones that other folks have made), you need a copy of SketchUp Pro.
- ✓ **DCs are free.** People are adding new DCs to the 3D Warehouse every day. As you can imagine, companies that make things like furniture and building products (windows, kitchen cabinets, and flooring) are really excited about the possibilities that DCs offer. Many of them are in the process of producing DCs of everything in their catalogues and posting them to the 3D Warehouse. That's good news for you; soon you can download and use a configurable model of almost anything you need.
- ✓ **They have a special icon.** When you download SketchUp, you find a few sample DCs in the Components dialog box. They're the ones with the little green dynamic icon next to them (that looks kind of like an arrow).

## Using Dynamic Components

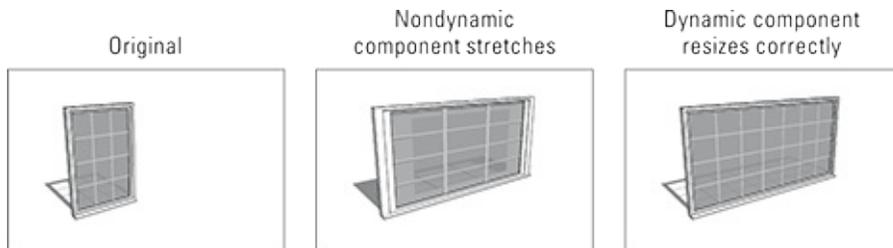
In SketchUp, you can interact with Dynamic Components in three basic ways. Depending on what a particular DC has been set up to do, it may respond to one, two, or all three of the following

interactions.

## Smart scaling

DCs designed to react intelligently to the Scale tool are the closest things to true magic that SketchUp offers. Instead of stretching and getting all distorted when you scale them, the parts that are supposed to change dimensions, do; the other parts don't.

Take a look at Figure 5-10. The center image shows what happens when I scale a nondynamic window component to make it wider. See how the frame stretches? Yuck. The image on the far right shows the dynamic version of the same window. It gets wider when I scale it, but the frame stays the same thickness. It's smart enough to know that only some parts of it should get wider when I scale it.

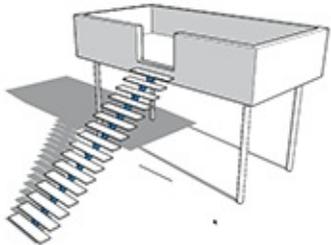
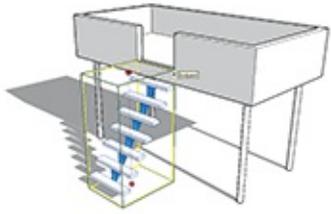
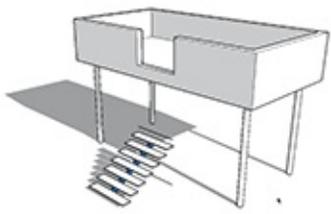


**Figure 5-10:** Scaling a nondynamic window (center) stretches the whole thing. The DC version scales properly.

There's another way that DCs can scale smartly: by adding or subtracting pieces as they get bigger or smaller. Dynamic stairs are a perfect example of this, as shown in Figure 5-11. When I use the Scale tool to make the staircase taller, the staircase adds steps instead of stretching.



You can turn on the Dynamic Components toolbar, which is a quicker way to work with DCs than constantly using the menu bar. Just choose View⇒Toolbars⇒ Dynamic Components, and you're all set.



**Figure 5-11:** When you make the staircase taller, this dynamic staircase adds steps instead of stretching.

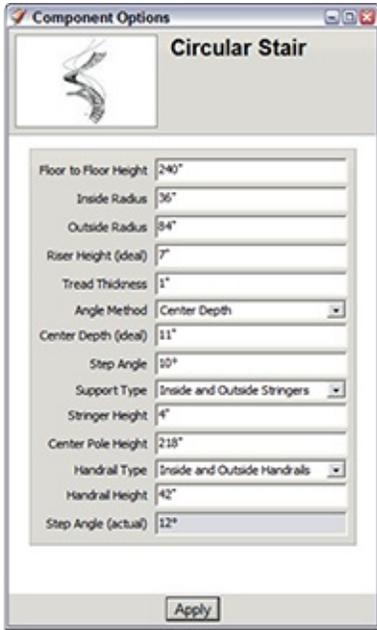
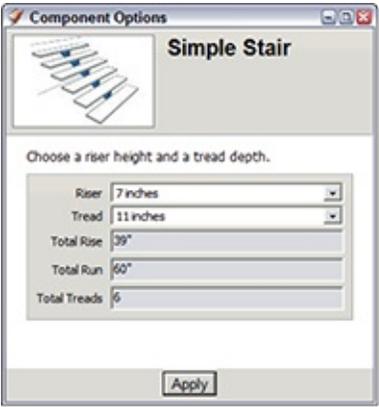
## Component Options

SketchUp 7 added the Component Options dialog box, which is on the Window menu. You can configure DCs that have been hooked up to this dialog box by choosing options from drop-down lists, typing dimensions, and performing other simple tasks. When you change a setting in Component Options, the DC you've selected updates to reflect the change, kind of like modeling by remote control.



The Component Options dialog box looks different for every DC.

The first image in Figure [5-12](#) shows the Component Options dialog box for a simple, straight staircase I built. I set it up so you can choose a riser height and a tread depth from preprogrammed lists. The dialog box also displays the total height (*rise*), total length (*run*), and number of steps in the staircase as it currently appears.



**Figure 5-12:** The Component Options dialog box looks different for every Dynamic Component.

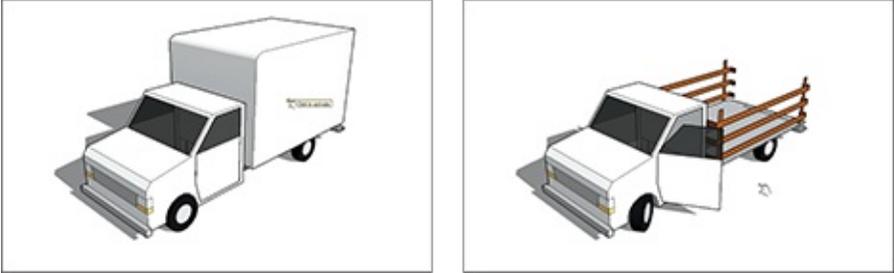
The second image in Figure 5-12 shows the Component Options for a circular-stair DC. I wanted to provide a lot of configuration options, so it looks a lot different. The dialog box lets you enter a size, structure type, and other information and then redraws the staircase based on your specifications.

**The Interact tool**

Activate the Interact tool by choosing it from the Tools menu. Using this tool couldn't be simpler: When a DC is set up to react to the Interact tool, it does stuff when you click it. Its actions depend on what you've programmed it to do.

Check out the truck in Figure 5-13; it's been designed to react to the Interact tool in a few ways:

- ✓ Clicking the back of the truck cycles through the following options: box, flatbed, or flatbed with rails.
- ✓ Clicking the front wheels turns them from side to side.
- ✓ Clicking the doors makes them open and close.



**Figure 5-13:** Clicking stuff with the Interact tool makes things happen.



When you're hovering over a DC that's been connected to the Interact tool, your cursor (it was originally called the Magic Finger) glows a little yellow at the end.

**Poking around to see what happens**

You can't know which interactions you can use with any particular DC just by looking at it. If you know you're dealing with a DC, the best way to figure out what it does is to experiment:

- ✓ Select it and open Component Options to see whether anything's there.
- ✓ Hover over it with the Interact tool to see whether a glow appears at the end of your cursor.
- ✓ Click it with the Select tool to show its scale *grips* (little green boxes). If any show up, grab one and scale to see what happens. If none show up, your DC can't be scaled with the Scale tool.



Groups can be dynamic, too. Deep down in the basement of SketchUp's programming, groups and components are pretty much the same thing — groups are just components that behave differently. This means that a group can be assigned dynamic capabilities. What does this matter to you? Not much, but I thought I'd point it out. It's good to know, especially if you plan to build your own DCs with SketchUp Pro. You can find more details about creating DCs on this book's companion website. DC-creation is tricky, and the extra room that cyberspace affords means more images, *color* images, and direct links to working examples in the 3D Warehouse. If the site isn't already bookmarked in your browser, check the Introduction for the address of this book's companion website.

## ***Taking Advantage of Components to Build Better Models***

A huge amount of the stuff in the galaxy is made of some kind of *repeated element*. In the case of bilaterally symmetrical objects (like most furniture), that element is a mirrored half; for things like staircases, it's a step or tread. The *whole* is composed of two or more instances of a single *part*. This makes modeling a heck of a lot easier because you don't often have to model things in their entirety — especially if you use components.

In the following sections, I describe two methods for modeling with components. The first method involves symmetrical objects, and it covers about 50 percent of the things you might ever want to model. The second technique applies to things like stairs and fences, which are both perfect examples of why components were invented in the first place.

### ***Modeling symmetrically: Good news for lazy people***

And smart people, I suppose. First off, take a hard look at the shape of the things you may want to model. I want you to think about all the objects in the universe. I'll wait a couple of minutes while you do that. Done so soon? Good. Everything in the world (as I'm sure you realized) can be categorized as either of the following formal types:

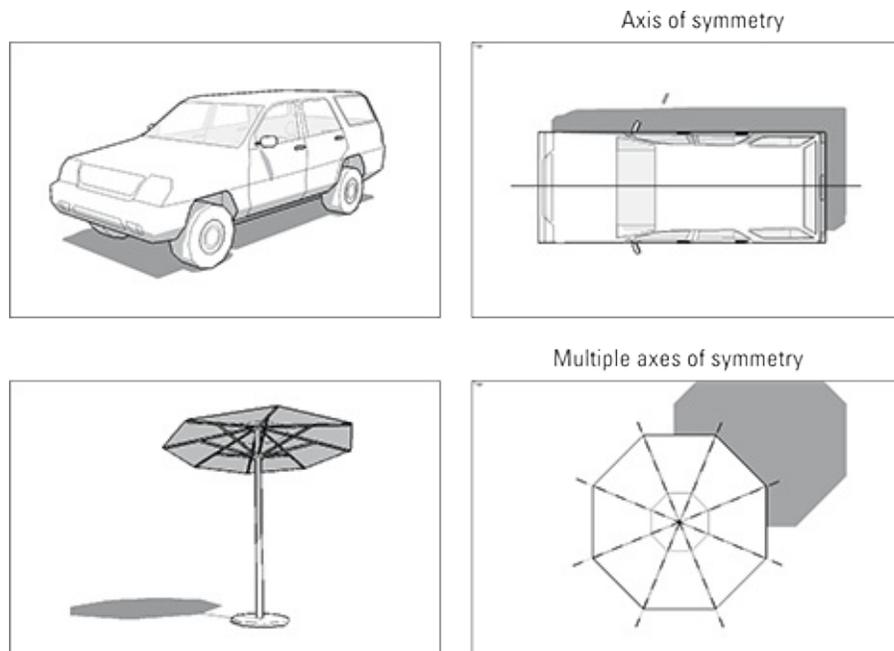
- ✓ **Symmetrical:** Objects that exhibit *bilateral symmetry* are made of mirrored halves. You're (more or less) bilaterally symmetrical, and so is your car. Another kind of symmetry is *radial symmetry*. Radially symmetrical objects can be (conceptually, anyway) cut into identical wedges that all radiate from a central axis. Starfish are good examples of this, as are umbrellas

and apple pies. If you were going to build a model of something that exhibits some form of symmetry, building one part and making copies would be a smarter way to do it.

- ✔ **Asymmetrical:** Some things — puddles, oak trees, and many houses — aren't symmetrical. There's no real trick to making these things; you just have to get some coffee, settle in, and get to work.

You can take advantage of both bilateral and radial symmetry with SketchUp components. To do so, assemble those components as follows, depending on what type of symmetry your object has (also take a look at Figure 5-14):

- ✔ **Bilateral symmetry:** To make a model of something that's bilaterally symmetrical, build half, make it into a component, and flip over a copy.
- ✔ **Radial symmetry:** You can use components to model radially symmetric things such as car wheels and turrets by building a single wedge and rotating a bunch of copies around a central point.



**Figure 5-14:** Bilateral symmetry (top) and radial symmetry (bottom) make your SketchUp life a lot easier.

### ***Working smarter by building only half***

Bilaterally symmetrical forms are everywhere. Most animals you can name, the majority of the furniture in your house, and your personal helicopter —they can all be modeled by building half, creating a component, and flipping over a copy.

Follow these steps to get the general idea of how to build a bilaterally symmetrical model in SketchUp (see Figure 5-15):

#### **1. Make a simple box.**

You can do this however you want, but I think the easiest way is to draw a rectangle and push/pull it into 3D.

#### **2. Draw a diagonal edge on the corner of your box.**

The point of this step is to mark one side of your box so that when you flip it over, you don't get confused about which side is which.

### 3. Turn your box into a component.

See "[Creating your own components](#)," earlier in this chapter, if you wonder how to do this.

### 4. Make a copy of your new component instance.

The last part of Chapter 2 has information about moving and copying objects in SketchUp, but here's a simple version:

- a. Choose the Move tool and then press the Ctrl key (Option on a Mac) to toggle from Move to Copy mode.

A little plus sign (+) appears next to your cursor.

- b. Click your component instance, move your copy beside the original, and click again to drop it.

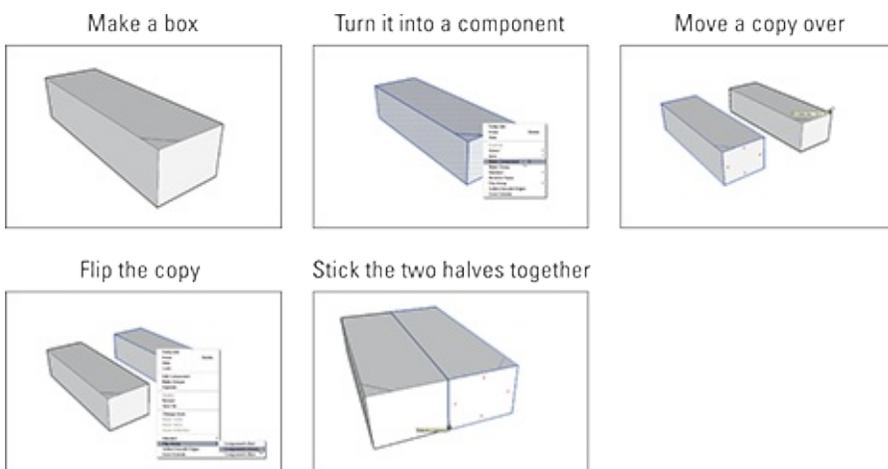
Make sure that you move in either the red or the green direction; it makes things easier in the next step.

### 5. Flip over the copy.

To do this, right-click the copy and choose Flip Along from the context menu. If you moved your copy in the red direction in the preceding step, choose Flip Along⇒Component's Red. Choose Component's Green if you moved in the green direction.

### 6. Stick the two halves back together.

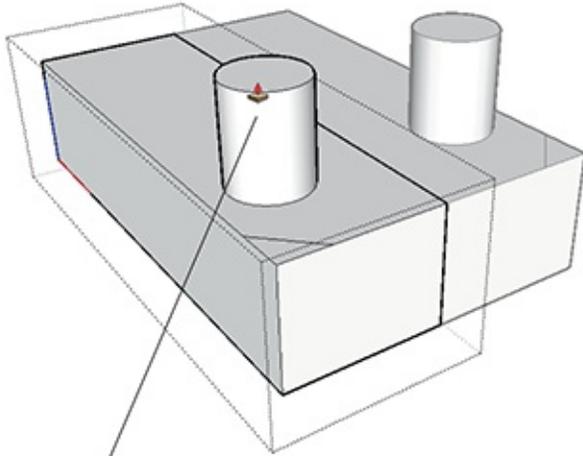
Using the Move tool (this time without Copy toggled on), pick up your copy *from the corner* and move it over, dropping it *on the corresponding corner* of the original. Take a look at the last image in Figure 5-15 to see what I mean. Doing this precisely is important if you want your model to look right.



**Figure 5-15:** Getting set up to build a bilaterally symmetrical model.

Now you're set up to start building symmetrically. If you want, you can do a test to make sure things went smoothly. (See Figure 5-16.) Follow these steps:

1. **With the Select tool, double-click one of the halves of your model to edit it.**
2. **Draw a circle on the top surface and push/pull it into a cylinder.**



Whatever you do on this side should happen on the other side, too

**Figure 5-16:** Test your setup to make sure that everything works.

If the same thing happens on the other side, you're good to go. If the same thing *doesn't* happen on the other side, it's possible that:

- ✓ **You're not really editing one of your component instances.** If you aren't, you're drawing *on top of* your component instead of *in* it. You know you're in edit mode if the rest of your model looks grayed out.
- ✓ **You never made a component in the first place.** If your halves don't have blue boxes around them when you select them, they're not component instances. Start a new file and try again, paying particular attention to Step 3 in the previous steps.



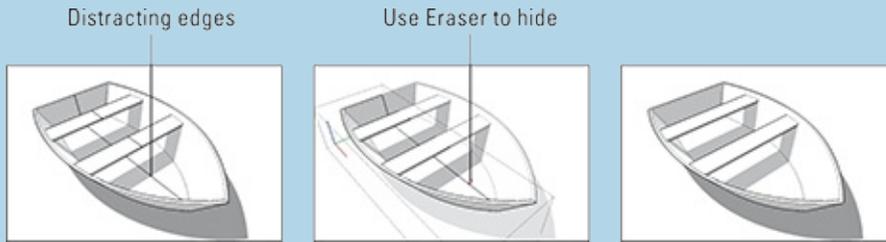
## Making two halves look like one whole

Looking carefully at the little boat in the figure that follows, notice how the edges in the middle clearly show that it's made out of two halves? If I were to erase those edges, my whole model would disappear because those edges are defining faces, and without edges, faces can't exist.

Instead of erasing those unwanted edges, I can hide them by using the Eraser while pressing the Shift key. See the second and third images of the boat? When I hold down Shift as I drag over the edges I want to hide with the Eraser, they disappear.

Keep in mind these two important details about hidden edges:

- ✔ **Hidden edges aren't gone forever.** Actually, this applies to any hidden geometry in your model. To see what's hidden, choose View⇒Hidden Geometry. To hide it again, just choose the same thing.
- ✔ **To edit hidden edges, you have to make them visible.** If you need to make changes to your model that involve edges you've already hidden, you can either view your hidden geometry (see the preceding point) or unhide them altogether. Just show your hidden geometry, select the edges you want to unhide, and choose Edit⇒Unhide⇒Selected.



## The coolest things since radially sliced bread

You can model objects that exhibit radial symmetry just as easily as those with bilateral symmetry; you just start slightly differently. The only thing you have to decide before you start is how many wedges — how many identical parts you need to make the whole object.

To model something with radial symmetry, start with one wedge, make it into a component, and then rotate copies around the center. Follow these steps to get the hang of it:

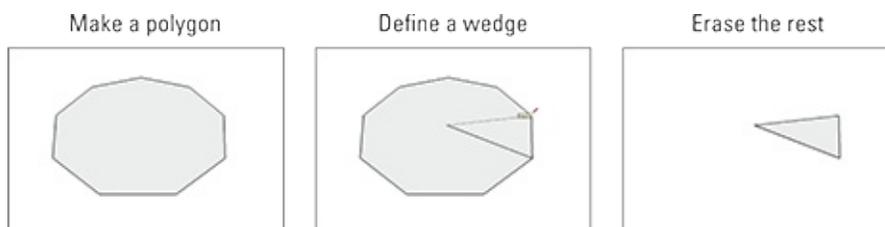
1. **Draw a polygon with as many sides as the number of segments you need for the object you're modeling.**

Here's the easiest way to draw a polygon in SketchUp, as shown in Figure 5-17:

- a. Choose Tools⇒Polygon to select the Polygon tool.
- b. Click once to establish the center (I like to do this on the axis origin), move your cursor, and then click again to establish the radius.

Don't worry about being accurate right now.

- c. Before you do anything else, type the number of sides you want your polygon to have and press Enter.



**Figure 5-17:** Draw a polygon to start, draw two edges to create a wedge, and erase the rest of your polygon.

2. **Draw edges from the center of your polygon to two adjacent vertices (endpoints) on the perimeter, creating a wedge.**

To find the center of a polygon (or a circle), hover your cursor over the outline for a couple

seconds and move the cursor toward the middle; a center inference point appears.

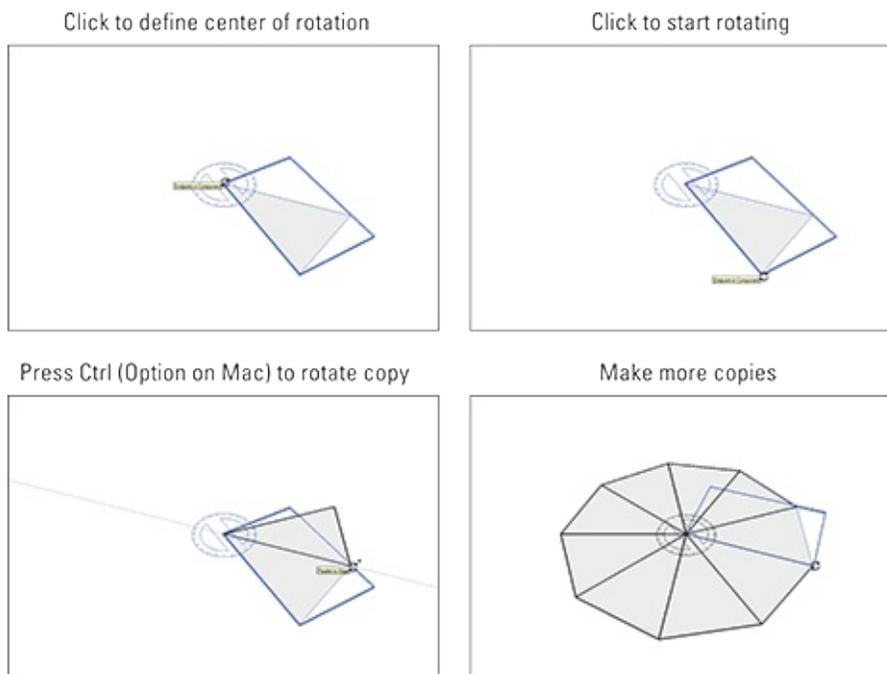
### 3. Erase the rest of your polygon, leaving only the wedge.

The first three steps in this list are all about making sure that your wedge is the correct angle; if it isn't, this technique won't work.

### 4. Turn your wedge into a component.

Check out "[Creating your own components](#)," earlier in this chapter, if you're unsure of how to do this.

### 5. Make copies of your wedge component instance with the Rotate tool. (See [Figure 5-18](#).)



**Figure 5-18:** Use the Rotate tool to make copies of your wedge component instance.

As with the Move tool, you can use the Rotate tool to make copies. You can even make an *array* (more than one copy at a time). Here's how:

- Select your wedge's edges (sorry — I just wanted to say that) and select the face, too.*
- Choose Tools⇒Rotate to select the Rotate tool.*
- Press the Ctrl key (Option on a Mac) to tell SketchUp you want to make a copy.*

A plus sign (+) appears next to your cursor.

- Click the pointy end of your wedge to set your center of rotation.*
- Click one of the opposite corners of your wedge to set your rotation start point.*
- Click the other corner to make a rotated copy of your wedge.*
- Type the number of additional wedges you want, followed by the letter x, and then press Enter.*

## 6. (Optional) Test your setup.

Follow the steps associated with Figure 5-16 to test whether updates to a single component in your new object updates all instances of the component.



Hiding the edges in your component instances makes your finished model look a whole lot better. Take a look at the sidebar “[Making two halves look like one whole](#),” earlier in this chapter, to read how.

### *Modeling with repeated elements*

A staircase is a perfect example of an object that’s composed of several identical elements. If, when you hear the phrase “several identical elements,” a big, flashing neon sign that screams “COMPONENTS!” doesn’t appear in your head, you’re not using SketchUp enough. On the other hand, maybe there’s something wrong with *me*...

In the following example, I kill two birds with one stone: I use the example to A) demonstrate how you might use components to model more efficiently, and B) show readers of Chapter 4 the smartest way to build a set of stairs.

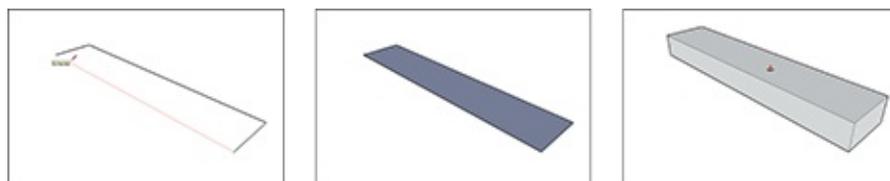
The Treads Are Components method involves (you guessed it) making each *tread* (step) in your staircase into an instance of the same component. Basically, you build one simple tread that’s the right depth, make it into a component, and copy a bunch of instances into a full flight of stairs. Because every step is linked, anything you do to one automatically happens to them all. If you don’t know the first thing about components, now would be a terrific time to start from the beginning of this chapter.



Go through these steps to build a staircase using the Treads Are Components method (and watch the video at [www.dummies.com/extras/sketchup2014](http://www.dummies.com/extras/sketchup2014) for additional help):

#### 1. Model a single step, including the tread and the riser.

You can make this very simple at this stage if you want to; all that matters is that the tread depth and the riser height are correct. You can fiddle with everything else later. Figure 5-19 shows a simple example of this.

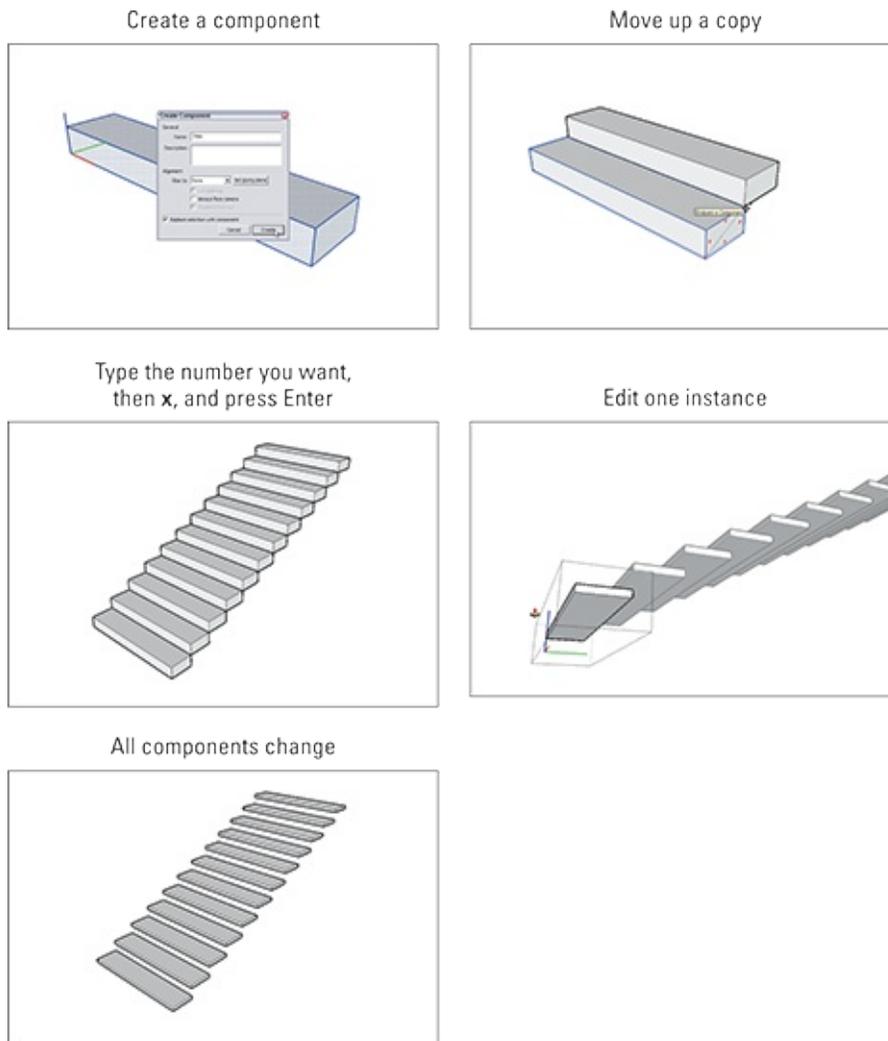


**Figure 5-19:** Model a single step, making sure that the depth and height are accurate.

#### 2. Make a component out of the step you just built.

Take a look at “[Creating your own components](#),” earlier in this chapter, if you need help.

3. **Move a copy of your step into position, above the first one, as shown in Figure 5-20.**



**Figure 5-20:** Make your step into a component instance, move a copy into position above the original, and then create an array.

4. **Type the total number of steps you want, type an x, and then press Enter.**

You're creating a *linear array*, meaning that you're making several copies at regular intervals, in the same direction you moved the first one. Typing **12x** generates 12 the same distance apart as the first step and its copy. The last image in Figure 5-20 shows what I mean.

5. **With the Select tool, double-click any one of your steps to edit all instances of your component.**

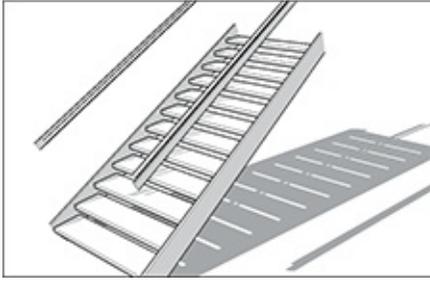
Everything besides the component instance you're editing fades out a little.

6. **Go nuts.**

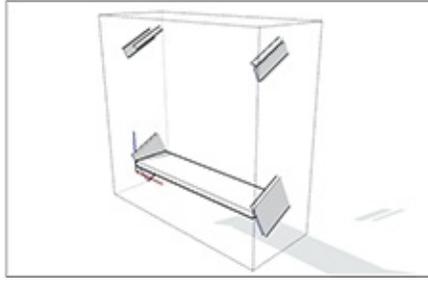
This really is the fun part. Having your staircase made up of multiple component instances means that you have all the flexibility to make drastic changes to the whole thing without ever having to repeat yourself. Add a *nosing* (a bump at the leading edge of each tread), a *stringer* (a diagonal piece of structure that supports all your steps), or even a handrail by getting creative with how you modify a single component instance. Figure 5-21 shows some of what you can do. The color insert in this book shows the Building a Circular Stair with Components method

applied to building a spiral stair.

Series of component instances



A single component instance



**Figure 5-21:** A flight of stairs with side stringers and a handrail. On the right, a single component instance.

## Chapter 6

# Going Beyond Buildings

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### *In This Chapter*

- ▶ Extruding around circles and along paths with Follow Me
  - ▶ Mastering the Scale tool
  - ▶ Creating 3D terrain with the Sandbox tools
  - ▶ Using the Solid Tools for additive and subtractive modeling
- 

Here's something you already know: There's more to life than modeling buildings. Even though SketchUp is *really good* at letting you make models of built structures, you can use it to build just about anything you can think of — all it takes is time, ingenuity, and the ability to take a step back and break down things into their basic parts. SketchUp provides fantastic tools for creating forms that aren't the least bit boxy, but they're not as obvious as Push/Pull and Rectangle, so most people never find them. This chapter is devoted to helping you discover SketchUp's "rounder" side.

Another reason for pushing past basic boxes? Many people see 3D printing (sound of futuristic music and warp drives engaging) as the next vanguard of human innovation, and 3D modeling — like you do with SketchUp — is half of that equation. If you're going to be printing your own bike helmets and vacuum cleaners in the next decade, you'd better get good at modeling organic shapes.

In this chapter, I present tools, techniques, and other tips for creating forms that are distinctly unbuilding-like — my hope is that you'll use them to push the limits of what you think SketchUp can do.

## *Extruding with Purpose: Follow Me*

Follow Me is probably the best example of a powerful SketchUp tool with kind of an underwhelming name. When the software designers were trying to figure out what to call their new baby, the problem that they faced was this: This tool does what other 3D modeling programs dedicate two or three other tools to doing. The designers chose an unconventional name because Follow Me is a wholly unconventional tool.

In the following sections, I talk about how to use Follow Me to create a number of different types of shapes; examples of these are shown in Figure [6-1](#) and are as follows:

- ✓ **Bottles, spindles, and spheres:** These are all examples of *lathed* forms. You can create these by spinning a 2D *profile* (shape) around a central axis to create a 3D model.
- ✓ **Pipes, gutters, and moldings:** If you look closely, all three of these things are basically created by extruding a 2D face along a 3D path; the result is a complex 3D form.
- ✓ **Chamfers, fillets, and dados:** Without explaining what all these things are (that's what Internet search engines are for), know this: You can use Follow Me to *cut away* profiles, too.



**Figure 6-1:** Follow Me lets you create all kinds of different shapes.

## Using Follow Me

At its core, Follow Me lets you create forms that are extrusions. It's a little bit like Push/Pull, except that it doesn't just work in one direction. You tell Follow Me to follow a path, and it extrudes a face all along that path. So, you need three things to use Follow Me:

- ✓ **A path:** In SketchUp, you can use any edge, or series of edges, as a path. All you have to do is make sure that they're drawn before you use Follow Me.
- ✓ **A face:** Just like with Push/Pull, Follow Me needs a face to extrude. You can use any face in your model, but it needs to be created before you start using Follow Me.
- ✓ **Undo:** Imagining what a 2D face will look like as a 3D shape isn't easy. Getting a Follow Me operation right usually takes a couple tries. That's what Undo is for, after all.

Follow these steps to use Follow Me; Figure [6-2](#) shows a basic example of how it works:

**1. Draw a face to use as an extrusion profile.**

In this example, you create a pipe, so the extrusion profile is a circular face.

**2. Draw an edge (or edges) to use as an extrusion path.**

Although the edge (or edges) is touching the face in this case, it doesn't have to for Follow Me to work.

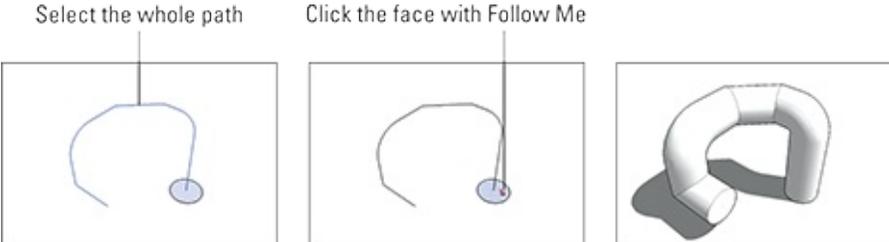
**3. Select the complete extrusion path you want to use.**

Check out the section on making selections in Chapter [2](#) for pointers on using the Select tool to best advantage.

**4. Activate the Follow Me tool by choosing Tools⇒Follow Me.**

**5. Click the face you want to extrude.**

Magic! Your face (extrusion profile) is extruded along the path you chose in Step 3, creating a 3D form (in this case, a section of pipe).



**Figure 6-2:** Using Follow Me to create a simple extruded shape.



If you want to use Follow Me all the way around the perimeter of a face, you don't need to spend time selecting all the individual edges. Just select the face and then use Follow Me; the tool automatically runs all the way around any selected face.

You can use Follow Me another way, too: Instead of preselecting a path (as in Step 3 of the preceding list), you can click any face with Follow Me and attempt to drag it along the edges in your model. Although this works on simple things, I find that preselecting a path works a lot better — it's really the only option for using Follow Me in a predictable way.

## ***Making lathed forms like spheres and bottles***

And nuclear power plant chimneys. A surprising number of things can be modeled by using Follow Me to perform a lathe operation. A *lathe* is a tool that carpenters (and machinists) use to spin a block of raw material while they carve into it — that's how baseball bats are made (the good ones, anyway).

A simple example of a lathed object is a sphere. Here's how you might make one with Follow Me:

- 1. Draw a circle on the ground.**
- 2. Rotate a copy of your circle up by 90 degrees, as shown in [Figure 6-3](#).**

If you're wondering how to do this, follow these steps:

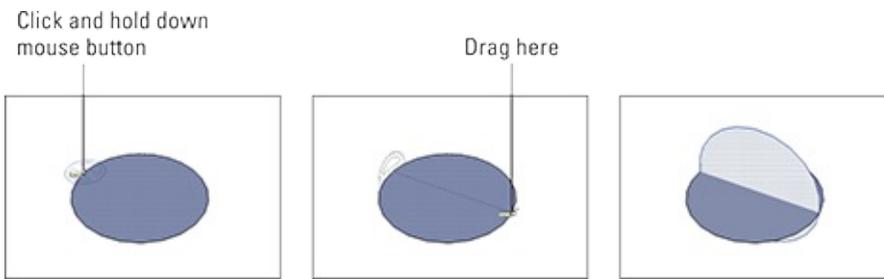
- Select the face of your circle with the Select tool and then choose Tools⇒Rotate to activate the Rotate tool.*
- Press the Ctrl key (Option on a Mac) to tell SketchUp you want to make a copy.*
- Click a green endpoint inference along the edge of your circle and hold down your mouse button to drag. Don't let go just yet.*
- Still dragging, move your cursor over to the endpoint on the exact opposite side of your circle; then release your mouse button.*

Your *axis of rotation* is a line right through the center of your circle.

- Click anywhere on the edge of your circle and then move your mouse over a little bit.*
- Type **90** and press Enter.*



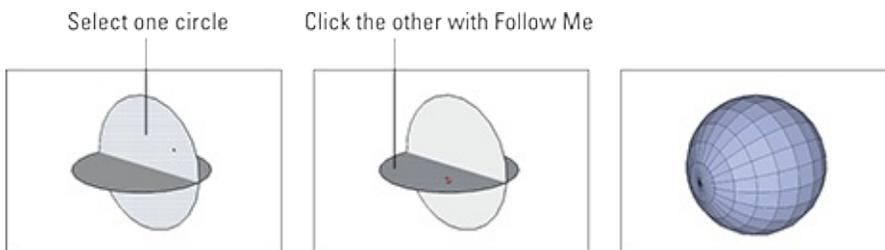
You can read all about the Rotate tool in [Chapter 2](#).



**Figure 6-3:** Using the Rotate tool to make a rotated copy of a circle.

3. **Make sure that one of your circles is selected.**
4. **With the Follow Me tool (choose Tools⇒Follow Me), click the circle that’s not selected, as shown in Figure 6-4.**

Now you have a sphere. The Follow Me tool lathed your circular face around the path you selected — the other circle.



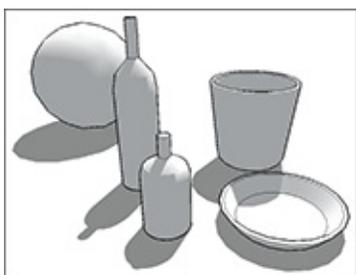
**Figure 6-4:** Clicking one circle with Follow Me while the other one is selected produces a sphere.



If you really need a sphere, the easiest way to get one is in the Components dialog box. Type **sphere** into the 3D Warehouse search box, then press Enter on your keyboard. Something useful should appear.

If you want to make your curved surfaces look *smooth* (hiding the edges between them), check out the sidebar “[Smoothing those unsightly edges](#),” later in this chapter.

Under typical circumstances, you only have to model half a profile to use Follow Me to make it three-dimensional. Figure 6-5 shows a few examples of 3D objects.



**Figure 6-5:** A few examples of lathed objects created with Follow Me.

## ***Creating extruded shapes like gutters and handrails***

A lot of the time, you want to use Follow Me to create geometry (edges and faces) that’s attached to another part of your model. An example of this may be modeling a gutter that runs all the way around the roof of your house. In this case, you already have the path along which you want to extrude a profile (the edge of the roof).

When you use Follow Me to extrude a face along a path that consists of edges that already exist as part of your model, *always* do two things:



✓ **Before using Follow Me, make the rest of your model a separate group.** Take my word for it — Follow Me can sometimes mess up your model, so keep the geometry Follow Me creates separate, just in case.



✓ **Make a copy of your extrusion path outside your group.** There's a consequence to working with Follow Me on top of a group: The edge (or edges) you want to use as an extrusion path aren't available because you can't use Follow Me with a path that's in a separate group or component.

What to do? You need to make a copy of the path *outside* the group and then use the *copy* to do the Follow Me operation. Here's the best way to make a copy of the path:

- a. *With the Select tool, double-click your group to edit it.*
- b. *Select the path you want to use for Follow Me and then choose Edit⇒Copy.*
- c. *Exit (stop editing) your group by clicking somewhere else in your modeling window.*
- d. *Choose Edit⇒Paste in Place.*

You have a copy of the path you want to use, and it's outside your group.



Take a look at the material on this book's website at [www.dummies.com/extras/sketchup2014](http://www.dummies.com/extras/sketchup2014). You find the Weld Ruby script (don't worry — I explain what that means) that's super-useful for creating extrusion paths for Follow Me.

When you use an existing edge (or series of edges) as an extrusion path, the hard part is getting your profile in the right place. You can proceed in two ways; which one you choose depends on what you need to model:

- ✓ **Draw the profile in place.** Do this only if the extrusion path is parallel to one of the colored drawing axes.
- ✓ **Draw the profile on the ground and then move it into position.** If your extrusion path doesn't start out parallel to a colored drawing axis, you should probably draw your profile somewhere else and move it into place later.

## Why your computer is so slow

When you use Follow Me with an extrusion profile that's a circle or an arc, you create a piece of 3D geometry that's very

big. By *big*, I mean that it has lots of faces, and faces are what slow down your computer. Without going into detail about how SketchUp works (I don't really know that anyway), keep this in mind: The more faces you have in your model, the worse your computer's performance will be. At a certain point, you'll stop being able to orbit, your scenes (which I talk about in Chapter [11](#)) will stutter, and you'll be tempted to do something terrible out of frustration.

The first pipe in the figure that follows has been extruded using Follow Me; it was made with a 24-sided circle as an extrusion profile, and it has 338 faces. Hidden Geometry is turned on (in the View menu) so that you can see how many faces you have.

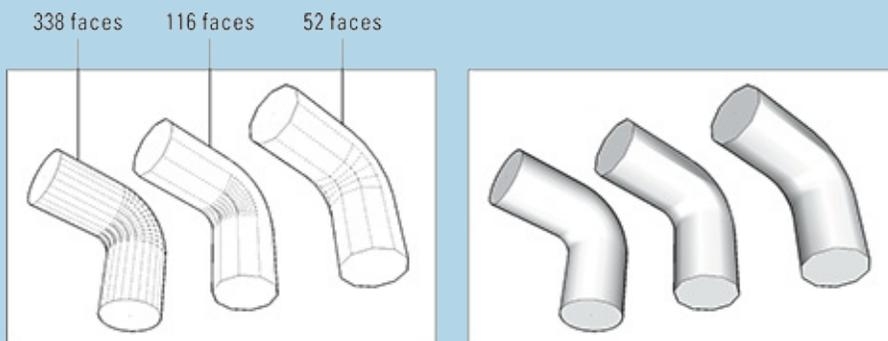
The second pipe uses a 10-sided circle as an extrusion profile. As a result, it has only 116 faces. What an improvement!

The third pipe also uses a 10-sided circle as an extrusion profile, but the arc in its extrusion path is made up of only 4 segments, instead of the usual 12. This pipe has a total of 52 faces. Even better.

The second image in the figure shows all three pipes with Hidden Geometry turned off. Is the difference in detail worth the exponential increase in the number of faces? Most of the time, the answer is no.

To change the number of sides in a circle or an arc, just before or just after you create it, follow these steps:

1. **Type the number of sides you want to have.**
2. **Type an s to tell SketchUp that you mean "sides."**
3. **Press Enter.**



## ***Drawing your profile in place***

Consider that you have a model of a house. You want to use Follow Me to add a gutter that goes all the way around the perimeter of the roof. You decide to draw the profile in place (right on the roof itself) because the edges of the roof are drawn parallel to the colored drawing axes. This means that you'll have an easier time using the Line tool to draw in midair.

The trick to drawing an extrusion profile that isn't on the ground is to start by drawing a rectangular face. You then draw the profile on the face and erase the rest of the rectangle. Figure [6-6](#) shows how you'd draw the profile of a gutter directly on the corner of a roof; the steps that follow explain the same things in words:

1. **Zoom in on what you're doing.**

I can't tell you how many people try to work without filling their modeling windows with the subject at hand. Not doing so is like trying to do a crossword puzzle while looking the wrong way through a pair of binoculars. Get close — SketchUp models don't bite!

2. **Using the Line tool, draw a rectangle whose face is perpendicular to the edge you want to use for Follow Me.**

Pay careful attention to SketchUp's inference engine; watch the colors to make sure that you're drawing in the right direction.

3. **Use the Line tool (and SketchUp's other drawing tools) to draw your profile directly on the rectangle you just drew.**



The important thing here is to make sure that your extrusion profile is a single face; if it's not, Follow Me won't work the way you want it to.

4. **Erase the rest of your rectangle, leaving only the profile.**

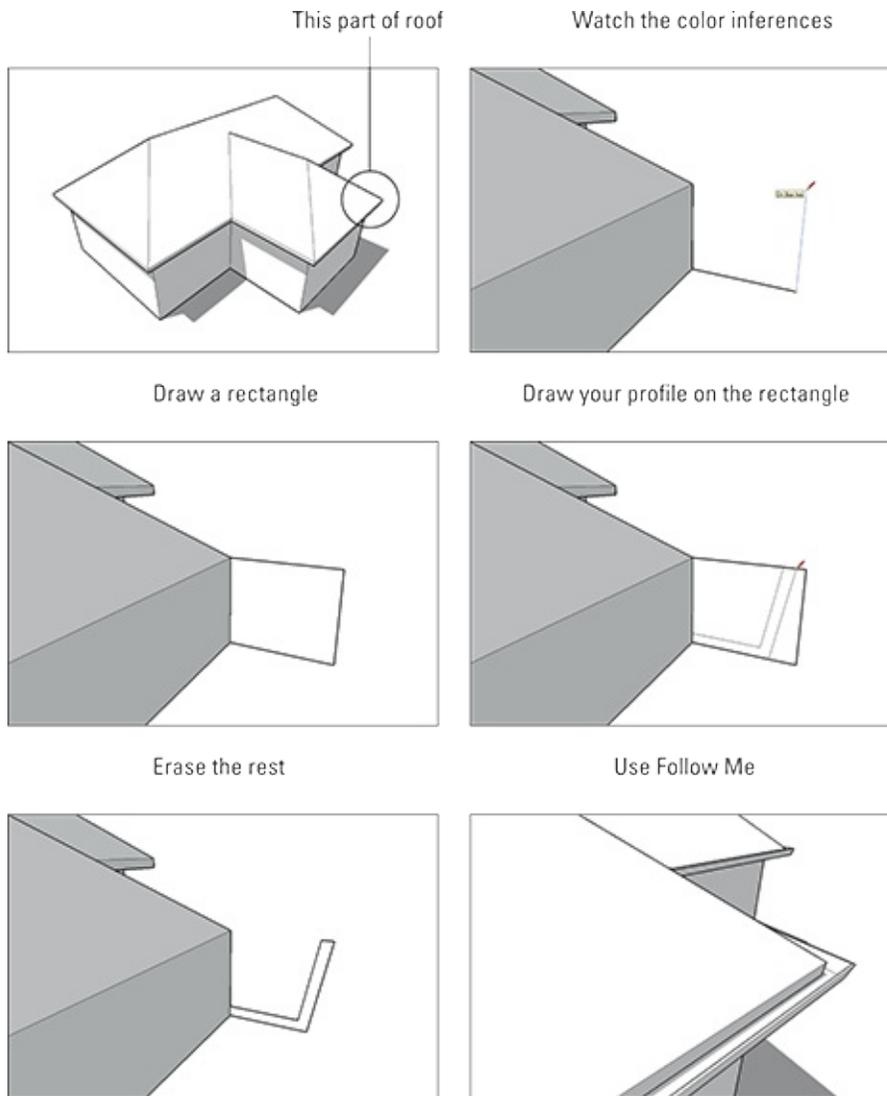
### ***Drawing your profile somewhere else***

The awful thing about handrails is that they're almost always at funny angles, not parallel to a colored axis. When drawing your extrusion profile in place isn't convenient, draw it on the ground and move it into position after.

Here's the trick: Draw a *tail* — a short edge — perpendicular to your extrusion profile. You can use this tail to help line up your profile with the edge you want to use as an extrusion path for Follow Me. The following steps and [Figure 6-7](#) describe how you'd draw and position a profile for a handrail:

1. **Draw your extrusion profile flat on the ground.**
2. **Draw a short edge perpendicular to the face you just drew.**

This tail should come from the point where you want your profile to attach to the extrusion path.



**Figure 6-6:** Drawing an extrusion profile in place by starting with a rectangle.

**3. Make your profile and its tail into a group.**

This makes it easier to move and rotate around all at once. See Chapter [5](#) for information on creating and using groups.

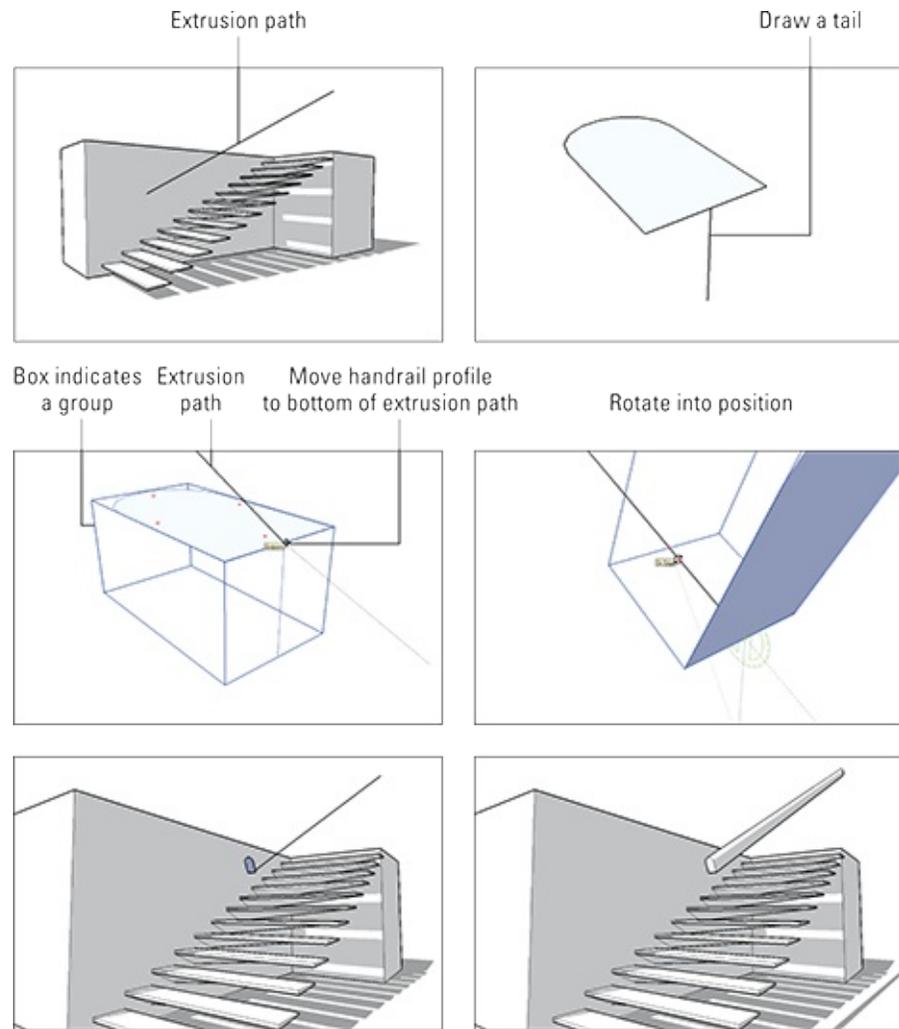
**4. Using the Move tool, place your profile at the end of the extrusion path.**

To make sure that you position your profile accurately, pick it up by clicking the point where the tail meets the face and then drop it by clicking the end of the extrusion path.

**5. With the Rotate tool, rotate your profile into position.**

Here's where you need to use a bit of skill. (See Chapter [2](#) for guidance.) The Rotate tool is easy to use — after you get the hang of it.

**6. Right-click the group you made in Step 3 and choose Explode; delete your tail.**



**Figure 6-7:** Draw a short tail on your extrusion profile to help you position it with the Move and Rotate tools.

## Subtracting from a model with Follow Me

What if you want to model a bar of soap? Or a sofa cushion? Or anything that doesn't have a sharp edge? The best way to round off edges in SketchUp is to use Follow Me. In addition to using Follow Me to *add* to your model, you can also *subtract* from your model.

Here's how it works: If you draw an extrusion profile on the end face of a longish form, you can use Follow Me to remove a strip of material along whatever path you specify. Figure 6-8 demonstrates the concept on the top of a box.

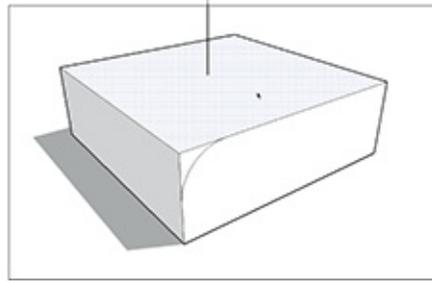
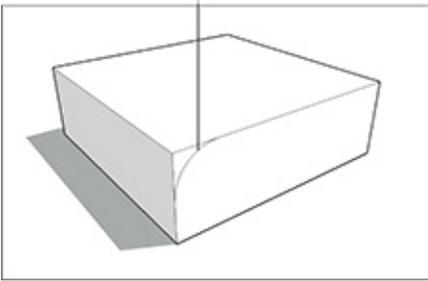


If the extrusion path you want to use for a Follow Me operation consists of the entire perimeter of a face (as is the case in Figure 6-8), you can save time by just selecting the face instead of all the edges that define it.

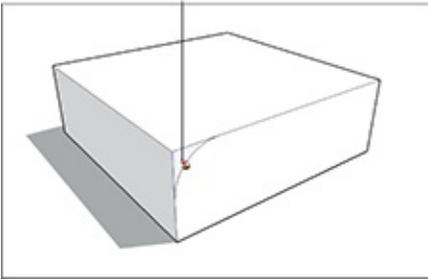
But what if you want to create a corner that's rounded in *both* directions, as so many corners are? That one's a little trickier to do in SketchUp, but because it's such a common problem, I thought I'd devote a few hundred words to explaining how to do it. The basic technique involves using Follow Me on a corner you've already rounded with the Push/Pull tool. After you have a corner that's rounded with an arc of the correct radius, you can use copies (or component instances, if you're clever) of that corner several times, wherever you need them. Although I wouldn't call this solution elegant, it works when you need it to.

Draw an arc

Select a path



Click the face with Follow Me



**Figure 6-8:** Creating a rounded edge with Follow Me.



There's a beautiful RoundCorner (by Fredo6) Ruby script that mostly automates the process I'm about to describe. If you're so inclined, check out its description on this book's website at [www.dummies.com/extras/sketchup2014](http://www.dummies.com/extras/sketchup2014).

Figure 6-9 gives a step-by-step, visual account of the process, while I explain it in words, as follows:

### 1. Draw a box.

The box should be big enough for the round you want to apply.

### 2. With the Arc tool, draw an arc on the corner of the box.

When you're drawing an arc on a corner, keep an eye out for the inferences that help you draw properly:

- After clicking to place one endpoint of your arc, as you cut across the corner, the point at which your line turns magenta is where your endpoints are *equidistant* (the same distance) from the corner across which you're cutting.
- After clicking to place your second endpoint, you see a point at which the arc you're drawing turns magenta — this means your arc is *tangent to* (continuous with) both edges it's connected to. You want this to be the case, so you should click when you see magenta.



I strongly recommend reducing the number of sides on your arc before you start rounding away. See the sidebar "[Why your computer is so slow](#)," earlier in this chapter, to find

out why.

3. **Push/pull down the new face to round off the corner.**
4. **Draw another *identical* arc on one of the corners directly adjacent to the corner you just rounded.**

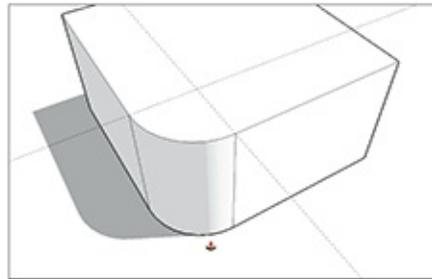
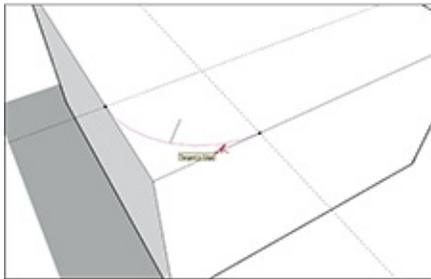
This is where you refer to Figure 6-9. Pictures are better than words when explaining things like which corners are adjacent to which.

5. **Select the edges shown in Figure 6-9.**
6. **Choose Tools⇒Follow Me.**
7. **Click the arc corner face to extrude it along the path you selected in Step 5.**
8. **Hide or smooth any edges that need it.**

For information about hiding edges, see Chapter 5. Check out this chapter’s “[Smoothing those unsightly edges](#)” sidebar for the whole scoop on how to smooth edges.

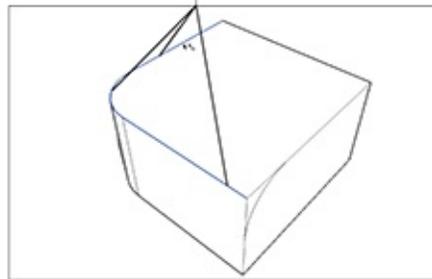
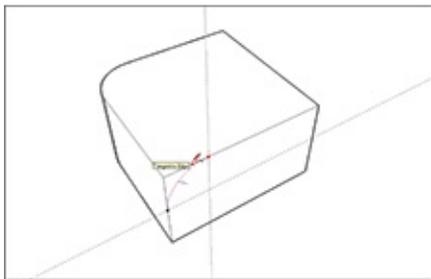
Draw an arc

Push/Pull away the corner

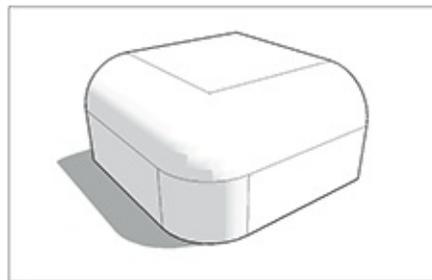
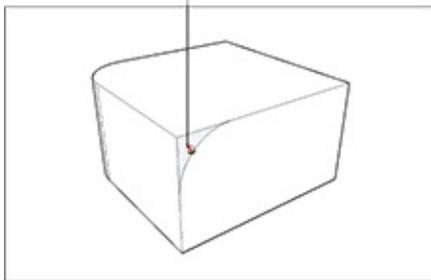


Draw identical arc

Select the whole path



Click with Follow Me



**Figure 6-9:** Making a corner that’s rounded in both directions.

After you have a fully rounded corner, you can use a bunch of them to make anything you want; it just takes a little planning. Figure 6-10 shows a simple bar of soap I created out of eight rounded corners, copied, and flipped accordingly. The text (in case you’re wondering) was created with

## Smoothing those unsightly edges

If you're wondering how to get rid of all the ugly lines that appear when you use Follow Me, the answer is pretty simple: You can *smooth* edges, just like you can hide them. (See Chapter 5 for more information about hiding edges.) The difference between hiding and smoothing is illustrated by the images of the cylinders in the figure that follows:

- ✓ **When you *hide* an edge between two faces**, SketchUp treats those faces as though your edge is still there — it just doesn't show the edge. Materials you've applied to each face stay separate, and each face is lit separately by SketchUp's sun. The latter fact is the reason why simply hiding the edges between faces that are supposed to represent a smooth curve doesn't make things look smooth — you still end up with a faceted look, as you can see in the second cylinder.
- ✓ **When you *smooth* an edge between two faces**, you're telling SketchUp to treat them as a single face — with a single material and smooth-looking shading. The difference is pretty huge, as you can see in the third cylinder in the figure.

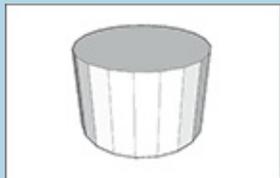
You can smooth edges in two ways:

- ✓ **Use the Eraser.** To smooth edges with the Eraser tool, hold down the Ctrl key (Option on the Mac) while you click or drag over the edges you want to smooth.
- ✓ **Use the Soften Edges dialog box.** Located on the Window menu, this dialog box lets you smooth a bunch of selected edges all at once, according to the angle of their adjacent faces. It's a little complicated at first, but here's what you need to know to get started: Select the edges you want to smooth and then move the slider to the right until you like the way your model looks.

To unsmooth edges, follow these steps:

1. **Turn on Hidden Geometry to make edges visible.**
2. **Select the edges you want to unsmooth.**
3. **In the Soften Edges dialog box, move the slider all the way to the left.**

Visible edges



Hidden edges

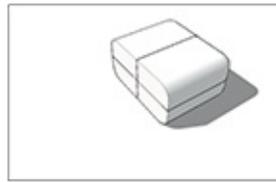
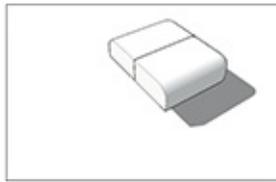
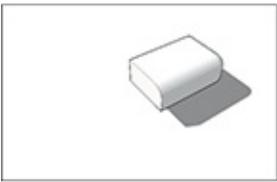


Smoothed edges



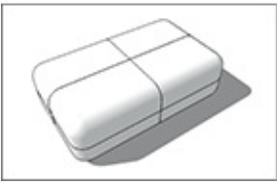
Copy and flip

Copy and flip



Copy and flip

Hide and smooth edges; then add text



**Figure 6-10:** Assembling a bunch of rounded corners to make objects is relatively easy.

## Modeling with the Scale tool

Real heroes are rarely obvious. The Scale tool is, in my opinion, the single most misunderstood member of SketchUp's mercifully limited toolkit. New modelers assume that Scale is for resizing things in your model. That's technically true, but most folks only use it to resize *whole* objects; the real power of Scale happens when you use it on *parts* of objects to change their shape. Take a look at [Figure 6-11](#) to see what I mean.

### Getting the hang of Scale

The basic principle of this technique is pretty simple: You select the geometry (edges and faces) in your model that you want to resize, activate the Scale tool, and go to town.

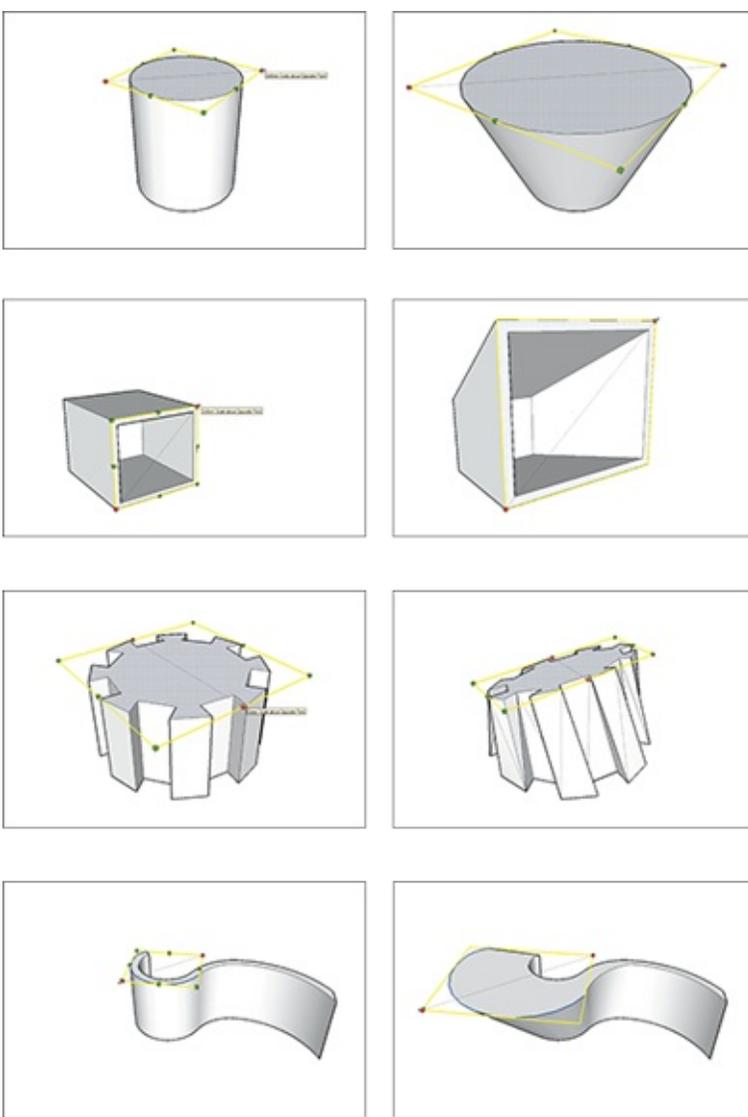
Here's a list of steps, just so it's crystal clear. [Figure 6-12](#) tells the story in pictures:

- 1. Select the part of your model that you want to scale.**

Use the Select tool to do this; check out [Chapter 2](#) if you need a refresher.

- 2. Activate the Scale tool by choosing Tools⇒Scale.**

You can also make Scale active by clicking its button on the toolbar or by pressing the S key on your keyboard. After you activate Scale, the geometry you selected in Step 1 should be enclosed in a box of little green cubes, or *grips*.

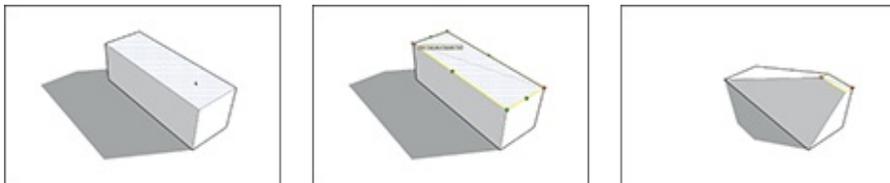


**Figure 6-11:** Using the Scale tool on parts of objects changes their shape.

**3. Click a grip and then move your mouse to start scaling your selected geometry.**

Keep reading for the lowdown on the different grips.

**4. When you're finished scaling, click again to stop.**

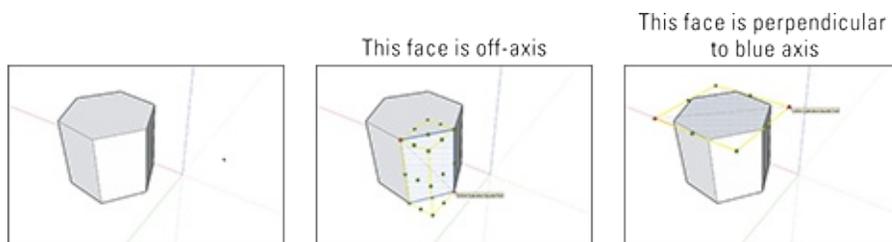


**Figure 6-12:** The Scale tool is a cinch to use.

While I'm on the subject of Scale, here are a few more things you should know:

- **Use different grips to scale different ways.** Which grip (the little green boxes that appear when you activate the Scale tool) you use determines how your geometry scales:
  - *Corner* grips scale proportionally — nothing gets distorted when you use them.
  - *Edge* and *side* grips distort your geometry as you scale — use them to squeeze what you're scaling.

- ✓ **Hold down the Shift key to scale proportionally.** This happens automatically if you're using one of the corner grips, but not if you're using any others. If you don't want to distort what you're scaling, hold down Shift.
- ✓ **Hold down the Ctrl key (Option on a Mac) to scale about the center of your selection.** I find myself doing this more often than not.
- ✓ **Type a scaling factor to scale accurately.** To scale by 50 percent, type **0.5**. Typing **3.57** scales your geometry by 357 percent, and typing **1.0** doesn't scale it at all. Take a look at Chapter 2 to read more about using numbers while you work.
- ✓ **Type a specific measurement.** If you know the final dimension you're trying to achieve with the Scale tool, you can type it in, followed by the units. To scale a 4-foot box until it's 10 feet wide, type **10'**.
- ✓ **Which grips appear depend on what you're scaling.** Have a look at Figure 6-13 to see what I mean.
  - Most of the time, you see a scaling box enclosed by 26 green grips.
  - If you're scaling flat, *coplanar* geometry (faces and edges that all lie on the same plane) and that plane is perfectly aligned with one of the major planes in your model, you get a rectangle consisting of 8 grips instead of a box with 26.
  - If what you're scaling is a Dynamic Component, you may see anywhere from 0 to all 26 grips; it depends on how the builder set up the component. Take a look at Chapter 5 for more information about Dynamic Components.



**Figure 6-13:** Grips depend on what you're trying to scale.

- ✓  **You can't make a copy while you scale.** Both the Move and Rotate tools let you make copies by holding down a button on your keyboard while you're using them, but Scale doesn't work this way, unfortunately. If you need to make a scaled copy, try this instead:
  - a. *Select the geometry that you want to scale and copy, and then make it into a group.*  
See Chapter 5 for more information on making groups.
  - b. *Choose Edit⇒Copy from the menu bar and then choose Edit⇒Paste in Place from the menu bar.*
  - c. *Scale the copied group as you would anything else.*

## Scaling profiles to make organic forms

Here's where it gets really interesting. I need to thank über-SketchUpper Justin Chin (who goes by

the handle monsterzero online) for demonstrating the power of scaling profiles to make organic forms; it's great because it's easy to understand *and* powerful enough to be applied all over the place. That's why I'm so excited to show it to you in this book.

So what is this method? It involves using the Scale tool in combination with a series of 2D profiles to create curvy, lumpy, distinctly un-boxy 3D shapes. An awful lot of the stuff in the universe fits squarely in this category: me, you, slugs, intergalactic alien fighter vessels, bananas — just about everything that wasn't made by a machine can be modeled using the scaled profiles method of 3D modeling.



Read about the Ruby script FredoScale on this book's website at [www.dummies.com/extras/sketchup2014](http://www.dummies.com/extras/sketchup2014)— it's hyper-relevant to the material in this section.

## Combining Scale and Push/Pull

The simplest way to use this method is in association with Push/Pull. Here's a very simple example of how it works. Check out Figure [6-14](#) for an illustrated view:

### 1. Create a 2D shape.



This shape may be something simple (such as a circle) or something more complex; it all depends on what you're trying to model. The shape may also be a half-shape if what you're trying to make exhibits bilateral symmetry. Take a look at the last section in Chapter [5](#) for more information on using components to build symmetrical models.

### 2. Push/pull your 2D shape into a 3D form.

### 3. Scale the new face you created so it's slightly bigger (or slightly smaller) than the original 2D shape from Step 1.

See the previous section in this chapter for more specifics about using the Scale tool. Pay special attention to the points about using *modifier keys*, or keyboard buttons, to scale proportionally or about the center of what you're working on.

### 4. Push/pull the face you scaled in the preceding step.

Try to make this extrusion about the same as the one you made in Step 2.

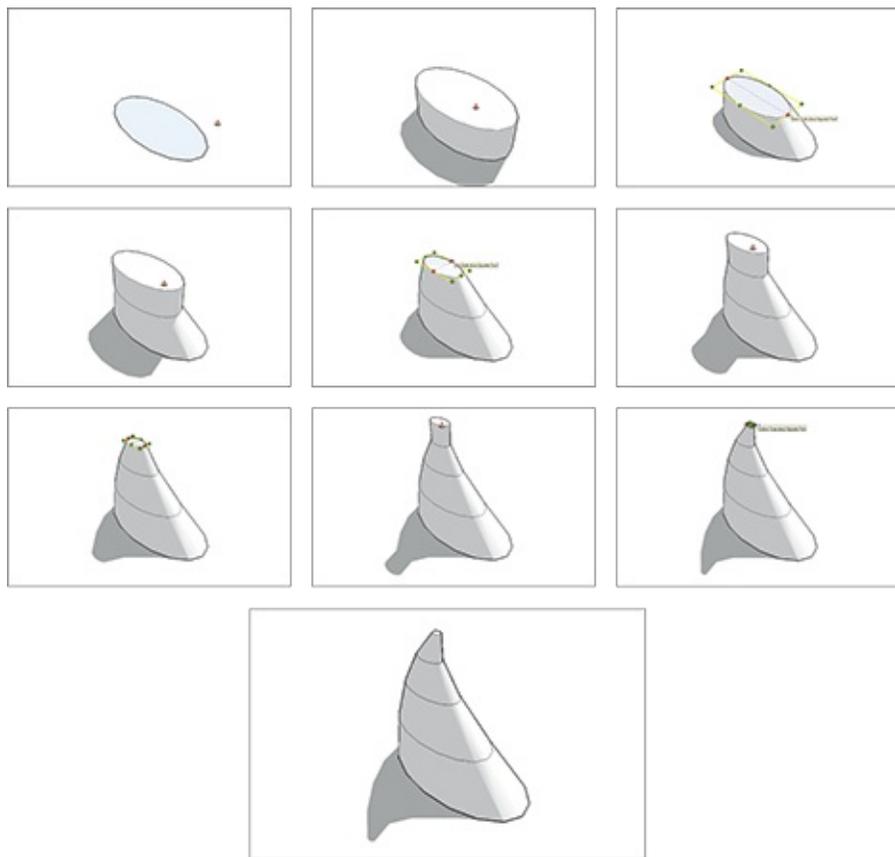


You can usually double-click a face with the Push/Pull tool to repeat the last Push/Pull operation you did.

### 5. Repeat Steps 3 and 4 until you're done.

You can add skillful use of the Rotate tool into the mix if you like; doing so allows you to

curve and bend your form as you shape it.



**Figure 6-14:** Using Scale and Push/Pull together is a simple way to make organic forms.

Keep the following tidbits in mind as you explore this technique:

- ✓ **Watch your polygon count.** *Polygons* are faces, basically — the more you have, the “heavier” your model becomes, and the worse it performs on your computer. Try to minimize the number of faces you’re working with by reducing the number of edges in your original 2D shape. Have a look at the sidebar “[Why your computer is so slow](#),” earlier in this chapter, for the whole scoop.
- ✓ **Don’t be afraid to go back and tweak.** The beauty of this method is its flexibility. While you’re working, you can select any of the 2D *profiles* (shapes) in your model and use the Scale tool to tweak them. Just select the loop of edges along the perimeter of the profile you want to scale and take it from there. Check out [Figure 6-15](#) to see what I mean.



**Figure 6-15:** You can go back and scale any profile at any time while you work.

### **Combining Scale and Follow Me**

Another way to create extruded forms is to use Follow Me. (See the first part of this chapter if you need a refresher.) This technique is ideally suited to making long, curvy, tapered things like tentacles and antlers; it’s a little time-consuming but works like a charm.

Modeling a simplified bull’s horn is a good, straightforward illustration of how the Follow Me

variation of this method works. Here's how to go about it; take a look at Figure [6-16](#) to see the story in pictures:

**1. Draw a circle.**

This is the extrusion *profile* for Follow Me. Strongly consider reducing the number of sides in your circle from the standard 24 to something more like 10 or 12. See the sidebar "[Why your computer is so slow](#)" (earlier in this chapter) to find out how and why you should do this.

**2. Draw a 10-sided arc that starts perpendicular to the center of the circle you drew in Step 1.**

Type **10s** and press Enter right after you click to finish drawing your arc.

This tells SketchUp to make sure your arc has 10 sides (instead of the default 12). Why 10 sides? It makes the math easier a few steps from now.



The easiest way to create a halfway-accurate arc in 3D space is to start by drawing a rectangle. When you're sure this rectangle is properly situated, use the Arc tool to draw on top of it and then delete everything but the arc.

**3. Select the arc you just drew.**

This is the extrusion *path* for Follow Me.

**4. Activate the Follow Me tool by choosing Tools⇒Follow Me from the menu bar.**

**5. Click the circle you drew in Step 1 to extrude it along the path you drew in Step 2.**

**6. Choose View⇒Hidden Geometry from the menu bar.**

Showing the hidden geometry in your model lets you select the edges that were automatically *smoothed* (made hidden) when you used Follow Me in Step 4.

**7. Scale the face at the end of your new extrusion by a factor of 0.1.**

See "[Getting the hang of Scale](#)," earlier in this chapter, for instructions on how to do this. Use any of the four corner grips on the scaling box, and don't forget to hold down the Ctrl key (Option on a Mac) while you're scaling — this forces SketchUp to scale about the center of the face you're resizing.

**8. Select the edges that define the next-to-last profile in your extruded form.**

Depending on the angle of your arc, making this selection can get tricky. Here are some considerations that may help:

- See Chapter [2](#) for tips on making selections.

- Choose View⇒Face Style⇒X-Ray or View⇒Edge Style⇒Back Edges from the menu bar to make it easier to see what you’ve selected.



- Hold down the Ctrl key (Option on a Mac) while you orbit to turn off SketchUp’s “blue is up/down gravity bias.” While orbiting this way, try drawing lots of tight, little circles with your mouse to get your view to tilt in the direction your want. This is by no means simple stuff, but getting the hang of temporarily disabling the Orbit tool’s tendency to keep the blue axis straight up and down is a very nifty way to work. Doing so makes it infinitely easier to get just the right angle for making a window selection. This in turn makes selecting the edges that define profiles a whole lot easier, and that’s what becoming a Zen master of the Orbit tool is all about.

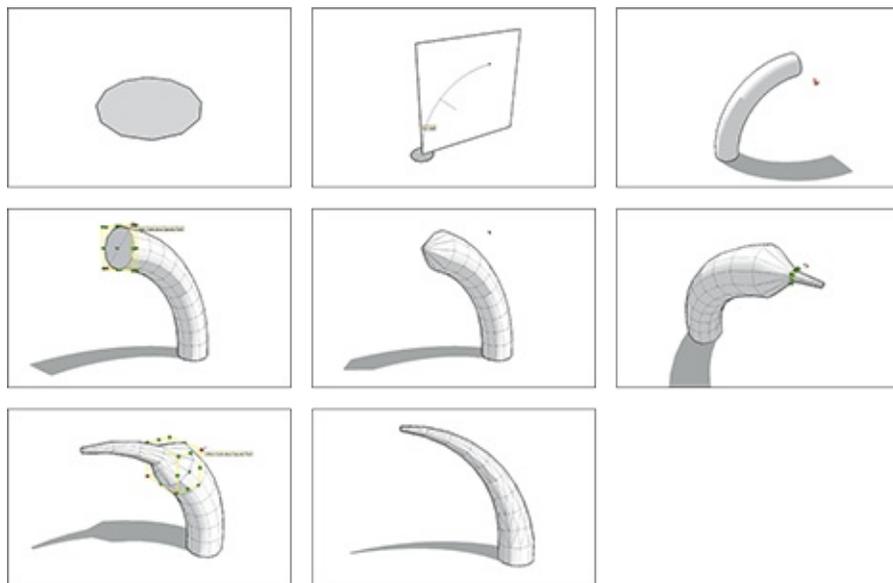
**9. Scale the edges you selected in the preceding step by a factor of 0.2.**

Starting to see what’s happening?

**10. Repeat Steps 8 and 9 for each of the remaining profiles in your form, increasing the scaling factor by 0.1 each time.**

Of course, you can absolutely choose to sculpt your form however you like, but this method (counting up by tenths) yields a smooth taper.

Have a look at the Santa-Claus-and-reindeer project in the color insert (in the center of this book) to get an idea of the kind of fancy, not-a-box models you can build after you master the Scale tool. It’s not beginner-level material, but it’s worth the time when you’re ready.



**Figure 6-16:** Use Scale with Follow Me to create long, tapered forms like this bull's horn.

## ***Making and Modifying Terrain***

Continuing in the grand tradition of building extremely powerful tools and then hiding them so you’ll never find them, the people at SketchUp introduced the *Sandbox* in version 5 of the software.

I introduce the Sandbox here because it helps people to model *terrain* — the stuff your buildings sit on (or in, if what you’re making is underground).

The Sandbox isn’t new, but owing to its less-than-obvious location, most SketchUp users have never used it. Here are the facts:

- ✓ **The Sandbox is a collection of tools.** Each tool serves a fairly specific purpose and is meant to be used at a particular stage of the terrain-modeling process. That said, like all SketchUp’s tools, they’re incredibly flexible. You can use them to model anything you want.
- ✓ **The Sandbox is in both Make and Pro.** Despite what many people think, the Sandbox tools aren’t just for Pro users; people who use the free version of SketchUp can use them, too. They’re just hidden, which brings me to my next point.
- ✓ **The Sandbox is hidden.** The reasons for this are complicated, but the tools in the Sandbox are a little bit special; they’re *extensions* — you have to find them and turn them on before you can use them. If you’re using SketchUp Pro, you can skip the first two steps in the following list — they’re already turned on.

Follow these steps to switch on the Sandbox tools:

- a. *Choose Window⇒Preferences from the menu bar to open the Preferences dialog box.*

Choose SketchUp⇒Preferences if you’re on a Mac.

- b. *In the Extensions panel, make sure the Sandbox Tools check box is selected and then close the Preferences dialog box.*
- c. *Choose View⇒Toolbars⇒Sandbox from the menu bar to show the Sandbox toolbar.*



Rather than doggedly describe what each element of the Sandbox does, I mention each tool as it becomes necessary. Don’t worry about figuring out everything all at once — pick up new tools as you need them.

## ***Creating a new terrain model***

Whether you’re modeling a patch of ground for a building or redesigning Central Park, you need one of two terrain-modeling methods:

- ✓ **Starting from existing data:** This existing data usually arrives in the form of *contour* or *topo* lines; see the next section to read more about them.
- ✓ **Starting from scratch:** If you don’t have any data to start or if you’re beginning with a perfectly flat site, you can use SketchUp’s From Scratch tool to draw a grid that’s easy to form into rolling hills, berms, and valleys. Skip ahead to “[Modeling terrain from scratch](#)” for more information.



There's a neat trick I learned for modeling small (yard-sized) amounts of terrain — the piece of land immediately surrounding a building, for example. You *could* use the From Scratch tool to start with a flat site, but there's a better way: See "[Roughing out a site](#)" a little later in this chapter to see what I mean.

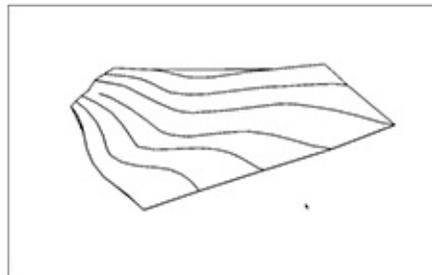
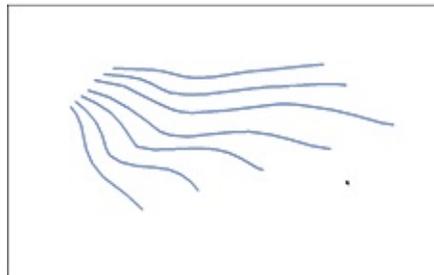
### **Modeling terrain from contour lines**

You know the squiggly lines on topographical maps that show you where the hills and valleys are? They're *contour lines* (or *contours*) because they represent the contours of the terrain; every point on a single line is the same height above sea level as every other point on that line. Where the lines are close together, the ground between them is steep. Where the lines are far apart, the slope is less steep. Cartographers, surveyors, engineers, and architects use contour lines to represent 3D terrain in flat formats like maps and site drawings.

Sometimes, you have contour lines for a building site that you want to model in 3D. You can use the From Contours tool in the Sandbox to automatically generate a three-dimensional surface from a set of contour lines. Have a look at [Figure 6-17](#) to see what I mean.

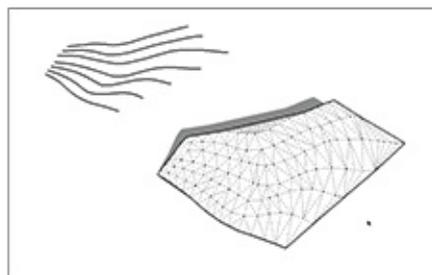
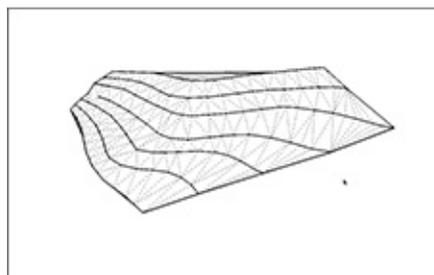
Select your lines

Choose From Contours



Show Hidden Geometry

Separate your lines from your surface



**Figure 6-17:** Use the From Contours tool to turn a set of contour lines into a 3D surface.

Here are some things to keep in mind about the From Contours tool:

- ✓ **It's a two-step tool.** Using From Contours is simple after you get the hang of it:
  - a. *Select all the contour lines you want to use to create a surface.*
  - b. *Choose Draw⇒Sandbox⇒From Contours from the menu bar (or click the From Contours tool button, if the Sandbox toolbar is visible).*



If you can't see the Sandbox tools in your menus, you haven't turned them on yet. See the beginning of this section, "[Making and Modifying Terrain](#)," to rectify the situation.

- ✓ **Your contour lines need to be lifted up.** The From Contours tool creates a surface from contour lines that are already positioned at their proper heights in 3D space. Most of the time you work with contours that are part of a 2D drawing, and that means you probably have to lift them up yourself using the Move tool — one at a time. It's tedious but necessary. Just oil up the Select tool, put on some music, and get to work. For a refresher on selecting things, take a look at the last part of Chapter [2](#).



- ✓ **Download and install Weld.** The Weld Ruby script (which you can read about on this book's website at [www.dummies.com/extras/sketchup2014](http://www.dummies.com/extras/sketchup2014)) turns selections of individual line segments into *polylines* — this makes them much, much easier to work with. If you work with contour lines imported from a computer-aided drawing (CAD) file, using Weld makes your life a little easier.
- ✓ **You end up with a group.** When you use From Contours, SketchUp automatically makes your new surface (the one you generated from your contour lines) into a group. It leaves the original lines themselves completely alone; you can move them away, hide them, or delete them if you want. I recommend making another group out of them, putting them on a separate layer (see Chapter [7](#) for more on this), and hiding that layer until you need it again.



- To edit the faces and edges inside a group, double-click it with the Select tool. Chapter [5](#) has all the details on groups and components.
- ✓ **To edit your new surface, turn on Hidden Geometry.** The flowing, organic surface you just created is actually just a bunch of little triangles. The From Contours tool smooths the edges that define them, but they're there. To see them, choose View⇒Hidden Geometry from the menu bar.
- ✓ **Try to keep your geometry reasonable.** The From Contours tool is super useful, but it has its limits. The trouble is that it's too easy to use it to create enormous amounts of geometry (faces and edges) that can really bog down your system. If it takes forever for your contours to turn into a surface, or if that surface is so big that your computer turns blue and curls up into a fetal position (so to speak), you need to go back a few steps and do one (or perhaps all) of the following:

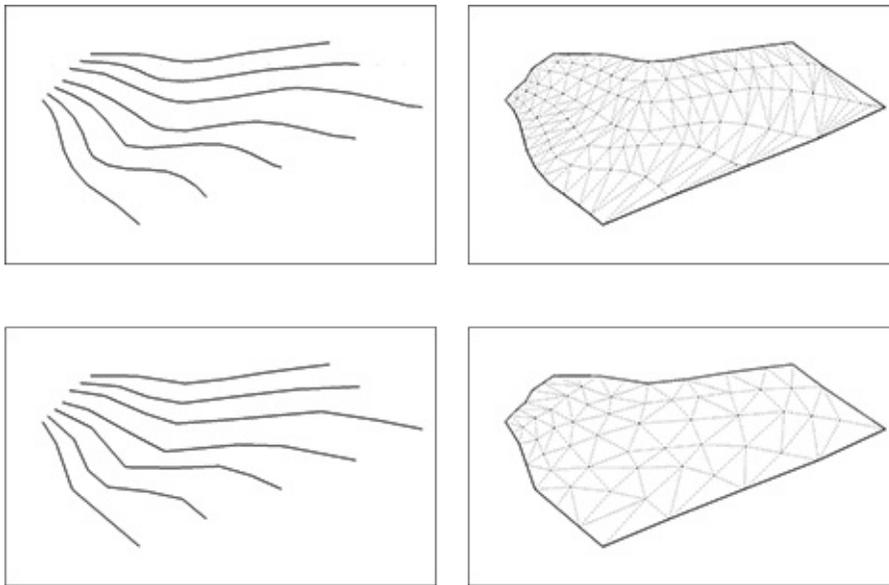
- *Work on a smaller area.* As nice as it'd be to have the whole neighborhood in your SketchUp model, you may have to narrow your scope. Creating only what you need is good modeling policy.
- *Use only every other contour line.* Doing this effectively halves the amount of geometry in your resulting surface.



- *Dumb down the contour lines.* This is a little bit hard to explain, but here goes: The From Contours tool works by connecting adjacent contour lines together with edges that form triangles. How many triangles it creates depends on how many

individual edge segments are in each contour line; Figure 6-18 provides an illustration. Unless you created the contour lines to begin with — there’s a good chance you imported them as part of a CAD file — you have no control over how detailed they are. Redrawing each contour line is a major bummer, but luckily, you can download a great Simplify Contours Ruby script that makes the process much simpler. Take a look at this book’s website at [www.dummies.com/extras/sketchup2014](http://www.dummies.com/extras/sketchup2014) for a link to this script.

- ✔ **You don’t have to start with existing contour lines.** In fact, drawing your own edges and using From Contours to generate a surface from them is one of the most powerful ways to create organic, nonboxy forms in SketchUp. Take a look at the next part of this chapter to see what I mean.



Low-detail lines yield fewer triangular faces

**Figure 6-18:** How many triangles are created depends on the number of edge segments in the contour lines you start with.

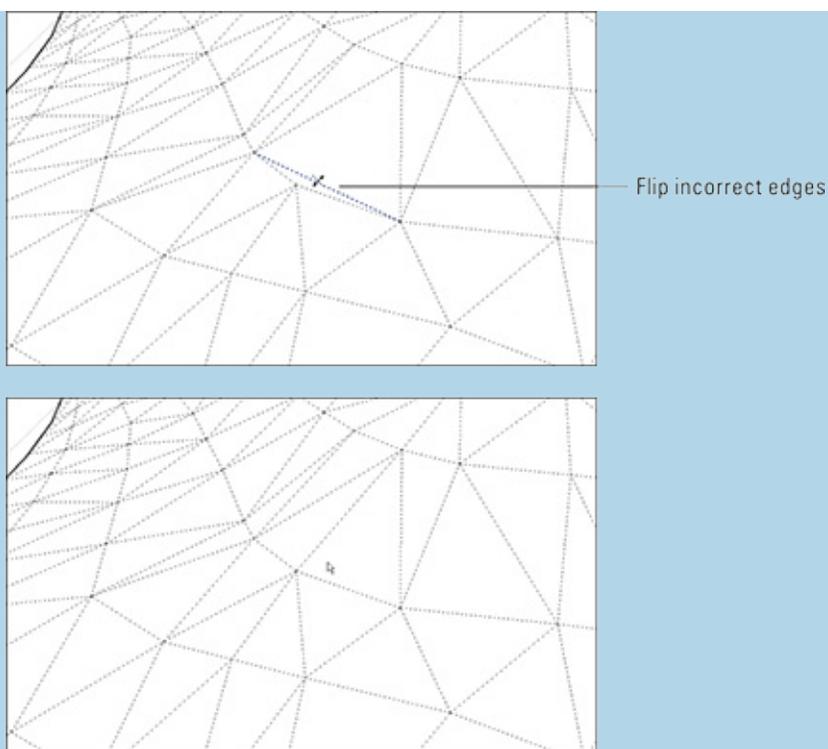
- ✔ **Get ready to do some cleanup.** The surfaces that From Contours creates usually need to be cleaned up to some extent. Use the Eraser to delete extra geometry (you’ll find lots along the top and bottom edges of your surface). Use the Flip Edge tool to correct the orientation of your triangular faces. See the nearby sidebar “[Don’t flip out — Flip Edge](#)” for the lowdown.

## Don’t flip out — Flip Edge

The Sandbox’s Flip Edge tool is a simple beast, but it’s indispensable if you’re working with the From Contours tool. Basically, you use Flip Edge to clean up the surfaces that From Contours creates. When you turn contour lines into a surface, lots and lots of triangular faces appear. Sometimes, the From Contours tool decides to draw an edge between the wrong two line segments, creating two triangular faces that form a “flat spot” in your surface. The following image shows what I mean.

You get rid of these flat spots manually by flipping the edges that create them. Doing so changes the resulting triangular faces, usually making them end up side by side (instead of one above the other).

To use the Flip Edge tool (choose Tools⇒ Sandbox⇒ Flip Edge), just click the edge you want to flip. If you’re not sure about an edge, go ahead and flip it; then see if things look better. If they don’t, you can always undo or flip it back.



### ***Modeling terrain from scratch***

Without contour lines that define the shape of the terrain you want to model, you have to start with a level surface. Use the From Scratch tool to create a big, flat rectangle that represents a chunk of ground. Because the rectangle is already divided into triangular faces, it's easy to use the Smoove tool (which I talk about next in this chapter) to shape the rectangle into hills, valleys, sand traps, and whatever else you have in mind.

Here's the thing, though: It's a very rare occasion that you have *carte blanche* with a piece of land. Unless you design something like a golf course in the middle of a dry lake bed or terraform a new planet for colonization, you probably have preexisting terrain conditions to contend with. And if that's the case, you're probably better starting off with a set of contour lines that describe those conditions — I talk all about the From Contours tool earlier in this chapter.

So although the From Scratch Tool works great, I doubt you'll need to use it much. All the same, here's how to do so, just in case.

Follow these steps to create a new terrain surface with the From Scratch tool and take a look at [Figure 6-19](#) while you're at it:

- 1. Choose Draw⇒Sandbox⇒From Scratch from the menu bar to activate the From Scratch tool.**
- 2. Type a grid spacing amount and press Enter.**

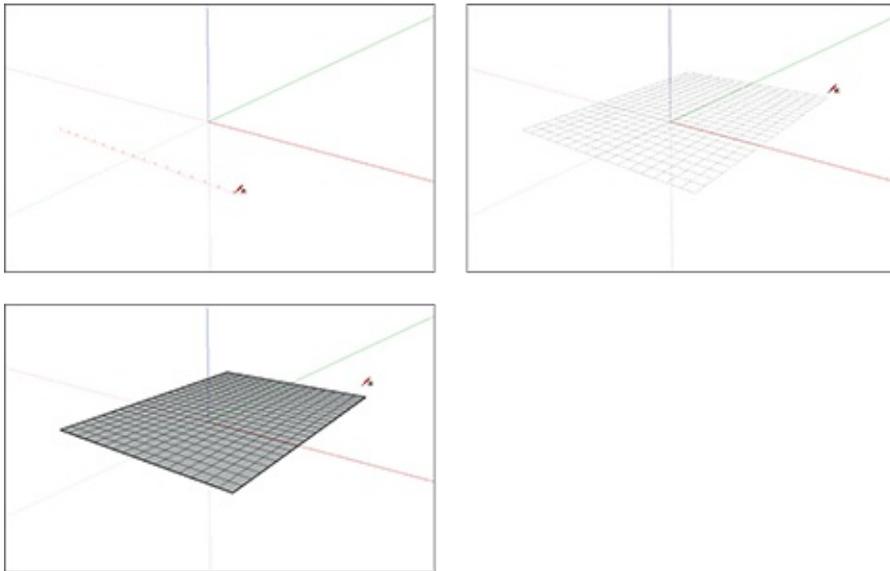
The default grid spacing amount is 10 feet, which means the tool draws a rectangle made up of squares that are 10 feet across. The grid spacing you choose depends on how big an area you're planning to model and how detailed you plan to make the terrain for that model.



If I were modeling a single-family house on a reasonably sized lot, I'd probably use a grid spacing of 2 feet — that'd provide enough detail for elements like walkways and small berms without creating too much geometry for my computer to handle. If I were laying out an 18-hole golf course, on the other hand, I'd choose a grid spacing closer to 50 feet and then add detail to certain areas later.

3. **Click to position one corner of your new terrain surface where you want it.**
4. **Click to determine the width of the surface you're drawing.**
5. **Click to establish the length of your new terrain surface.**

When you're done, the great big rectangle you've created will automatically be a group. Double-click with the Select tool to edit it and get started. You'll probably decide to use the Smoove tool next; jump ahead to "[Making freeform hills and valleys with Smoove](#)" (later in this chapter) to find out how.



**Figure 6-19:** Use the From Scratch tool to create big swatches of flat terrain. Ah, the possibilities!

### ***Roughing out a site***

Perhaps you want to model a smallish chunk of nonflat terrain that surrounds a building. Maybe you're trying to reproduce existing site conditions, or maybe you're in the process of designing the landscape for a project. There's a neat technique for cases like this one: You can use From Contours to quickly generate a surface from just a few simple outlines.

Follow these steps to model a simple terrain surface with the From Contours tool, as shown in Figure [6-20](#):

1. **Extend the bottom of your building down so the exterior walls drop below ground level.**
2. **Make your building into a group.**

See Chapter [5](#) if you need help.

- 3. Use the Tape Measure and Line tools to draw the outline of the chunk of terrain you want to model around the building.**

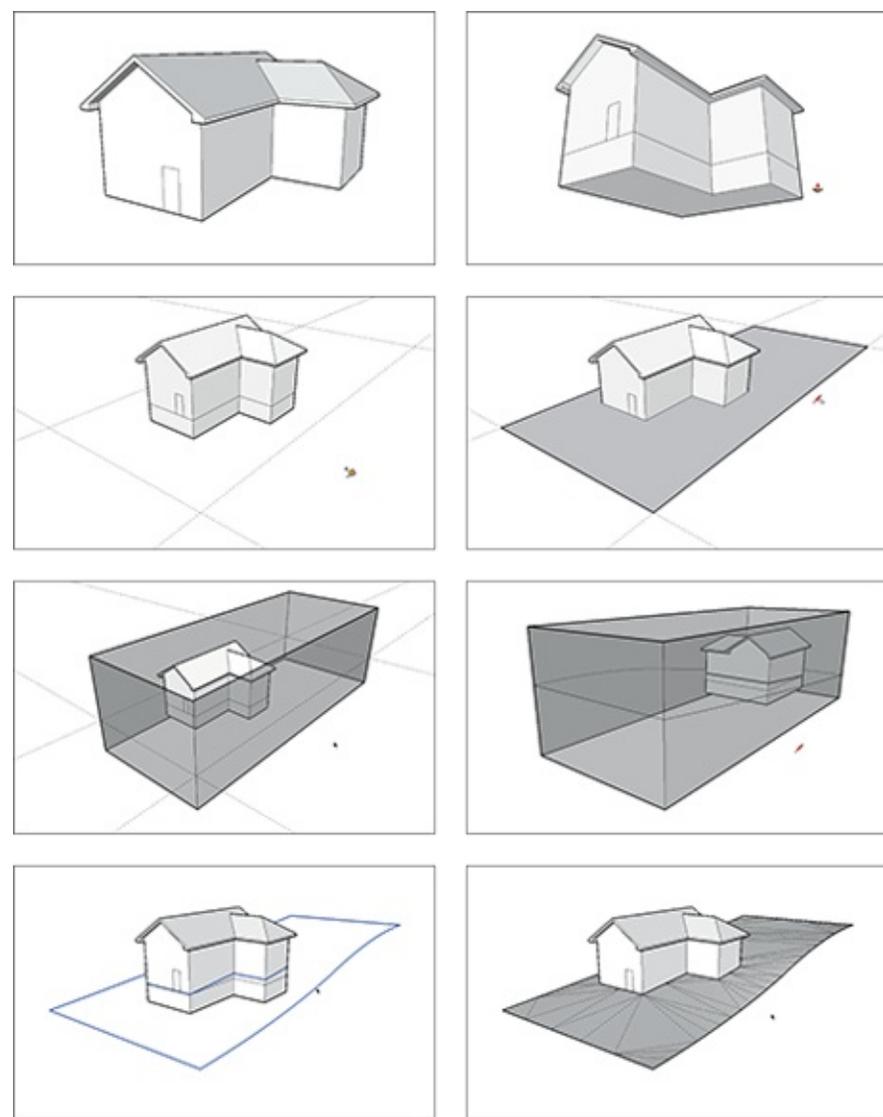
Keep in mind that the resulting horizontal face is flat; just pretend you're drawing in 2D space. It doesn't matter if the outline you draw is below, above, or in line with the building, as you see in the next step.

- 4. Use the Push/Pull tool to extrude the face you drew in Step 3 into a box that extends above and below your building, and then delete the top and bottom faces of the box you just drew.**
- 5. Paint the walls of your box with a translucent material.**

You can find some in the Translucent library, in the Materials dialog box.

- 6. Draw edges on the sides of the box that represent where the ground should intersect them.**
- 7. Draw edges on the sides of the building that represent where the ground meets the building.**
- 8. Delete the box you created in Step 4, leaving only the edges you drew in Step 6.**
- 9. Select all the edges you drew in Steps 6 and 7.**
- 10. Choose Draw⇒Sandbox⇒From Contours from the menu bar to generate a surface based on the edges you selected in the preceding step.**

Take a look at the section “[Modeling terrain from scratch](#)” for tips on using From Contours; at this point, you need to use the Flip Edge tool and the Eraser to clean up your terrain model — particularly where your building is supposed to go.



**Figure 6-20:** You can create irregular terrain surfaces very quickly with the From Contours tool.

## ***Editing an existing terrain model***

No matter how you make a terrain model, there's a 99-percent chance that it consists of lots and lots of triangles. Switch on Hidden Geometry (choose View⇒Hidden Geometry) to see them. As long as you have triangles, you can use the Sandbox's terrain editing tools. This section shows you how to do the following:

- ✓ Shape (or reshape) your terrain with the Smoove tool.
- ✓ Create a flat spot for a building with the Stamp tool.
- ✓ Draw paths and roads with the Drape tool.

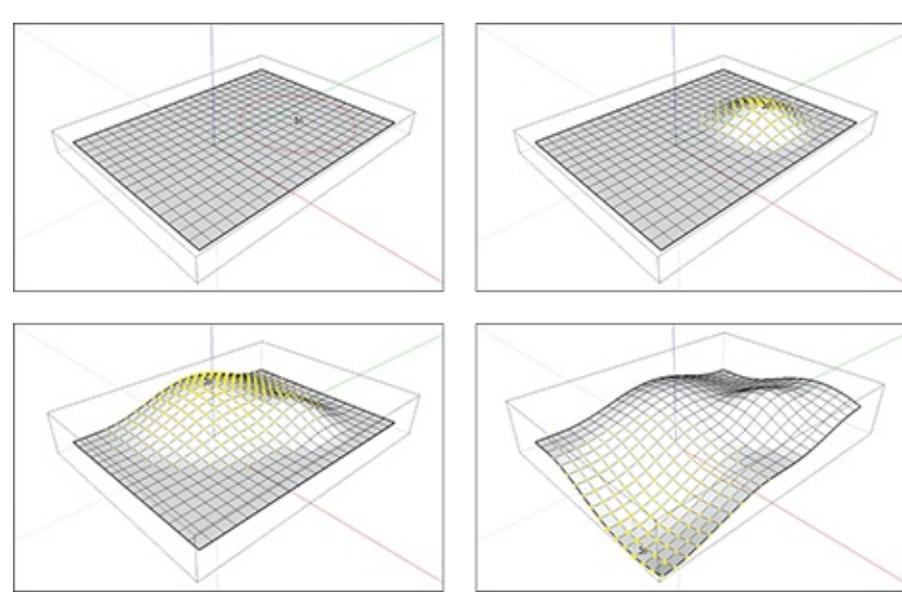


Keep in mind that both From Contours and From Scratch create terrain objects that are groups. To edit a group, double-click it with the Select tool. When you're done, click somewhere else in your modeling window.

## ***Making freeform hills and valleys with Smoove***

*Smoove* is a tool for moving smoothly — get it? Smooth + Move = Smoove. I'll wait while you compose yourself.

Smooove is actually one of the coolest tools in SketchUp; it lets you shape terrain (or any horizontal surface that's made up of smaller, triangular faces) by pushing and pulling (sort of) bumps and depressions of any size. Smooove is fun to use and yields results that you'd be hard-pressed to produce with any other tool in SketchUp. Figure 6-21 shows what Smooove can do.



**Figure 6-21:** Smooove creates shapes that are unlike anything else you can make with SketchUp.

Follow these steps to shape a surface with Smooove:

**1. Double-click the group containing your terrain to edit it.**

If your terrain isn't part of a group, forget I said that.

**2. Choose Tools⇒Sandbox⇒Smooove from the menu bar to activate the Smooove tool.**

**3. Type a radius and press Enter.**

Smooove creates lumps, bumps, and dimples that are circular. The radius you enter here determines how big those lumps, bumps, and dimples should be.

**4. Click somewhere on your terrain surface to start smoooving.**

**5. Move your mouse up or down (to create a bump or a depression, respectively), and then click again to stop smoooving.**

Fun, huh? Here are some more things to keep in mind when you use Smooove:

- ✓ **Use the From Scratch tool beforehand.** You don't have to, but creating a surface with the From Scratch tool (which I describe earlier in this chapter) is by far the easiest way to end up with terrain that you can smooove easily.
- ✓ **Try smoooving to edit other terrain surfaces.** You can also use Smooove after you create a terrain surface with the From Contours tool.
- ✓ **Double-click to repeat your previous smooove.** As with Push/Pull, double-clicking tells SketchUp to carry out the same operation as you did the last time you used the tool.

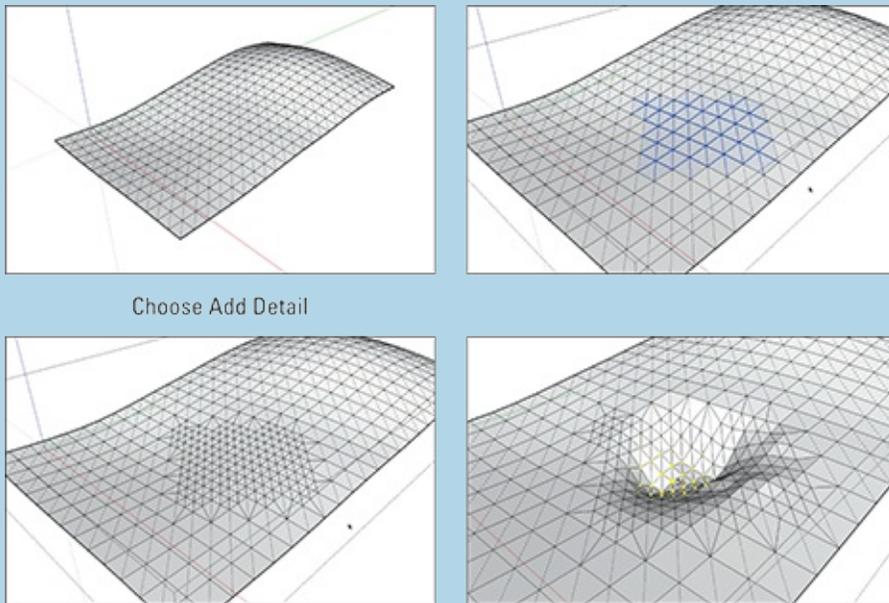
- ✔ **Preselect to smooove shapes other than circles.** Any faces and edges you select before you use the Smooove tool will move up (or down) by a constant amount. This means you can use Smooove to create things like ridges and ditches by selecting the right geometry beforehand. Figure [6-22](#) provides a much-needed picture of what I mean.

## Need more triangles? Add Detail

Like the Flip Edge tool, Add Detail is kind of a one-trick pony. Use it to add triangles to areas of your terrain surface that need more detail. That way, you can save geometry (and file size, and waiting) by having lots of faces only in the areas of your terrain that require it. If I were designing a golf course, I'd use very big triangles for the vast majority of it. I'd use the Add Detail tool to add triangles to areas where I planned to have smallish things like sand traps.

You can use the Add Detail tool in two ways:

- ✔ **Add detail to faces one at a time.** To be honest, I've never used the tool this way, but here goes: You can activate the tool (see the next bullet) *without* having any geometry selected. Then click faces or edges on your terrain to divide them into more faces. I suppose this comes in handy when you model something very precisely.
- ✔ **Add detail to an area all at once.** This is actually my favorite way to use this tool; it's quick and easy to understand. Simply select the faces on your terrain you want to subdivide and choose Tools⇒Sandbox⇒Add Detail from the menu bar. Take a look at the figure to see what happens when you do.



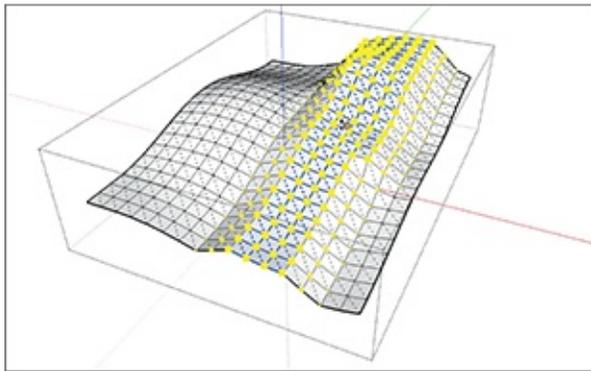
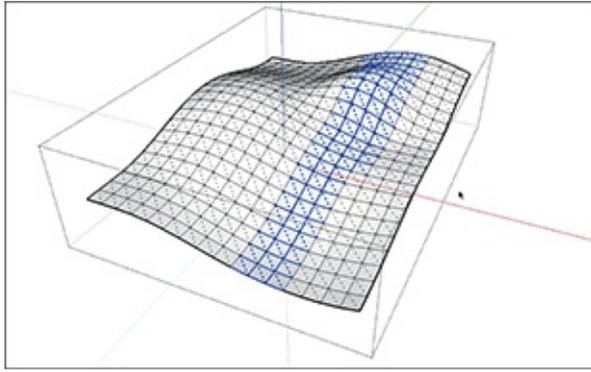
## Placing a building on your terrain with Stamp

Eventually, you may need to plunk down a building (or some other structure) on the terrain you've lovingly crafted. The Stamp tool provides an easy way to — you guessed it — stamp a building footprint into a terrain surface, creating a flat “pad” for something to sit on. This tool also provides a way to create a gently sloping offset around the perimeter of your stamped form. This creates a smoother transition between the new, flat pad and the existing terrain.

Follow these steps to use the Stamp tool; check out Figure [6-23](#) to see the corresponding pictures:

1. **Move the building you want to stamp into position above your terrain surface.**

The building shouldn't touch the terrain but float in space directly above it. Also, turn the building into a group before you start moving anything; take a look at Chapter 5 to find out all about groups and components.



**Figure 6-22:** Preselect faces and edges to smooove shapes other than circles.

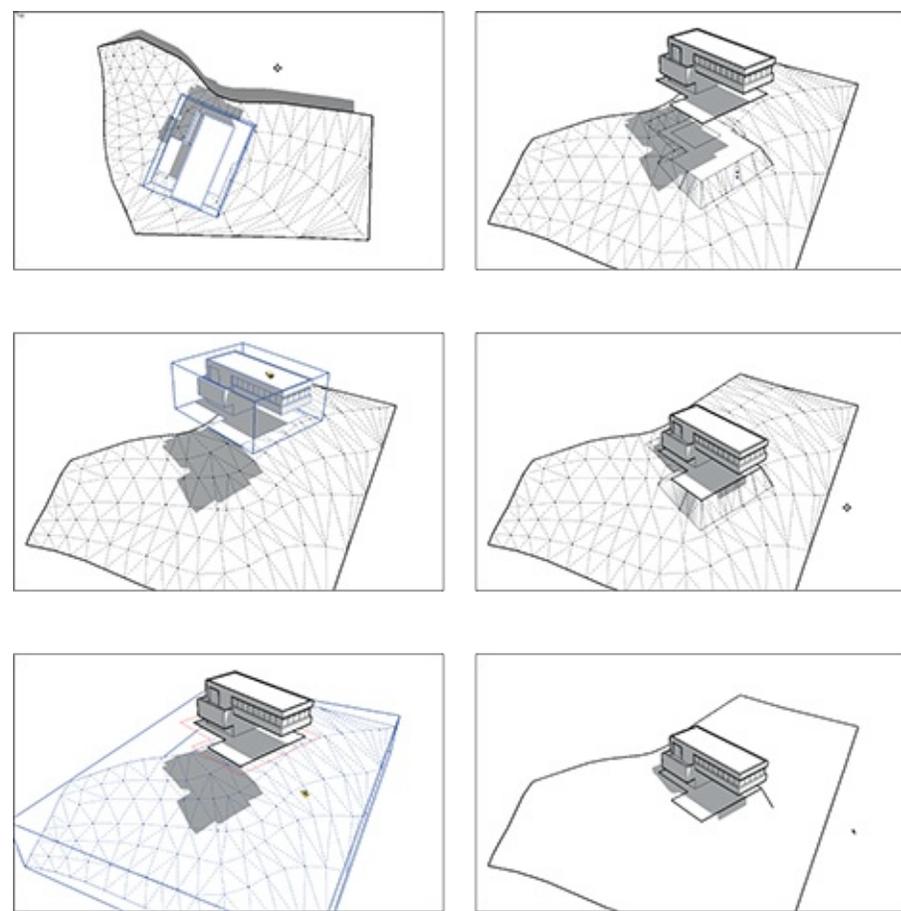


If you're having trouble moving your building into position accurately, move it to the correct height first and then switch to a top, no-perspective view to finish the job. Look in the Camera menu for both these commands.

2. **Choose Tools⇒Sandbox⇒Stamp from the menu bar to activate the Stamp tool.**
3. **Click the floating object to tell SketchUp what you want to use as the stamp.**
4. **Type an offset distance and press Enter.**

The *offset distance* is the amount of space around the perimeter of whatever you're stamping that SketchUp uses to smooth the transition between the flat spot it's creating and the existing terrain. The offset amount you choose depends entirely on what you're stamping. Go nuts, and thank your lucky stars for Undo.

5. **Move your cursor over your terrain surface and click again.**
6. **Move (but don't drag) your mouse up and down to position the flat pad in space. Click again to finish the operation.**



**Figure 6-23:** Use the Stamp tool to create a nice, flat spot for your building.

Here are a couple things that are handy to know when you use Stamp:

- ✓ SketchUp uses the bottommost face in your stamp object as the template for the flat pad it creates in your terrain.
- ✓ Read the “[Don’t flip out — Flip Edge](#)” sidebar, earlier in this chapter; Stamp creates triangular faces that sometimes need cleaning.

### ***Creating paths and roads with Drape***

The Drape tool works a little like a cookie cutter; use it to transfer edges from an object down onto another surface, which is directly beneath it.

Perhaps you have a gently sloping terrain and you want to draw a meandering path on it. The path has to follow the contours of the terrain, but because you want to paint it with a different material, it needs to be a separate face. In this case, you’d draw the path on a separate face and use the Drape tool to transfer it to your terrain surface.

Taking the preceding example, follow these steps to use the Drape tool to draw a path on a nonflat terrain surface. Figure [6-24](#) illustrates the steps:

- 1. Use the Line tool (see [Chapter 2](#)) to draw a flat face somewhere directly above your terrain surface.**

If you can, make your flat face exactly the same size as your terrain. Just make sure it’s big enough for whatever you plan to draw next (in this example, a path).

**2. Paint the face you just created with a translucent material.**

I find that a light gray works well; there's a good one in the Translucent library, inside the Materials dialog box.

**3. Use the Line tool to carry up any important points on your terrain surface.**

In this case, make sure the path begins precisely at the door of the building, so draw vertical lines from the sides of the door to the flat face directly above. That way, you have something to inference to in Step 6.

**4. Choose Camera⇒Standard Views⇒Top from the menu bar to switch to a top view.**

**5. Choose Camera⇒Parallel Projection from the menu bar to turn off perspective.**

**6. On the upper face, draw the edges you want to drape.**



Make sure that your edges form closed loops to create faces. If they don't, you'll have a miserable time trying to paint the path (in this case) after it's draped onto your terrain surface.

**7. Orbit your model so you can see both the upper and lower surfaces.**

**8. Soften/smooth the edges of the triangles in your terrain surface (if they aren't already).**

To do this, follow these steps:

- a. *Select all the edges and faces in your terrain, and then choose Window⇒Soften Edges from the menu bar.*
- b. *In the Soften/Smooth Edges dialog box, move the slider to the far right and make sure that both the Smooth Normals and Soften Coplanar check boxes are selected.*

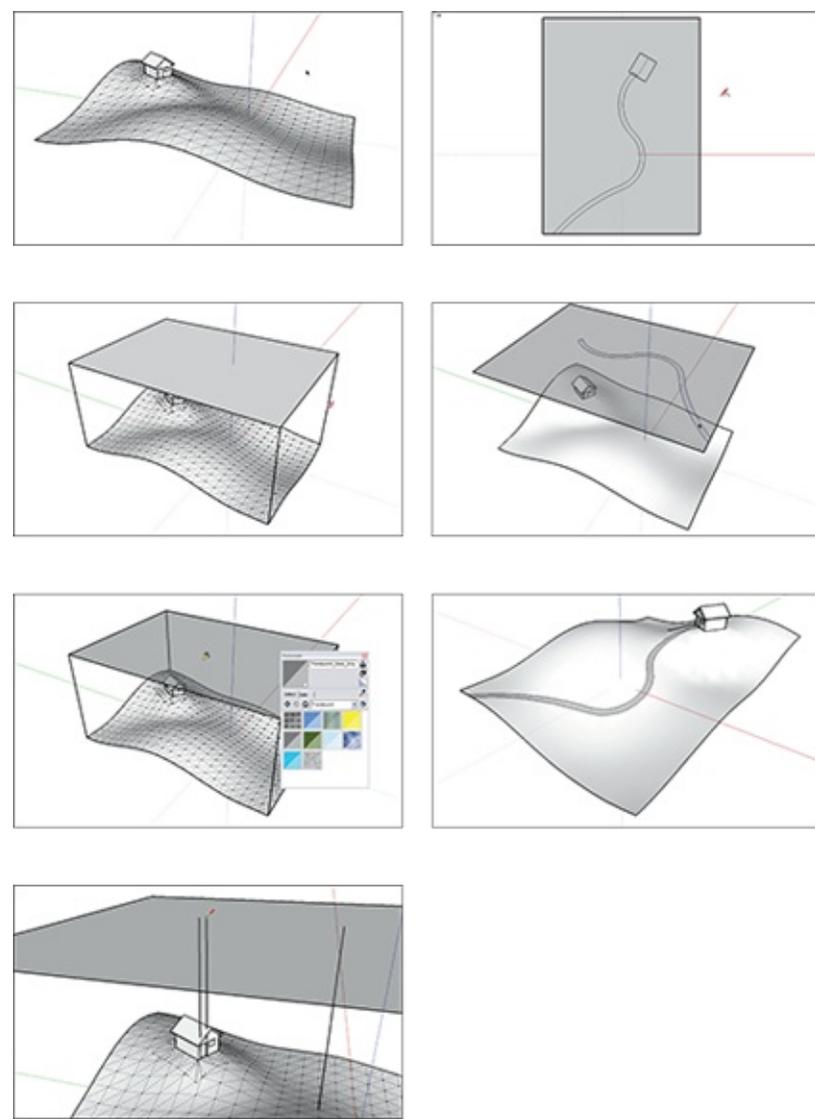
**9. Select the edges you want to drape.**

If your edges define closed faces, you can select those faces instead; sometimes that's easier than selecting a bunch of individual edges. Take a look at Chapter [2](#) for tips on selecting things.

**10. Choose Draw⇒Sandbox⇒Drape from the menu bar to activate the Drape tool.**

**11. Click once on your terrain surface to drape the edges you selected in Step 9.**

It doesn't matter if your terrain is inside a group — the Drape tool works anyway.



**Figure 6-24:** Use Drape to transfer edges onto your terrain surface.



My friend Daniel Tal (a landscape architect and SketchUpper extraordinaire who regularly builds models that defy explanation) has written *Google SketchUp for Site Design: A Guide to Modeling Site Plans, Terrain and Architecture* (published by Wiley), which is available online and at your local bookstore. I *highly* recommend checking it out.

## ***Building a Solid Tools Foundation***

So-called *solid modeling operations* (fancy people refer to them as *Boolean operations*) give you the ability to create the shapes you need by adding or subtracting other shapes to or from each other. This type of modeling is actually pretty common in other 3D apps; now SketchUp can do it, too. In the next few pages, I show you how to use all six of SketchUp Pro's Solid Tools, giving detailed examples for the three that I think are the most useful.



I think it's important to mention right away that five of the six Solid Tools are only in the Pro version of SketchUp. Take a look at Table [6-1](#) (later in this chapter) to see what's available to you.

## Understanding solids

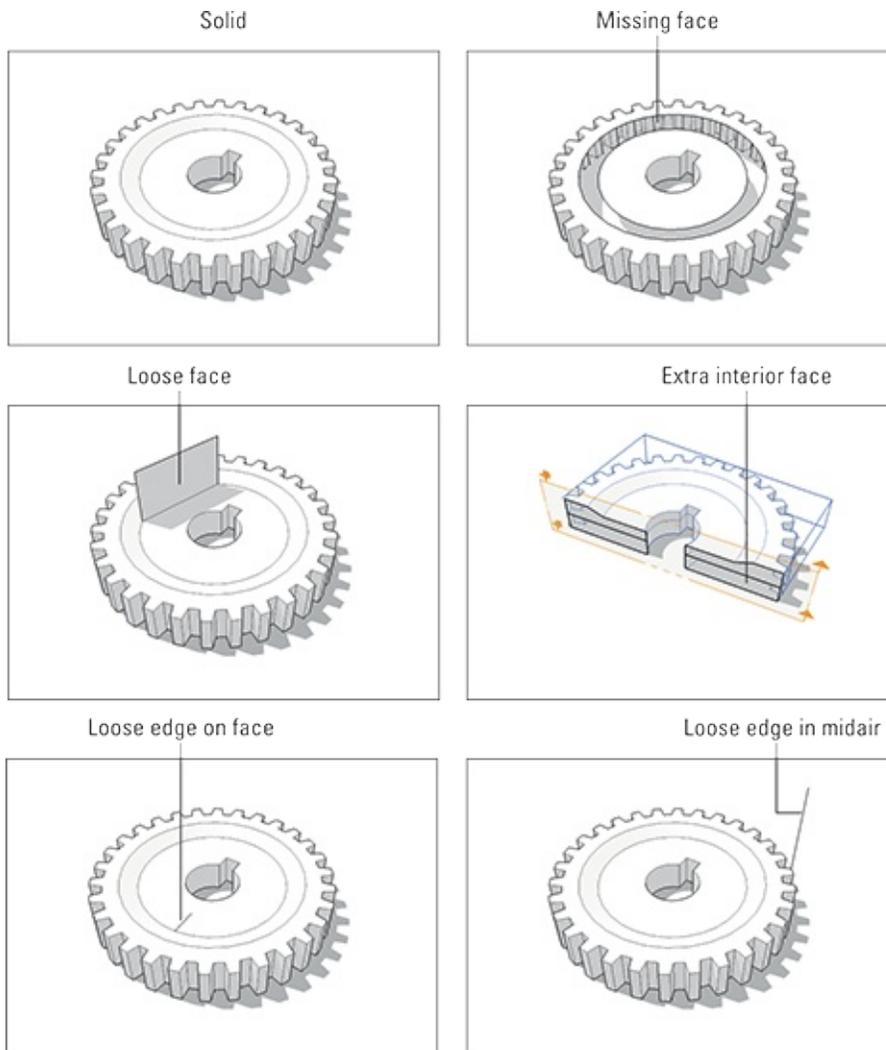
Before you can use the Solid Tools, you need *solids*. Here are six things you need to know about solids; you can think of them as the Solid Rules:

- ✓ **A solid is nothing more than an object that's completely enclosed.** It has no holes or other gaps; if you filled it with water, none would leak out. For this reason, solids are sometimes referred to as being *watertight*. Here's another way to think about it: Every edge in a solid must be bordered by two faces.
- ✓ **No extra edges or faces allowed.** You wouldn't think that one or two edges or faces would make much of a difference, but it does — solids can't contain *any* extra geometry, period. Figure 6-25 shows some examples of things that can disqualify otherwise completely enclosed shapes from being solids.



A few Ruby scripts make it easier to figure out why a particular group or component isn't solid. Take a look at this book's website at [www.dummies.com/extras/sketchup2014](http://www.dummies.com/extras/sketchup2014) to see a list.

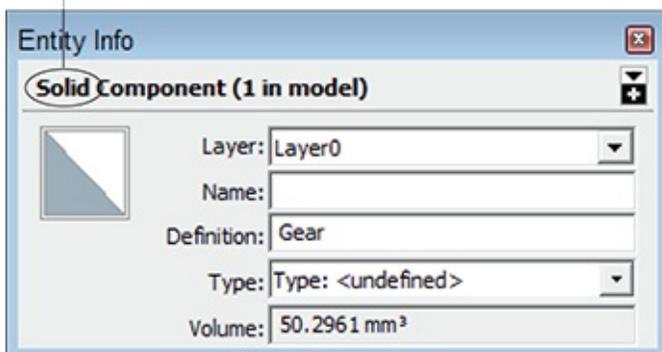
- ✓ **Only groups and components can be solids.** This one's a biggie. For SketchUp to *realize* something is a solid, you have to make it into either a group or a component first. Another thing: Solid groups and components can't have other groups and/or components nested inside them.
- ✓ **Making a solid doesn't require any special tools.** You don't have to pick from a special list of objects to create solids; you make them with the same SketchUp tools you use all the time. Case in point: Every time you've pushed/pulled a rectangle into a box, you've created a solid.



**Figure 6-25:** Solids can't contain any extra edges or faces.

- ✓ **Check Entity Info to see if your object is a solid.** The easiest way to tell whether a group or component is a solid is to select it and choose Window⇒Entity Info. If it's solid, this dialog box will say either "Solid Group" or "Solid Component." Have a look at Figure 6-26 to see what I mean.
- ✓ **Solids have volumes.** Manually calculating the volume of a simple shape like a rectangular box is straightforward, but try it for anything more complicated and you'll see why the Volume readout in Entity Info is so great. Figure 6-26 shows where to look.

This means it's a solid



**Figure 6-26:** Check the Entity Info dialog box to see whether your selection is a solid.



✓ **Solids can be made up of multiple shapes.** This one confused me at first. As long as each individual cluster of geometry within a group or component is completely enclosed, SketchUp considers that group or component to be a solid. It doesn't matter that they're not connected or touching in any way; what's important is that an area of space is fully surrounded by faces.

## Checking out the Solid Tools

When you have a solid object or objects, you can use SketchUp's Solid Tools in powerful ways to create shapes that'd otherwise be very complicated and time-consuming to make. For example:

- ✓ Add two solids together to create a new one.
- ✓ Use one solid to cut away part of another one.



To see SketchUp's Solid Tools in action, watch the video available via [www.dummies.com/extras/sketchup2014](http://www.dummies.com/extras/sketchup2014).



With the SketchUp Intersect Faces tool, you can achieve many of the same things that the Solid Tools do. Intersect Faces takes longer because it requires an awful lot of cleanup; however, it's still useful for two very important reasons: It's available in both the free and Pro versions of SketchUp, and it works on any face in your model — not just on solids. You can read about Intersect Faces in Chapter [4](#).

Two things you need to know before you start using the Solid Tools:

- ✓ **Open the dedicated toolbar.** Choose View⇒Toolbars⇒Solid Tools to open the toolbar that contains all six tools. You can also find them on the Tools menu. Keep in mind that five of them — all but the Outer Shell tool — are available only if you have SketchUp Pro 8 or later.
- ✓ **To use the Solid Tools, preselect — or don't.** Pick the tool you want to use either *before* or *after* you've told SketchUp which solid objects you want to affect. Like most “order of operations” issues (are you listening, Follow Me tool?), this can be confusing for some folks.



I find the easiest way to use the Solid Tools is to preselect the solids I want to use and *then* choose the tool to carry out the operation. The glaring exceptions to this rule are the Subtract and Trim tools; both of these depend heavily on the *order* in which you pick your solids. Take a peek at Table [6-1](#) for more specifics.

Without further ado, here's Table [6-1](#) with a rundown of the Solid Tools. (Check out Figure [6-27](#) for a visual.)

Table 6-1

## The Solid Tools

| <i>Tool</i> | <i>Make or Pro?</i> | <i>What It Does</i>   | <i>How to Use It</i>  | <i>Start With</i> | <i>End With</i> |
|-------------|---------------------|---|---|-------------------|-----------------|
| Union       | Pro only            | Combines two or more solids into a single solid. Deletes overlapping geometry. Preserves internal pockets.* | Select the solids you want to use and then activate the tool.             | Two+ solids       | One solid       |
| Outer Shell | Make and Pro        | Combines two or more solids into a single solid. Deletes overlapping geometry, including internal pockets.* | Same as Union tool.   | Two+ solids       | One solid       |
| Intersect   | Pro only            | Makes a single solid in which two or more solids overlap. Deletes everything else.                          | Same as Union tool.   | Two+ solids       | One solid       |
| Subtract    | Pro only            | Uses one solid to cut away part of another solid. Deletes the first solid when it's done.                   | Activate the tool, click "cutting" solid, and then click solid to be cut. | Two solids        | One solid       |
| Trim        | Pro only            | Uses one solid to cut away part of another solid. Keeps what's left of both solids.                         | Same as Subtract tool.  | Two solids        | Two solids      |

|       |          |   |                     |            |              |
|-------|----------|---|---------------------|------------|--------------|
| Split | Pro only | Cuts two solids where they overlap and creates a new solid from the overlap. Doesn't delete anything. | Same as Union tool. | Two solids | Three solids |
|-------|----------|---|---------------------|------------|--------------|

---

\* An internal pocket is like a solid within a solid — it's a completely enclosed volume that happens to be located inside the main volume of a solid. Picture a SketchUp model of a tennis ball. Because tennis balls have a thickness, you'd need two surfaces to model one: one for the inside, and one for the outside. If you selected both and made a group, you'd have a solid with an internal pocket inside.



Note that the Split tool actually does three operations every time you use it: It yields two subtractions and an intersection. That is to say, using Split is like using both Subtract *and* Intersect on your solids. For this reason, I've taken to replacing both of these tools with Split full-time. It's easier to keep track of what's going to happen, and the only downside is that I have to delete a couple extra objects when I'm done.

## Putting the Solid Tools to work

In this section, I give a few examples of everyday modeling challenges that the Solid Tools can help make less challenging. You're almost certain to encounter these tricky situations while you climb the ladder toward ultimate SketchUp ninjahood.

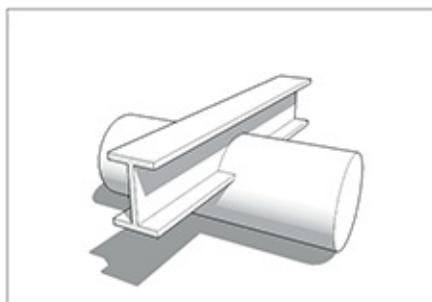
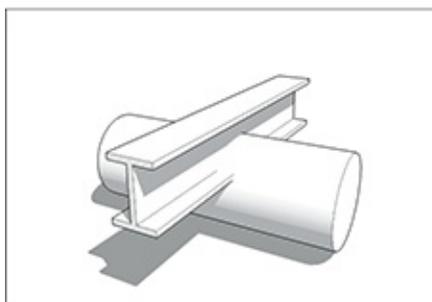
### Assembling complex objects with Union or Outer Shell

Chapter 4 has a section about using the Intersect Faces tool to combine multiple roof pitches into a single, solitary roof. If all those gables, hips, dormers, and other roof elements are solids, you can absolutely use SketchUp's Union or Outer Shell tools to make quick work of the problem.

The same goes for anything that's composed of several disparate elements that you've assembled by moving them together until they overlap. In the spacecraft in Figure 6-28, the *hull* (or body) of the craft is a combination of different pieces I modeled separately. Notice the lack of edges where the components intersect? I don't like that — I think edges add detail and definition, especially when my model is displayed using a lines-only style (as it is here). There's also the issue of all the geometry hidden inside the hull. Combining everything together into a single solid helps it shed weight and look better, all at the same time.

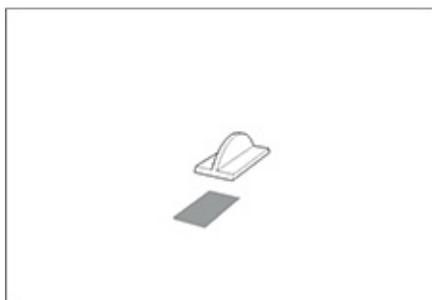
Original solid groups

Union



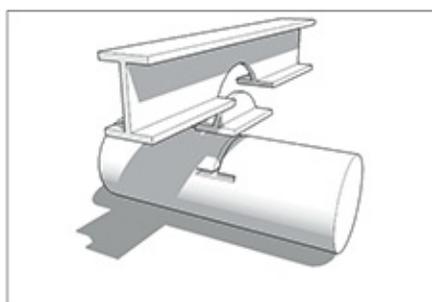
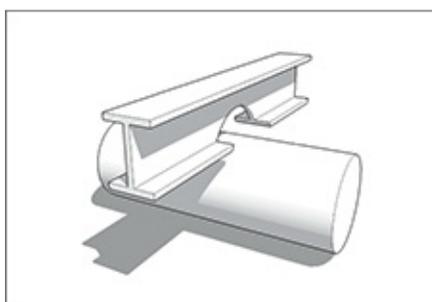
Intersect

Subtract



Trim

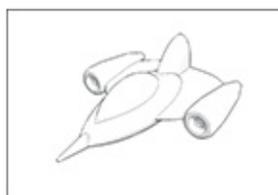
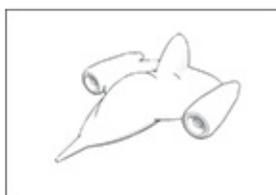
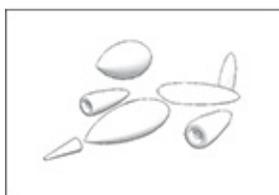
Split



**Figure 6-27:** The Solid Tools let you do additive and subtractive modeling operations.

Start with several solids

Use Union to put them together



**Figure 6-28:** Using Union or Outer Shell to combine several solids gets rid of internal geometry and adds edges where faces intersect.

### ***Using Intersect in combination with front, top, and side views***

Anyone who's ever tried to model a car with SketchUp knows it's a tricky undertaking. The problem is that cars (and most other vehicles) are kind of curvy; worse yet, they're curvy in several directions.

One trick lots of modelers use to block out a basic shape for things like cars is to start with *orthographic* — straight-on top, front, and side — views of the thing they're trying to model. Here's how the method works:

1. **Position each 2D view where it belongs in 3D space.**
2. **Push/pull them all so their extrusions overlap.**
3. **Use the Intersect tool (Tools⇒Solid Tools⇒Intersect) to find the object the extrusions all**

## have in common.

This method doesn't always produce perfect results, but it's a lot better than guessing. Plus, it's fun. Figure 6-29 shows the technique in action.

### *Modeling close-fitting parts with Trim*

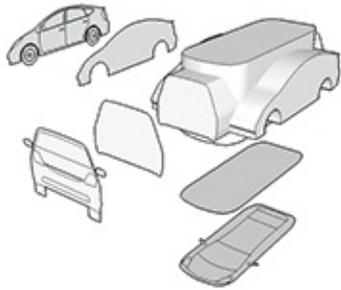
Woodworkers and industrial designers, take heed: SketchUp Pro's Trim tool saves you literally hours of work. Anytime you need to build a model with parts that interlock or otherwise fit together closely, Trim is where you should look first.

Trim basically tells one part to "take a bite" out of another, which is perfect for joinery (dovetails, finger joints, dadoes, and so on), machine parts, ball-and-socket joints, and any other positive/negative conditions where two parts meet.

In Figure 6-30, I build a small wooden box with dovetailed sides and a dadoed bottom.

Create solids from front, top, and side views

Position them precisely



Use Intersect to find shape they have in common

Smooth edges and use Intersect Faces with Model to transfer details



**Figure 6-29:** If you have orthographic views of the thing you're trying to model, you can use Intersect to give yourself a head start.



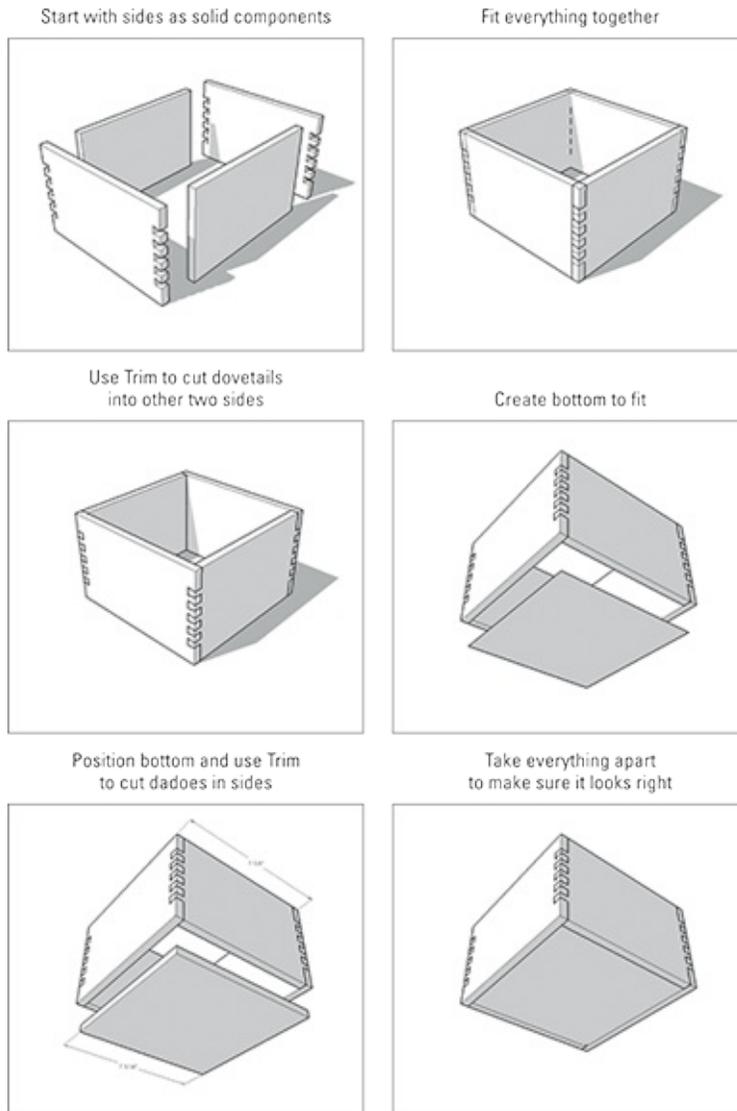
The only tricky thing about using the Trim tool is remembering which solid to pick first. Remember that the first thing you pick (or click) is the one you want to use to cut with. In the case of the box in Figure 6-30, that would be the side with the dovetails. When I select the dovetails and then select the blank side, the Trim tool cuts the dovetails into the second piece. You get the hang of it after a few tries.



The Trim tool has a neat trick up its sleeve: You can keep using your cutting solid on multiple other solids. To cut the *dado* (or groove) into the sides of the box in Figure 6-30, follow these steps:

**1. Choose Tools⇒Solid Tools⇒Trim to activate the Trim tool.**

Your cursor has the number 1 on it.



**Figure 6-30:** The Trim tool is perfect for modeling joinery and other close-fitting parts.

**2. Select the box bottom.**

Your cursor changes to show the number 2.

**3. Select one side on the box.**

You just cut a dado using the box bottom you picked in Step 2. Your cursor still says 2.

**4. Select another of the box's sides to create another dado.**

**5. Select the remaining two sides to cut dados in them, too.**

Fun!



A question that comes up pretty frequently concerning what happens when you use one of the Solid Tools on a component instance. Why doesn't the effect of what you just did affect all the other instances of that component? It should, shouldn't it? Anyone who's read [Chapter 5](#) of this book should know that ... .

Here's the thing: As soon as you use a Solid Tool on a component instance, SketchUp makes that instance unique; it's still a component — it just isn't connected to the other instances anymore.

## Chapter 7

# Keeping Your Model Organized

---

### *In This Chapter*

- ▶ Taking stock of your model with the Outliner
  - ▶ Avoiding problems by using layers the right way
  - ▶ Looking at how everything works together
- 

Starting with this chapter, I may sound like your mom: “Clean up your room! Don’t leave your toys in the driveway! Put your dishes in the sink!” As everybody knows, living life can be a messy ordeal, and modeling in SketchUp is no exception. As you crank away at whatever it is you’re building, you’ll reach a time when you stop, orbit around, and wonder how your model got to be such a pigsty. It’s inevitable.

Luckily, SketchUp includes a bunch of different ways to keep your *geometry* — edges and faces — from getting out of control. Because big, unwieldy, disorganized models are a pain to work with — they can slow your computer, or even cause SketchUp to crash. You should definitely get in the habit of “working clean” (as cooking shows like to call it). As I say earlier, I don’t mean to nag; I just want you to be familiar with the techniques experienced SketchUp modelers use to keep their sanity.

In this chapter, I present the two main tools that SketchUp provides for organizing your model. In the first section, I outline both tools and talk about what they’re for. Then I dive into the details about each one, describing how to use them and how *not* to use them (are you listening, layers?). This chapter ends with a detailed example of how you can use both tools together to make your life easier; I show you how I organize a model of my house.

## *Taking Stock of Your Organization Options*

When sorting out the thousands of edges and faces in your model, it’s all about lumping things together into useful sets. After you separate things into sets, you can name them, hide them, and even lock them so that you (or somebody else) can’t mess them up.



If you haven’t read about groups and components yet, now would be a good time to take a look at Chapter 5 — the stuff in this chapter is best understood if you have a firm grasp on the stuff in that one.

You have two organizational methods at your disposal in SketchUp. The best modelers use both all the time:

✓ **Outliner:** The Outliner is a dialog box that’s basically a fancy list of all the groups and

components in your SketchUp model. It shows you which groups and components are nested inside other ones, lets you assign names for them, and gives you an easy way to hide parts of your model that you don't want to see. If you use a lot of components (and you should), the Outliner may well become your new best friend.

✓ **Layers:** This is where a lot of people reading this book let out a big sigh of relief. “Thank goodness,” they’re thinking, “I was beginning to think SketchUp doesn’t have layers.” For people who are used to organizing content in other software programs, layers are usually where it’s at — you put different kinds of things on different layers, name the layers, and then turn them on and off when you need to. It’s a pretty simple concept. In SketchUp, layers are similar — but the ways in which SketchUp layers work differently are important for modelers to know.



In SketchUp, using layers the wrong way can seriously mess up your model. I’m not kidding. If you plan to use them, read the section “[Discovering the Ins and Outs of Layers](#),” later in this chapter. Not doing so can result in serious injury or even death — depending on how upset you get when your 50-hour model gets ruined.



The folks at SketchUp added an enormously powerful, enormously complicated new feature to SketchUp 2014 Pro: Classifications. Basically, it lets you tag groups and components in your model with special identifiers that make them more useful — in very specific circumstances.

If you’re using SketchUp Pro as part of a BIM (Building Information Modeling) workflow, *and* you want to imbue your model with juicy metadata while it’s still in SketchUp, you can. All you have to do is load an existing classification *schema* and apply Type metadata to the component definitions you want to classify. Not lost yet? If you like, you can even make your own *schemata* (the plural form of “schema”) using properly formatted XML to create your own .xsd files. Oof.

Needless to say, Classifications is a feature too technical for me to cover in a book like this one. You don’t need to use it for basic, everyday modeling; you might not even need to use it if you’re designing a new habitation module for the moon. But for folks who *do* need it (and there are more and more of them every year), it’s a giant step forward for keeping SketchUp Pro integrated with modern, connected BIM software.

## Seeing the Big Picture: The Outliner

I’m a person who really likes to make lists. Not only that, but I love to *look at* lists — information arranged neatly into collapsible rows is the kind of thing that brings a tear to my eye.

Now, before you decide that I ought to be locked in a small room with cushions on the walls, consider this: Most halfway-complicated SketchUp models consist of dozens, if not hundreds, of groups and components. These groups and components are nested inside each other like Russian dolls, and many are heavy, computer-killing behemoths like three-dimensional trees and shrubs.

Without a list, how are you going to manage all your groups and components? How are you going to keep track of what you have, hide what you don't want to see, and (more importantly) *unhide* what you *do* want to see? I thought so — I guess it turns out I'm not so crazy after all.

## Taking a good look at the Outliner

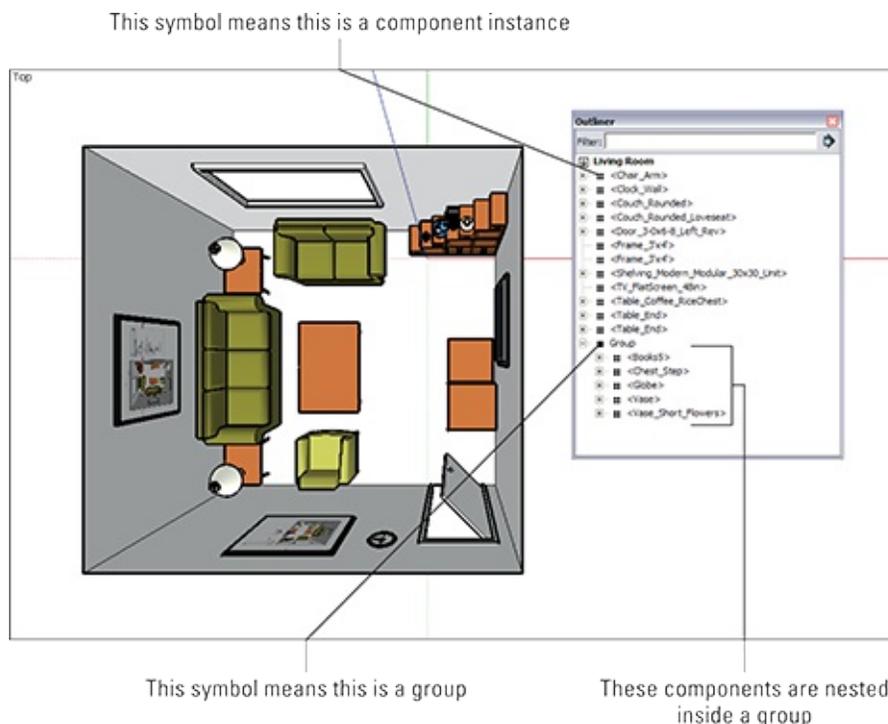
You can open the Outliner dialog box by choosing Window⇒Outliner. Figure 7-1 shows what it looks like when a model consists of a simple room with some furniture in it. Each piece of furniture is a separate component that I downloaded from the SketchUp 3D Warehouse. (Check out Chapter 5 for the whole story.)

The Outliner dialog box has the following features:

- ✓ **Search filter box:** If you type a word or phrase into this box, the Outliner shows only the items in your model that include that word or phrase in their names. For example, type **coffee**, and only the coffee table component is visible.
- ✓ **Outliner Options flyout menu:** This handy little menu contains three options:
  - *Expand All:* Choose this option to have the Outliner show *all* the nested groups and components in your model — every last one of them (provided they're on visible layers).



The Outliner shows only groups and components that exist on visible layers in your model. In other words, anything on a hidden layer doesn't appear in the Outliner, so be extra careful if you're using both the Outliner and layers to organize your model. You can read all about layers in the “[Discovering the Ins and Outs of Layers](#)” section, later in this chapter.



**Figure 7-1:** The Outliner, when I have a few components in my model.

- *Collapse All*: This option collapses your Outliner view so that you see only *top-level* groups and components — ones that aren't nested inside other groups and components.
- *Sort by Name*: Select this option to make the Outliner list the groups and components in your model alphabetically.

✓ **Outliner List window**: All the groups and components in your model are listed here. Groups and components that hold nested groups and components have an Expand/Collapse toggle arrow next to their names. When they're expanded, the constituent groups and components appear in the list.

## Making good use of the Outliner



If you use lots of groups and components (and you should), having the Outliner open onscreen is one of the best things you can do to model efficiently.

Here's why:

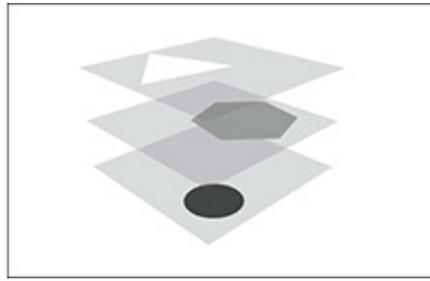
- ✓ **Use the Outliner to control visibility.** Instead of right-clicking groups and components in your model to hide them, use the Outliner instead. Just right-click the name of any element in the Outliner and choose Hide. When you do, the element is hidden in your modeling window and its name is grayed out and italicized in the Outliner. To unhide it, just right-click its name in the Outliner and choose Unhide.
- ✓ **Drag and drop elements in the Outliner to change their nesting order.** Don't like having the component you just created nested inside another component? Simply drag its name in the Outliner to the top of the list. This moves the component to the top level, meaning that it's not embedded in anything. You can also use the Outliner to drag groups and components into other ones, too.
- ✓ **Find and select things using the Outliner.** Selecting something in the Outliner highlights that something's name and selects it in your modeling window. This is a much easier way to select nested groups and components, especially if you're working with a complex model.

## Discovering the Ins and Outs of Layers

I'm gonna give it to you straight: Layers are a very useful part of SketchUp, and they can make your life a lot easier. Layers can also be a major source of heartache because they can *really* mess up your model if you're not careful. In this section, I try to set you on the right track.

### What layers are — and what they're not

In a 2D program like Photoshop or Illustrator, the concept of layers makes a lot of sense: You can have content on any number of layers, sort of like a stack of transparencies. You find a distinct order to your layers, so anything on the top layer is visually in front of everything on all the other layers. Figure [7-2](#) shows what I mean.



**Figure 7-2:** In 2D software, layers are pretty straightforward.

But hold on a second — SketchUp isn't a 2D program; it's a 3D program. So how can it have layers? How can objects in three-dimensional space be layered on top of each other so that things on higher layers appear in front of things on lower ones? In short, they can't — it's impossible. Layers in SketchUp are different from layers in most other graphics programs, and that's confusing for lots of people.



SketchUp has a layers system because some of the very first SketchUp users were architects, and many, *many* architects use AutoCAD drawing software. Because AutoCAD uses layers extensively, layers were incorporated into SketchUp to maximize compatibility between the two products. When you import a layered AutoCAD file into SketchUp, its layers show up as SketchUp layers, which is pretty convenient. For more information about importing CAD files into SketchUp Pro, take a gander at the last part of Chapter [8](#).

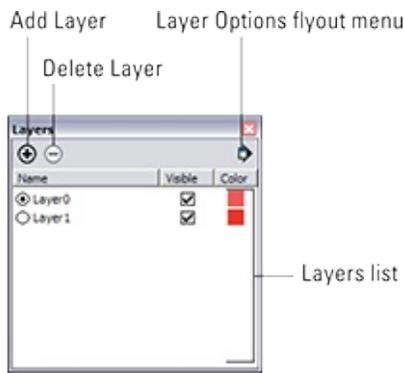


So what are SketchUp layers for? Layers control visibility. Use them to gather particular kinds of geometry so that you can easily turn it on (make it visible) and turn it off (make it invisible) when you need to. That said, layers *don't* work the same way as groups and components; your edges and faces aren't isolated from other parts of your model, which can cause major confusion if you're not careful. Take a look at the section "[Staying out of trouble](#)," later in this chapter, to find out more.

## Using layers in SketchUp

You can find the Layers dialog box on the Window menu. It's a pretty simple piece of machinery, as shown in Figure [7-3](#). Here's what everything does:

- ✓ **Add Layer:** Clicking this button adds a new layer to your SketchUp file.
- ✓ **Delete Layer:** Click this button to delete the currently selected layer. If the layer you're trying to delete contains anything, SketchUp asks what you want to do with it; choose an option and click Delete.



**Figure 7-3:** The Layers dialog box.

✓ **Layer Options flyout menu:** This menu offers the following useful options:

- *Purge:* When you choose Purge, SketchUp deletes all the layers that don't contain geometry. This is a handy way to keep your file neat and tidy.
- *Color by Layer:* Notice how each layer in the list has a little material swatch next to it? Choosing Color by Layer temporarily changes all the colors in your SketchUp model to match the colors (or textures) assigned to each layer. To see what's on each layer, this is the way to go.

✓ **Layers list:** This is a list of all the layers in your SketchUp file. You need to know about these three columns:

- *Name:* Double-click a layer's name to edit it. Giving your layers meaningful names is a good way to quickly find what you want.
- *Visible:* This check box is the heart and soul of the Layers dialog box. When it's selected, the geometry on that layer is visible; when the check box isn't selected, the layer's geometry isn't visible.
- *Color:* You can choose to view your model using Color by Layer, which I describe earlier in the list. You can choose which material (color or texture) to assign to each layer by clicking the Color swatch.

## Adding a new layer

Follow these steps to add a layer to your SketchUp file:

### 1. Choose Window⇒Layers.

The Layers dialog box opens.

### 2. Click the Add Layer button to add a new layer to the Layers list.

If you want, you can double-click your new layer to rename it.



Another, slightly trickier, way to add a new layer to your model is to type a new layer name into the Layer field in the Entity Info dialog box, and then press Enter. (Find the Entity Info dialog box by choosing Window⇒Entity Info.) This both creates a new layer with that

name and moves whatever geometry is currently selected onto it. My advice is to save this particular time-saver for when you're more experienced — nothing about Layers is as straightforward as it seems.

## ***Moving entities to a different layer***

Moving things from one layer to another involves using the Entity Info dialog box. Follow these steps to move an *entity* (an edge, face, group, or component) to a different layer:

### **1. Select the entity or entities you want to move to another layer.**



Move only groups and components to other layers; have a look at the next section in this chapter to find out why.

### **2. Choose Window⇒Entity Info.**

The Entity Info dialog box opens. You can also open it by right-clicking your selected entities and choosing Entity Info from the context menu.

### **3. In the Entity Info dialog box, choose a layer from the Layer drop-down list.**

Your selected entities are now on the layer you chose from the list.

## ***Staying out of trouble***

As I said before, layers can be really helpful, but you need to know how to use them; if you don't, bad things can happen. Check out the following do's and don'ts before you start working with layers:



- ✓ **Do all your modeling on Layer0.** Always make sure that Layer0 is your current layer when you're working. Keeping all your loose geometry (that's not part of a group or component) together in one place is the *only* way to make sure that you don't end up with edges and faces all over the place. SketchUp, unfortunately, lets you put geometry on whatever layer you want, which means that you can end up with a face on one layer, and one or more of the edges that define it on another. When that happens, it's next to impossible to work out where everything belongs; you'll spend hours trying to straighten out your model. This property of SketchUp's layers system is a major stumbling point for new SketchUp users; knowing to keep everything on Layer0 can save you a lot of anguish.
- ✓ **Don't move anything but groups and components to other layers.** If you're going to use layers, follow this rule: *Never* put anything on a layer other than Layer0 unless it's a group or a component. Doing so ensures that you don't end up with stray edges and faces on separate layers.
- ✓ **Use layers to organize big groups of similar things.** More complicated SketchUp models often include things like trees, furniture, cars, and people. These kinds of things are almost

always already components, so they're perfect candidates for being kept on separate layers. I often make a Trees layer and put all my tree components on it. This makes it easy to hide and show all my trees at once. This speeds my workflow by improving my computer's performance. (Trees are usually big, complicated components with lots of faces.)

- ✓ **Don't use layers to organize interconnected geometry; use the Outliner instead.** By *interconnected geometry*, I mean things like building floor levels and staircases. These model parts aren't meant to be physically separate from other parts in the way that vehicles and people are. When you put Level 1 on one layer and Level 2 on another, more often than not, you become confused about what belongs where: Is the staircase part of Level 1 or Level 2? Instead, make a group for Level 1, a group for Level 2, and a group for the staircase — you'll need less headache medicine at the end of the day.



- ✓ **Feel free to use layers to iterate.** *Iteration* is the process of doing multiple versions of the same thing. Lots of designers work this way to figure out problems and present different options to their clients. Using layers is a great way to iterate: You can move each version of the thing you're working on to a different layer, and then turn them on and off to show each in turn. Just remember to follow the rule about using groups and components only on separate layers (mentioned previously), and you'll be fine.



Check out the sidebar “[Using Scenes to control layers](#)” (later in this chapter) for a nifty way to quickly flip through layers that represent design iterations in your model.

## Putting It All Together



In this chapter (and in Chapter 5), I talk about each of SketchUp's organizational methods in isolation: discussing how they work, why they're special, and when to use them. When you're actually working in SketchUp, you probably use a combination of them all, so I thought you'd find an example of all the organizational tools in action especially helpful. To see a video of the concepts I outline in this section, check out the link at [www.dummies.com/extras/sketchup2014](http://www.dummies.com/extras/sketchup2014).

Figure 7-4 (along with a couple pages in this book's color insert) shows a model of a small house I'm building in SketchUp. I'm using all of SketchUp's organizational tools to help me manage my model's complexity while I'm working:

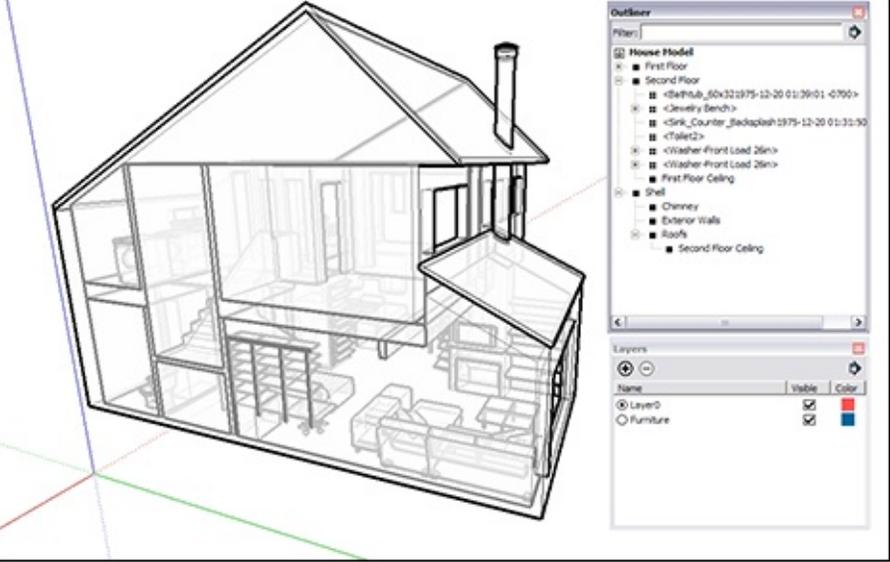


Figure 7-4: I'm using all of SketchUp's organizational tools to build this model.

✔ **Each floor level is a group.** By working with each floor level as a separate group, I can use the Outliner to hide whichever one I'm not working on. This makes it easier to see what I'm doing. I'm including the house's only staircase in the first floor group because that turns out to be the easiest thing to do.



I've decided to include the interior walls on each level of my house in that level's group. I don't think I'll ever have to hide them, so it wasn't worth making them a separate group. For what it's worth, I think the same thing probably applies to most buildings, unless you plan to study different floor plans with different interior wall arrangements.

✔ **The roof and exterior walls are groups inside of another group.** I want to be able to remove the roof and the exterior walls separately, so I've made each of them a group. I also want to be able to hide and unhide them both at the same time, so I made a Shell group that includes them both. Using the Outliner, I can selectively show or hide just the geometry I want. See Figure 7-5.

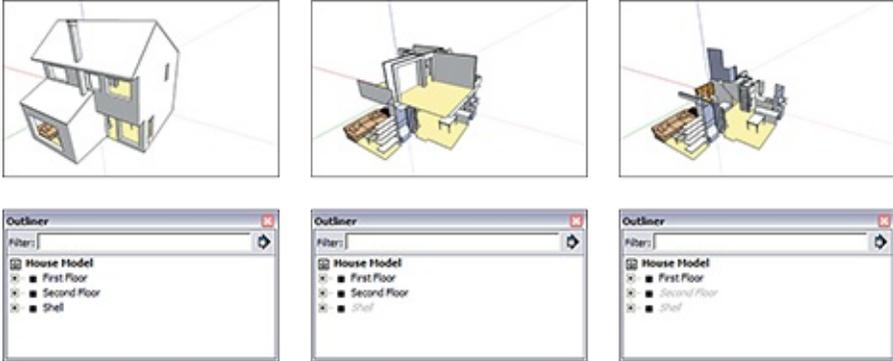


Figure 7-5: Each floor of my house, as well as the roof and the exterior walls, is a group.



The floor levels, roof, and exterior walls of my house are groups instead of components because they're *unique* — I have only one first floor, so it doesn't need to be a

component.

- ✓ **All the furniture and plumbing fixtures are components.** All the components I use to furnish my house are ones I built myself, took from the Components dialog box, or found in the 3D Warehouse.



But I have only one couch: Why make it a component instead of a group? By making every piece of furniture in my model a component, I can see a list of my furniture in the In Model collection of the Components dialog box. I can also save that as a separate component collection on my computer. The next time I move, I'll have all my furniture in a single place, ready to drop into a model of my new house.

- ✓ **All my furniture is on a separate layer.** Because furniture components can be a little *heavy* — taxing my computer system — and because I want the ability to see my house without furniture, I created a new Furniture layer and moved all my furniture onto it. Using the Layers dialog box, I can control the visibility of that layer with a single mouse click.



But why not just create a group from all my furniture components and use the Outliner to hide and unhide them all, instead of bothering with layers? Good question. Changing a component's layer is easier than adding a component to an existing group. To add something to a group, I need to use the Outliner to drag and drop that something in the proper place; with complex models, this can be a hassle. Changing a component's layer is just a matter of using the Entity Info dialog box to choose from a list.



## Using Scenes to control layers

If you're reading this book from front to back, you haven't yet encountered any mention of SketchUp's Scenes feature — Chapter [11](#) is where you can go to read all about it. Without diving into too much redundant detail, *scenes* are basically saved views of your model. Instead of fiddling with navigation tools and dialog boxes every time you want to return to an important view, you can click a scene tab.

Scenes are relevant in this chapter because scenes don't just save different camera positions; you can also use them to control layer visibility. Being able to click a scene tab to instantly change which layers are showing is a crazy-powerful way to do *iterative design*: creating and presenting different options within the same design.

A very simple example: You've modeled a living room and want to try three different furniture configurations:

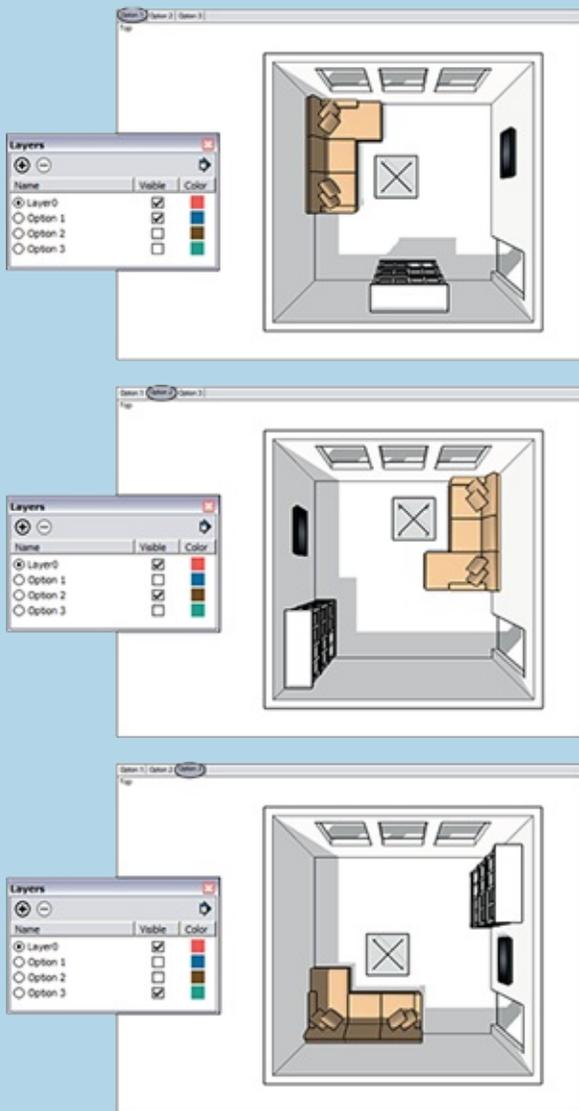
1. **Make three layers — Option 1, Option 2, and Option 3.**
2. **Do three separate furniture arrangements, one per layer.**  
Of course, this means that you have three copies of each object you move.
3. **Use the Layers dialog box to show Option 1, and hide Option 2 and Option 3.**
4. **Create a new scene and name it Option 1 using the Scenes dialog box.**

## 5. Repeat Steps 3 and 4 for the other two configurations.

Now all you have to do is click a scene tab to switch among the three options; this is much more elegant than having to fiddle with the Layers dialog box during a presentation. See the image below to get an idea of the setup.

The key to making this technique really sing is a working knowledge of how to use the Properties to Save check boxes in the Scenes dialog box. I should warn you: This isn't beginner-level stuff. Hooking up scenes and layers takes practice, but after you get the hang of it, it's an elegant way to work. Pick your way through Chapter [11](#), when you're ready.

One more useful tidbit: The Layer Tools plugin lets you (among other things) create a new layer that isn't visible in any of the scenes you've made previously. This plugin comes in handy when you need to add a new iteration *after* you've already made a bunch of scenes; without the plugin, your new layer is visible in every scene, forcing you to manually go through and hide it in each one. Take a look at this book's website at [www.dummies.com/extras/sketchup2014](http://www.dummies.com/extras/sketchup2014) for more information about Layer Tools and other useful plugins.



## Chapter 8

# Modeling with Photos and Other Resources

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### ***In This Chapter***

- ▶ Painting faces in your model with photographs
  - ▶ Building a model from scratch with SketchUp's photo-matching tools
  - ▶ Using photo-matching to match your model to a photograph
  - ▶ Giving your model a geographic location
  - ▶ Starting out with a 2D CAD file in SketchUp Pro
- 

Building a model from scratch is all fine and well, but there's an awful lot of information — in the form of digital photos, 3D terrain data, and even existing 2D CAD files — that you can import and use in SketchUp.

If you have a model you want to paint with photographs, you can do that. You can apply photos to faces and then use the information in the pictures to help with modeling; building windows is a lot easier when they're painted right on the wall. That's what I talk about in the first part of this chapter.

If you want to use a photo as a basis for modeling something that exists in the real world, you can do that in SketchUp, too. Photo-matching makes it (relatively) simple to bring in a picture, set things up so that your modeling window view matches the perspective in the photo, and then build what you see by tracing with SketchUp's modeling tools.

SketchUp spent six years of its life as a Google product, which provided it with unbelievable access to that company's vast trove of geographic data. High-resolution aerial imagery, detailed 3D terrain models, and billions upon billions of ground-level photos taken by Google's fleet of Street View vehicles are all available for your use in SketchUp. For free.

If you're working with SketchUp Pro, you can import a CAD file to use as a starting point for a 3D model. It's not hard, but I want to share a few hints with you before you try it for the first time.

## ***Painting Faces with Photos***

Technically, painting surfaces with pictures using 3D software is called *mapping*, as in “I *mapped* a photo of your face to the underside of the pile-driver model I'm building.” Different software programs have different methods for mapping pictures to faces, and luckily, SketchUp's are pretty straightforward.

The following sections deal with mapping photos to two kinds of faces: flat ones and curved ones. The tools are similar, but the methods aren't. I show you both because you never know what

you're going to run into.



SketchUp uses lots of terms to refer to the stuff you can paint faces with; generically, they're all *materials*. Materials can be colors or textures; *textures* are image-based, and *colors* are a single, solid hue. When you import an image to map it to a face, it becomes a texture — just like any of the other textures in your Materials dialog box. Read more about using materials in SketchUp in Chapter [2](#).

## Adding photos to flat faces

When mapping photos onto flat faces, you can choose the easy way or the hard way. Unfortunately, the hard way is the method you end up using the vast majority of the time, so I describe it first. Importing images by using the File menu lets you take any image and map it to any flat face in your model.

The easy way, which I get to in a few pages, is designed for one particular case: It gives you access to Google's huge collection of Street View imagery, letting you paint your models with building facades photographed by Google's roving fleet. The feature is cool, but also very specific.

## Importing images: Use your own photos



Follow these steps to map an image to a face (and check out the video of these steps via the link at [www.dummies.com/extras/sketchup2014](http://www.dummies.com/extras/sketchup2014)):

Before you follow these steps, make sure you have at least one face in your model; you map your texture to a face.

### 1. Choose File⇒Import.

The Open dialog box opens.

### 2. Select the image file you want to use as a texture.

You can use JPEGs, TIFFs, and PNGs as textures in SketchUp; all these are common image file formats.

### 3. Select the Use as Texture option, as shown in Figure [8-1](#).

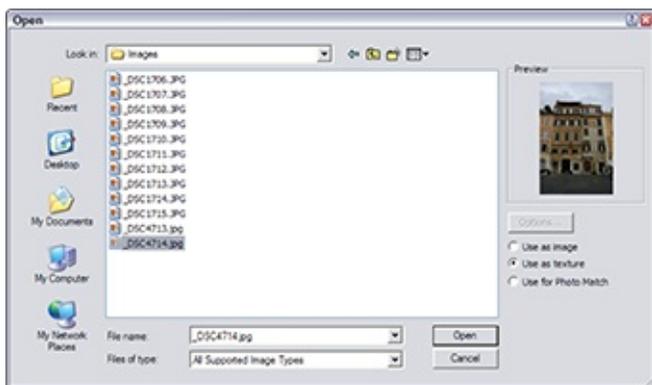


Figure 8-1: Make sure to pick Use as Texture.

#### 4. Click the Open button.

The Open dialog box closes, and Paint Bucket becomes your active tool, with the cursor loaded with the image you chose to import.

#### 5. Click once in the lower-left corner of the face you want to paint. (See Figure 8-2.)

Your click tells SketchUp where to position the lower-left corner of the image you're using as a texture. You can click anywhere on the face you're trying to paint, but I recommend the lower-left corner — it keeps things simple.

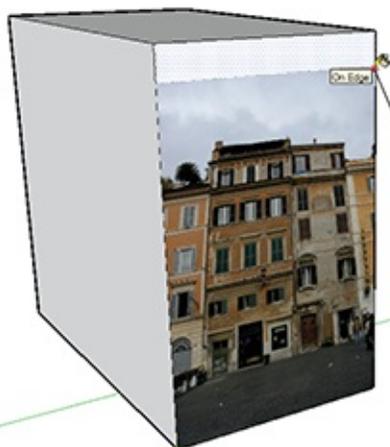
#### 6. Click somewhere else on the face you're painting. (See Figure 8-2.)



Time for a little bit of theory: Image textures in SketchUp are made up of *tiles*. To make a large area of texture, such as a brick wall, SketchUp uses a bunch of tiles right next to each other. In the case of a brick wall, it may look like there are thousands of bricks, but it's really just the same tile of about 50 bricks repeated over and over again.

Because SketchUp treats imported image textures just like any other texture, what you're really doing when you click to locate the upper-right corner of your image is this: You're telling SketchUp how big to make the tile for your new photo texture. Don't worry too much about getting it right the first time, though — you can always tweak things later.

Unless the proportions of your image perfectly match the face onto which it was mapped, you should see your image repeating. Don't worry — that's normal. SketchUp automatically tiles your image to fill the whole face. If you want to edit your new texture so that it doesn't look tiled (and you probably do), skip to the later section, "[Editing your textures](#)." You can scale, rotate, skew, or even stretch your texture to make it look however you want.



Click here to place the bottom left corner of your image...

...then click here to finish placing your image

**Figure 8-2:** Click once to locate the lower-left corner of the image you're using as a texture. Click again to locate the upper-

## ***Get Photo Texture: Use online imagery***

A few years ago, Google undertook a Street View project to enhance Google Maps. The company built special photography units, strapped them onto the roofs of vehicles, and drove them down every public highway, street, and lane it could, snapping away. Recently, Google has added imagery taken from specially equipped backpacks, tricycles, snowmobiles, museum trolleys, and even river rafts. The result is an immersive and spookily cool way to experience the outside world from the lazy comfort of your computer screen.

Street View and SketchUp got wired together back in SketchUp 8; since then, you've been able to grab imagery from the former and use it in the latter. If your goal is to build photo-textured models of real-world buildings, you're in luck.



To use this feature, you must meet two important prerequisites:

- ✓ **Your model must be *geo-located*.** You have to have already told SketchUp precisely where it is by adding a geo-location snapshot to your file. Consult the section “[Geo-locating your model](#),” later in this chapter, if the preceding sentence makes no sense to you.
- ✓ **Street View data must exist for the thing you're trying to texture.** Google has photographed an awful lot of places, but it's always possible that wherever you're working isn't one of them.

Follow these steps to paint a flat face in your model with Google Street View imagery (see [Figure 8-3](#)):

### **1. Select the face you want to paint with Street View imagery.**

Selecting a rectangle-shaped face helps. You see why in a couple steps.

### **2. Choose `Edit⇒Face⇒Get Photo Texture`.**

The Photo Textures window pops up. If Street View data isn't available for the location where you're modeling, this is when you find out.

### **3. Frame the imagery you want to use in the window:**

- a. *Click and drag to swivel the “camera.”*
- b. *Click the arrows superimposed on the photo to move up and down the street.*
- c. *Zoom in and out using the + and – buttons.*

If you need to, resize the whole window to get a better view.



**Figure 8-3:** You can use the Google Street View imagery to photo-texture your model.

**4. Click the Select Region button in the upper-right corner of the window.**

A rectangle with blue pins at the corners appears.

**5. Drag the blue pins to define an area to paint on the face you selected in Step 1.**

This is the fun part.

**6. Click the Grab button to paint the face you selected in Step 1 with the imagery you defined in Step 5.**

**7. Close the Photo Textures window.**

The photo textures you apply using Get Photo Texture are just like any other photo textures in your model; you can edit them exactly the same way, as I explain in the next section.

## ***Editing your textures***

After you successfully map an image to a face, you probably want to change the image somehow: Make it bigger, flip it over, rotate it — you get the idea. This is where the Position Texture tool comes in.

The Position Texture tool is actually more of a mode; I call it Texture Edit mode. Within this mode, you can be in either of two *submodes*. Their names are less important than what they do, so that's how I describe them:

- ✓ **Move/Scale/Rotate/Shear/Distort Texture mode:** Use this mode to move, scale, rotate, shear, or distort your texture (surprised?); its technical name is *Fixed Pin mode* — you see why in a little bit.
- ✓ **Stretch Texture mode:** Stretch Texture mode lets you edit your texture by *stretching* it to fit the face it's painted on. If you want to map a photograph of a building facade to your model, this is the mode you want to use. In the SketchUp Help documentation, Stretch Texture mode is

called *Free Pin mode*, in case you're interested.



You can edit textures only on flat surfaces; the Position Texture tool doesn't work on curved surfaces. To find out more about working with textures and curved surfaces, see the section "[Adding photo textures to curved surfaces](#)," later in this chapter.

## *Moving, scaling, rotating, shearing, and distorting your texture*



The title of this section pretty much says it all — doing the aforementioned things to your texture involves Texture Edit mode, which is a little bit hidden, unfortunately. To see this technique in action, watch the video available via [www.dummies.com/extras/sketchup2014](http://www.dummies.com/extras/sketchup2014).

Follow these steps to move, scale, rotate, or skew your texture:

1. **With the Select tool, click the face with the texture you want to edit.**
2. **Choose Edit⇒Face⇒Texture⇒Position.**

This enables (deep breath) the Move/Scale/Rotate/Shear/Distort Texture mode. You see a transparent version of your image, along with four pins, each a different color. Have a look at Color Plate 9 to see what I mean. If all your pins are yellow, you're in Stretch Texture mode. Right-click your textured face and select Fixed Pins to switch into the correct mode.



A quicker way to get to Texture Edit mode is to right-click the textured face and then choose Texture⇒Position from the context menu.

3. **Edit your texture.**

At this point, you can edit your texture in two ways: by using the options on a context menu or by dragging the colored pins.

Right-clicking your texture opens a context menu with the following options:

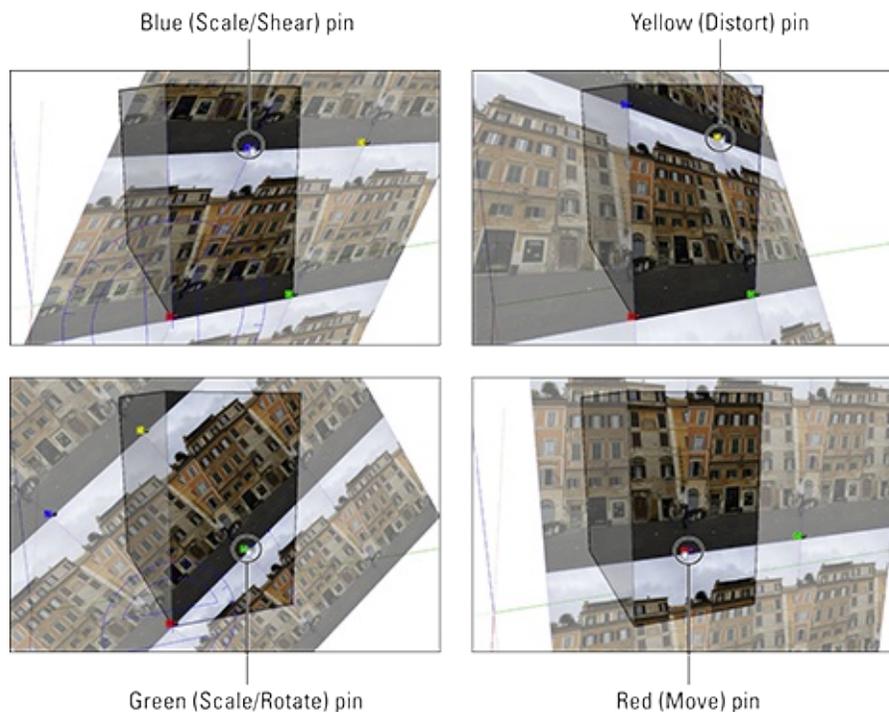
- *Done*: Tells SketchUp you're finished editing your texture.
- *Reset*: Undoes all the changes you've made to your texture, returning it to how it looked before you started messing around.
- *Flip*: Flips your texture left to right or up and down, depending on which suboption you choose.
- *Rotate*: Rotates your texture 90, 180, or 270 degrees, depending on which suboption you choose.
- *Fixed Pins*: When this option is selected, you're in Move/Scale/Rotate/Shear/Distort

Texture mode (Fixed Pin mode). Deselecting it switches you over to Stretch Texture mode, which I talk about in the section “[Stretching a photo over a face](#),” later in this chapter.

- *Undo/Redo*: Goes back or forward a step in your working process.

Dragging each of the colored pins has a different effect (see Figure 8-4):

- *Scale/Shear (Blue) pin*: Scales and shears your texture while you drag it. *Shearing* keeps the top and bottom edges parallel while making the image “lean” to the left or right.
- *Distort (Yellow) pin*: Distorts your texture while you drag it; in this case, the distortion looks kind of like a perspective effect.
- *Scale/Rotate (Green) pin*: Scales and rotates your texture while you drag it.
- *Move (Red) pin*: Moves your texture around while you drag it. Of all four colored pins, I think this one is the most useful. I use it all the time to precisely reposition brick, shingle, and other building material textures in my model.



**Figure 8-4:** Dragging each of the colored pins does something different.



Instead of just dragging around the colored pins, try single-clicking one of them to pick it up; then click again to drop it wherever you want. This trick comes in handy especially when you’re using the Move and Rotate pins.

#### 4. Click anywhere outside your texture in your modeling window to exit Texture Edit mode.

You can also press Enter or right-click and choose Done from the context menu.

### *Stretching a photo over a face*

The basic metaphor here is one of a photograph printed on a piece of really stretchy fabric. Stretch

the fabric until the photo looks the way you want and then hold it in place with pins.



Follow these steps to stretch your texture using the Position Texture tool's Stretch Texture mode (and the video at [www.dummies.com/extras/sketchup2014](http://www.dummies.com/extras/sketchup2014) shows me doing these steps in SketchUp):

1. **With the Select tool, click the face with the texture you want to edit.**
2. **Choose Edit⇒Face⇒Texture⇒Position.**

A quicker way to get to Texture Edit mode is to right-click the textured face and choose Texture⇒Position from the context menu.

3. **Right-click your texture and *deselect* the Fixed Pins option. (Make sure that no check mark is next to it.)**

Deselecting Fixed Pins switches you to Stretch Texture mode (or Free Pin mode if you're reading SketchUp's online Help). Instead of four differently colored pins with little symbols next to them, you see four identical yellow pins — Figure 8-5 shows you what to expect.



**Figure 8-5:** You know you're in Stretch Texture mode when all the pins are yellow.

4. **Click a pin to pick it up.**

Your cursor clenches into a fist, and the pin follows it as you move your mouse.



Press the Esc key to drop the pin you're carrying without moving it; pressing Esc cancels any operation in SketchUp.

5. **Place the pin at the corner of the building in your photograph by clicking once.**

If the pin you're "carrying" is the upper-left one, drop it on the upper-left corner of the

building in your photograph, as shown in Figure [8-6](#).

Place the pin here



**Figure 8-6:** Place the pin at the corresponding corner (upper left to upper left, for instance) of the building in your photo.

- 6. Click and drag the pin you just moved to the corresponding corner of the face you're working on.**

If the pin you just moved is the upper-left one, drag it over to the upper-left corner of the face whose texture you're editing. Check out Figure [8-7](#) to see this in action.

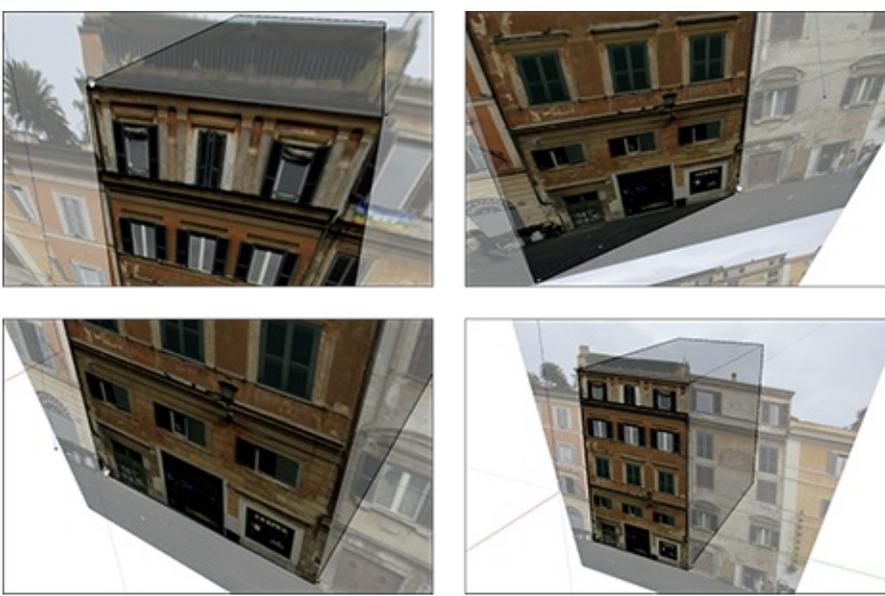
Move pin here



**Figure 8-7:** Drag the pin you just placed to the corresponding corner of the face you're working on.

- 7. Repeat Steps 4–6 for each of the three remaining pins. (See Figure [8-8](#).)**

If you need to, feel free to orbit, zoom, and pan around your model to get the best view of what you're doing; just use the scroll wheel on your mouse to navigate without switching tools.



**Figure 8-8:** Repeat Steps 4–6 for each of the other three yellow pins.



A good way to work is to pick up and drop each yellow pin in the general vicinity of the precise spot you want to place it. Then zoom in and use your better point of view to do a more accurate job.

## 8. Press Enter to exit Texture Edit mode.

If you don't like what you see, go back and edit the texture again; there's no limit to the number of times you can muck around.

### *Scaling your model until the photo looks right*

When you're happy with the way your texture is stretched to fit the face, one of two things will be true:

- ✓ **The proportions are correct.** By this, I mean that the photo doesn't look stretched or squashed. This is the case only if the face to which you applied the photo texture was already exactly the right size.
- ✓ **The proportions aren't correct.** If the photo texture you just "tweaked" looks stretched or squashed, the face it's on is the wrong size. No worries — you just need to stretch the whole face until the texture looks right. Better yet, if you know how big the face is *supposed* to be (in real life), you can stretch it until it's correct.



Follow these steps to stretch a face until the texture looks right (and see how I do these steps in the video at [www.dummies.com/extras/sketchup2014](http://www.dummies.com/extras/sketchup2014)):

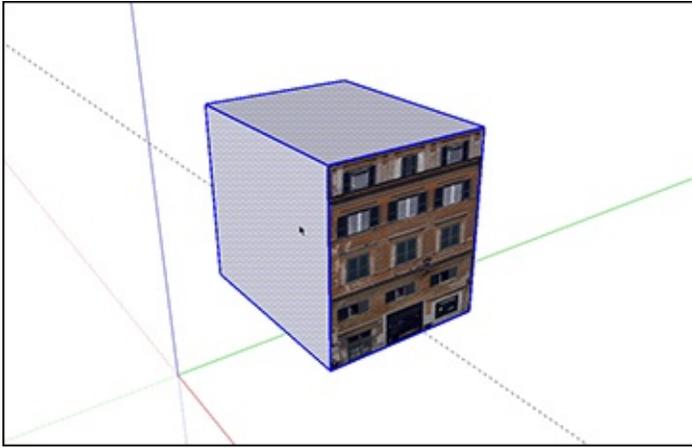
1. **Use the Tape Measure tool to create guides that you can use to accurately stretch your face.**

In this case, I know the building I'm modeling is supposed to be 50 feet wide. I talk about using

the Tape Measure tool and guides in Chapter 2, just in case you need a refresher.

## 2. Select the face you want to stretch.

If your model is at a fairly early stage, just select the whole kit and caboodle. Triple-click the face with the Select tool to select it and everything attached to it. Figure 8-9 shows my whole model selected because I'm just starting out.



**Figure 8-9:** Select everything you want to stretch.

## 3. Choose Tools⇒Scale to activate the Scale tool.

When the Scale tool is active, everything that's selected in your model should be surrounded by the SketchUp scaling box — its 27 little green cubes (or *grips*) and thick, yellow lines are hard to miss.

## 4. Scale your selection to the right size. (See Figure 8-10.)

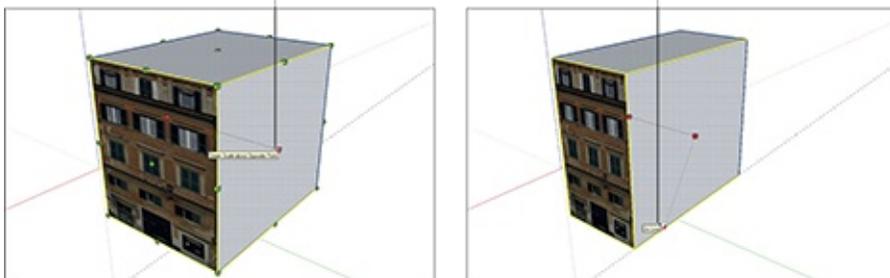
Use the Scale tool by clicking the grips and moving your cursor to stretch whatever's selected (including your texture). Click again to stop scaling.



To scale something precisely using a guide, click a scale grip to grab it and then hover your pointer over the relevant guide to tell SketchUp that's where you want to scale to. Click again to finish the scale operation.

Click here to start stretching

Click here to stretch as far as this guide



**Figure 8-10:** Use the Scale tool's grips to stretch your selection (texture and all).



It's perfectly normal to want to keep modeling with your photo-textured faces; tracing a window and pushing it in a bit with the Push/Pull tool is one of the most satisfying things you can do in SketchUp. Flip ahead a few pages and take a look at the “[Modeling on Top of Photo Textures](#)” section to discover everything you need to know.

### ***Editing the pixels in a texture image***

Perhaps there's something *in* a photograph you're using, and you don't want it to be there. You can use Edit Texture Image to open the texture you've selected in an image-editing program, where you can edit the texture directly.

Follow these steps to use Edit Texture Image:

- 1. Right-click the texture in your model you want to edit and choose Texture⇒Edit Texture Image.**
- 2. In the program that opens, make whatever changes you need to make.**

Be sure not to change the *proportions* of the image — that can really mess things up.

- 3. Save (don't Save As and change the filename) the image you're editing and close it if you like.**
- 4. Back in SketchUp, check to make sure your edits have been applied.**



Which image-editing program actually opens depends on what you have installed on your computer; you specify which one to use in the Applications panel of the Preferences dialog box. For what it's worth, most designers use Adobe Photoshop, but you can use whatever you have.

Take a look at Figure [8-11](#). In it, I use Edit Texture Image to remove a pesky element from a photograph I'm using as a photo texture.



Need to radically reduce the size of your SketchUp model file? Right-click any textured face in your model and choose Make Unique Texture to create a copy of the texture you've selected and *crop* (trim away everything that isn't visible) that copy according to the face it's on. Why is this important? Just because you can't see part of an image doesn't mean it's not there; SketchUp saves the whole photo with the model, even if you use only a little bit of it. In a complex model with dozens of photo textures, all that invisible, extra photo data adds up. Making your textures unique can make your models much, much smaller.

I want to remove this traffic light

Removing the light in Photoshop



Gone!



**Figure 8-11:** Use Edit Texture Image to open an image in a photo-editing app such as Photoshop.

## Adding photo textures to curved surfaces

Notice how the title of this section ends with *surfaces* and not with *faces*? That's because (as you know by now) individual faces in SketchUp are always flat — no exceptions. When you see a non-flat surface, it's actually made up of multiple faces. You can't see the edges between them because they've been *smoothed*. Choosing View⇒Hidden Geometry exposes all curved surfaces for what they really are. Check out Figures [2-3](#) and [2-5](#) (in Chapter [2](#)) for a visual reminder.

How you go about mapping an image to a curved surface in SketchUp depends on what type you have. With that in mind, curved surfaces fall into two general categories (see Figure [8-12](#)):

- ✓ **Single-direction curves:** A cylinder is a classic example of a surface that curves only in one direction. In SketchUp, a cylinder is basically a series of rectangles set side by side. Most curved walls you see on buildings are the same way; they don't taper in or out as they rise.

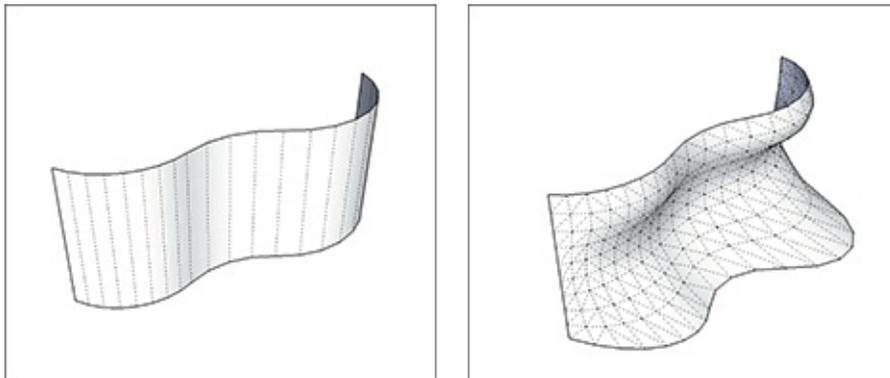


Another way to think about single-direction curves is to consider how they might have been made. If the curved surface you're staring at could be the result of a single push/pull operation (such as turning a circle into a cylinder), there's an excellent chance it's single-direction.

For mapping an image to a single-curve surface, you can use the Adjacent Faces method; it works well and doesn't stretch your image.

✓ **Multi-direction curves:** Terrain objects, saddles, and curtains are all prime examples of surfaces that curve in more than one direction at a time. They're always composed of triangles — never basic rectangles.

To map an image to this type of curved surface, you must use the Projected Texture method. Skip ahead a couple pages to read all about it.



**Figure 8-12:** All curved surfaces are either single-direction (left) or multi-direction (right).



Please keep in mind that I totally made up names for the Adjacent Faces and Projected Texture methods of mapping images to non-flat surfaces. I had to call them *something*, and these sounded descriptive without seeming too technical.

### ***The Adjacent Faces method***

If you need to paint an image onto a surface that curves only in a single direction (such as a cylinder), you can use this technique. Follow these steps to find out how and take a look at [Figure 8-13](#) to see the process in action:

1. **Choose View⇒Hidden Geometry to turn on Hidden Geometry so you can see the individual faces in your model.**
2. **“Load” your cursor with an imported image.**

Follow Steps 1–4 in “[Importing images: Use your own photos](#)” (earlier in this chapter) to import an image as a texture.



**Figure 8-13:** The Adjacent Faces method lets you map images to simple curved surfaces.

### 3. **Paint the leftmost sub-face entirely with the image.**

Your curved surface is composed of sub-faces. Here's how to paint the correct one:

- a. *Hover your loaded cursor over the lower-left corner of the sub-face farthest to the left. Don't click yet.*
- b. *When the image is oriented in the right direction, click once.*
- c. *Click again on the upper-right corner of the same sub-face.*

This places the image; it should be cropped on the right.

### 4. **Use the Paint Bucket tool with the Alt key (Command on a Mac) held down to sample the texture (image) you just placed.**

This “loads” your Paint Bucket tool with the texture.

### 5. **With the Paint Bucket tool, click once on the face immediately to the right of the face you painted in Step 3.**

If everything's working correctly, the image you placed appears on the face you just clicked.

### 6. **Keep painting sub-faces until you're done.**

Remember to work your way from left to right; skipping a sub-face messes up things. To fix a problem, just use Undo and keep going.

## ***The Projected Texture method***

For painting an image onto a complex curved surface, there's no substitute for this method. Chunks of terrain are good examples of complex curved surfaces — bumpy, twisted, rippled, and multi-directional. If the curve you're dealing with is more complicated than a simple extrusion, you need to use this image-mapping technique.

The key is to line up a flat surface with the curved surface to which you want to apply the photo texture. You then “paint” the flat surface with the texture, make it projected, sample it, and finally, paint the curved surface with the projected, sampled texture. Whew.

Follow these steps to get the basic idea (see Figure 8-14):

**1. Create a flat surface that lines up with your curved surface.**

I use the Line tool and SketchUp's inferencing system to draw a flat face that lines up with (and is the same size as) my curved surface.

**2. Apply a photo texture to your flat surface and make sure that it's positioned correctly.**

You can refer to the earlier parts of this chapter for detailed instructions on how to do this.



**Figure 8-14:** Mapping projected textures to curved surfaces is possible, but it ain't easy.

**3. Right-click the textured face and choose Texture⇒Projected.**

This ensures that the texture is projected, which is the key to this whole operation.

**4. Hold down the Alt key (Command on a Mac) while using the Paint Bucket tool to sample the projected texture.**

This “loads” your Paint Bucket tool with the projected texture.

5. Use the Paint Bucket tool *without* pressing anything on your keyboard to paint the curved surface with the projected texture.

The photo texture is painted on your curved surface, although the pixels in the image look stretched in some places.

6. Delete the flat surface that you originally mapped the image to; you don’t need it anymore.



If you’re trying to do this task on your own curved surface and things don’t seem to be working, your curved surface is probably part of a group or component. Either explode or double-click to edit the group or component before you do Step 5 and see whether that helps.

## *Modeling Directly from a Photo: Introducing Photo-Matching*

The first time I saw SketchUp’s photo-matching feature in action, I giggled and clapped my hands like a toddler at a petting zoo. I’m not ashamed of it, either. Sometimes technology that’s so useful, so *unexpectedly satisfying*, comes along, and you just can’t help yourself. Besides — people think I’m a little strange anyway.

So what does photo-matching do? You can use this feature to do a couple things:

- ✓ **Build a model based on a photograph:** If you have a good photograph (or multiple photographs) of the thing you want to model, SketchUp’s photo-matching feature can help you set up things so that building your model is much easier.
- ✓ **Match your model view to a photograph:** Perhaps you have a model of a building and a photograph of the spot where the building will be constructed. You can use photo-matching to position your “camera” in SketchUp to be exactly where the real-life camera was when the photograph was taken. Then, you can create a composite image that shows what your building will look like in context.



Photo-matching works only on photographs of objects with at least one pair of surfaces that are at right angles to each other. Luckily, this includes millions of things you may want to build, but still, if the thing you want to photo-match is entirely round, or wavy, or even triangular, this method won’t work.

### *Looking at all the pretty colors*

Like some of SketchUp’s other features, photo-matching is more of a *method* than a tool: You use it to set up things, you model a bit, you use the Match Photo dialog box a bit, and so on. If you

don't know the basics of modeling in SketchUp yet, you won't have any luck with photo-matching — it's really more of an intermediate-level feature, if such a thing exists.

Color Plate 10 shows what your screen may look like when you're in the throes of photo-matching. I admit it's daunting, but after you use it once or twice, it's not so bad. I include the image in the color section of this book because SketchUp's photo-matching method (at least at the beginning of the process) uses color as a critical part of its user interface.

The following elements of the photo-matching interface show up in your modeling window:

- ✓ **Photograph:** Your photograph shows up as a kind of background in your modeling window; it stays there as long as you don't use Orbit to change your view. To bring your photo back, click the Scene tab (at the top of your modeling window) labeled with the photograph's name.
- ✓ **Perspective bars:** These come in two pairs: one green and one red. Use them when you're setting up a new matched photo by dragging their ends (grips) to line them up with *perpendicular* pairs of *parallel* edges in your photograph. For a clearer explanation of how this works, see the next section in this chapter.
- ✓ **Horizon line:** This is a yellow, horizontal bar that, in most cases, you won't have to use. It represents the horizon line in your model view, and as long as you placed the perspective bars correctly, it takes care of itself.
- ✓ **Vanishing point grips:** These live at both ends of the horizon line, and once again, as long as you did a good job of setting up the perspective bars, you shouldn't have to touch them.
- ✓ **Axis origin:** This is the spot where the red, green, and blue axes meet. You position it to tell SketchUp where the ground surface is.
- ✓ **Scale line/vertical axis:** Clicking and dragging this blue line lets you roughly scale your photograph by using the colored photo-matching grid lines. After you're done, you can always scale your model more accurately using the Tape Measure tool. (Check out Chapter [2](#) for more information on how to do this.)

You also need to work with a few things that appear outside your modeling window:

- ✓ **Matched photo scene tab:** When you create a new matched photo, you create a new scene, too. (You can read all about scenes in Chapter [11](#).) Clicking a matched photo scene tab returns your view to the one you set up when you created (or edited) that matched photo. It also makes the associated photograph reappear — handy if you've orbited into another view.
- ✓ **Match Photo dialog box:** This is photo-matching Mission Control; it's where you can find almost all the controls you need for creating, editing, and working with your matched photo.
- ✓ **Photo visibility settings in the Styles dialog box:** Deep, deep down in the bowels of the Styles dialog box, in the Modeling Settings section of the Edit tab, you can control the visibility of your matched photo. Chapter [10](#) is where to find out all about Styles.

## Getting set up for photo-matching

Modeling with SketchUp's photo-matching feature is generally a step-by-step procedure. Whether you're building a new model or lining up an existing model with a photograph, start by getting

your modeling window ready. How you do this depends on which one you're trying to do:

✓ **Line up a model you've built already with a photograph:** This case requires you to re-orient your view and then reposition your drawing axes before you're ready to begin photo-matching. To do this, follow these steps:

1. *Orbit around until your model view more or less matches the camera position in your photograph.*
2. *Choose Tools⇒Axes and then click to place your axis origin somewhere on your model.*

The *axis origin* is where your colored axes meet. Try to choose a spot that's also visible in your photograph, if there is one.

3. *Click somewhere in the lower-left quadrant of your modeling window.*

This ensures that the red axis runs from the upper-left to the lower-right corner of your screen.

4. *Watch your linear inferences to be sure that your repositioned red axis is parallel to some of the edges in your model.*

Chapter [2](#) has more about linear inferences.

5. *Click somewhere in the upper-right quadrant of your modeling window to make sure that the blue axis is pointing up.*

✓ **Use a photograph to build a model:** Open a fresh, new SketchUp file, and you're good to go.



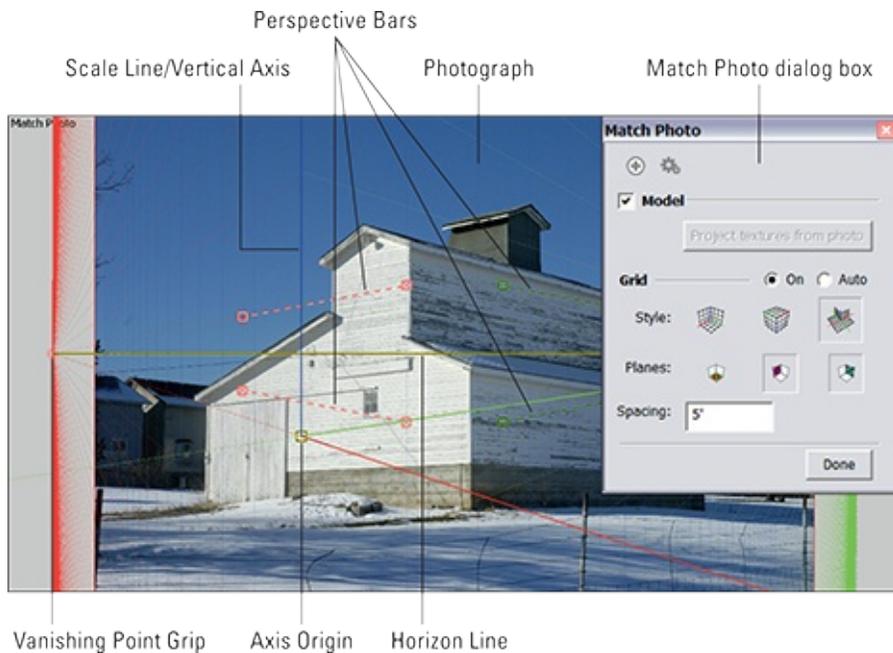
After your modeling window is set up, follow these steps to create a new matched photo in your SketchUp file (and for help, watch the video available via [www.dummies.com/extras/sketchup2014](http://www.dummies.com/extras/sketchup2014)):

1. **Choose Camera⇒Match New Photo.**

A dialog box opens.

2. **Select the image on your computer that you want to use and click the Open button.**

The dialog box closes, and you see the image you chose in your modeling window. You also see a jumble of colorful techno-spaghetti all over the place. Don't worry — it's all part of the photo-matching interface. Figure [8-15](#) gives you an idea of what I mean; Color Plate 10 shows the same image in color.



**Figure 8-15:** The photo-matching interface includes your picture, plus lots of other things.



SketchUp’s photo-matching feature requires that you use certain kinds of photographs for it to work properly. See the sidebar, “[Taking the right kind of picture](#),” later in this chapter, for pointers on what kinds of photos you can — and can’t — use.

**3. In the Match Photo dialog box (Window⇒Match Photo), choose the style that matches your photograph.**

The style buttons in the Match Photo dialog box correspond to three types of photographs you may use:

- *Inside* if your photo is an interior view
- *Above* if it’s an aerial shot
- *Outside* if your photo is an exterior view taken from a human vantage point

Figure [8-16](#) shows examples of each of these scenarios.

**4. Begin positioning the perspective bars, starting with the two green ones, by lining them up with any two parallel edges.**

The tops and bottoms of windows are good candidates, as are rooflines, tabletops, and ceiling tiles. Take a deep breath — this is easier than it looks. Move each perspective bar one at a time, dragging each end into position separately. Color Plate 11 shows what I mean in color.



**Figure 8-16:** Choose the style that best describes your photograph's camera position.



The following tips can help you position the bars correctly:

- Zoom in and out (using the scroll wheel on your mouse) to better view your photograph while you place your perspective bars. The more accurately you place the bars, the better things will turn out.
  - Match your perspective bars to nice, long edges in your photograph; you get better results that way.
  - If you're working with an existing model, hiding it while you place your perspective bars may help; sometimes a model gets in the way. Just deselect the Model check box in the Match Photo dialog box to temporarily hide it.
5. **Line up the two red perspective bars with a different set of parallel edges — just be sure that these parallel edges are *perpendicular* (at right angles) to the first pair.**



If the parallel edges aren't perpendicular to the first set of edges, photo-matching doesn't work. Color Plate 12 shows what it looks like when all four perspective bars have been positioned properly.

6. **Drag the *axis origin* (the little square where the axes come together) to a place where your building touches the ground.**

This is how you tell SketchUp where the ground plane is. Try to make sure your axis origin is right at the intersection of two perpendicular edges. Color Plate 13 shows what this looks like.

If you're photo-matching an existing model, dragging the axis origin moves your model, too. Line up your model with the photograph so that the spot where you placed the axis origin is right on top of the corresponding spot in your photo. Don't worry about size right now; you deal with that in a moment.

7. **Roughly set the scale of your photograph by clicking and dragging anywhere on the blue scale/vertical axis line to zoom in or out until your photograph looks to be at about the right scale.**

Do this by first setting your grid spacing in the Match Photo dialog box and then using the grid lines in your modeling window to eyeball the size of your photo until it looks about right.

Color Plate 14 shows an example where my grid spacing is set at 5 feet (the default setting). Because I know the barn in my photo is about 20 feet tall, I zoom in or out until it's about 4 grid lines high because 4 times 5 feet is 20 feet.



If you're trying to match an existing model to your photo, just zoom in or out until your model looks like it's the right size. You don't have to be very exact at this stage of the game. You can always scale your model later by using the Tape Measure tool. (Chapter [2](#) talks about how to do that.)

## 8. Click the Done button in the Match Photo dialog box.

When you click the Done button, you stop editing your matched photo. All the colorful lines and grips disappear, and you're left with the photo you brought in, your model axes, and your thoughts. It may have seemed like a lot of magic, but what you did was pretty simple: You used photo-matching to create a scene (which I talk about extensively in Chapter [11](#)) with a camera position and lens settings that match the ones used to take the picture that's on your screen. In effect, you're now "standing" exactly where the photographer was standing when the photograph was taken.



## Taking the right kind of picture

Your level of success with photo-matching depends to some extent on the photograph you use. Here are tips for choosing a photo for this process:

- ✓ **Make sure that the edges of two perpendicular surfaces are visible in the shot.** You need to see planes that are at right angles to each other in order to use photo-matching properly.
- ✓ **Shoot at a 45-degree angle if you can.** Because of the way perspective works, your results are more accurate if you use a photograph in which you can see both perpendicular surfaces clearly; if one of them is sharply distorted, you have a harder time.
- ✓ **Watch out for lens distortion.** When you take a picture with a wide-angle lens, some straight lines in the image bow a little bit, depending on where they are in the frame. Try to use photos taken with a normal or telephoto lens: 50mm to 100mm is a good bet.

## *Modeling by photo-matching*

Setting up a new matched photo was just the first step. Now it's time to use SketchUp's modeling tools (with a little help from the Match Photo dialog box) to build a model based on the photograph you matched. Here are two basic concepts:

- ✓ **The process is iterative, not linear.** Building a model using a matched photo entails going between drawing edges, orbiting around, drawing more edges, going back to your matched photo scene, and drawing yet more edges. Every photo is different, so the ones you work with will present unique challenges that you'll (hopefully) have fun figuring out.
- ✓ **Don't forget the photo textures.** By far one of the coolest features of photo-matching is the ability to automatically photo-texture your model's faces by using your photograph as "paint." It's a one-button operation, and it's guaranteed to make you smile.



Follow these steps to start building a model with a matched photo (and check out the video of me doing these steps at [www.dummies.com/extras/sketchup2014](http://www.dummies.com/extras/sketchup2014)):

**1. Click the matched photo scene tab to make sure that you're lined up properly.**

If you orbit away from the vantage point you set up, you'll know it; your photograph will disappear. You can easily get back by clicking the scene tab for your matched photo. The tab is labeled with the name of your photo at the top of your modeling window. (See Figure [8-17](#).)

**2. Starting at the axis origin, trace one of the edges in your photograph with the Line tool.**

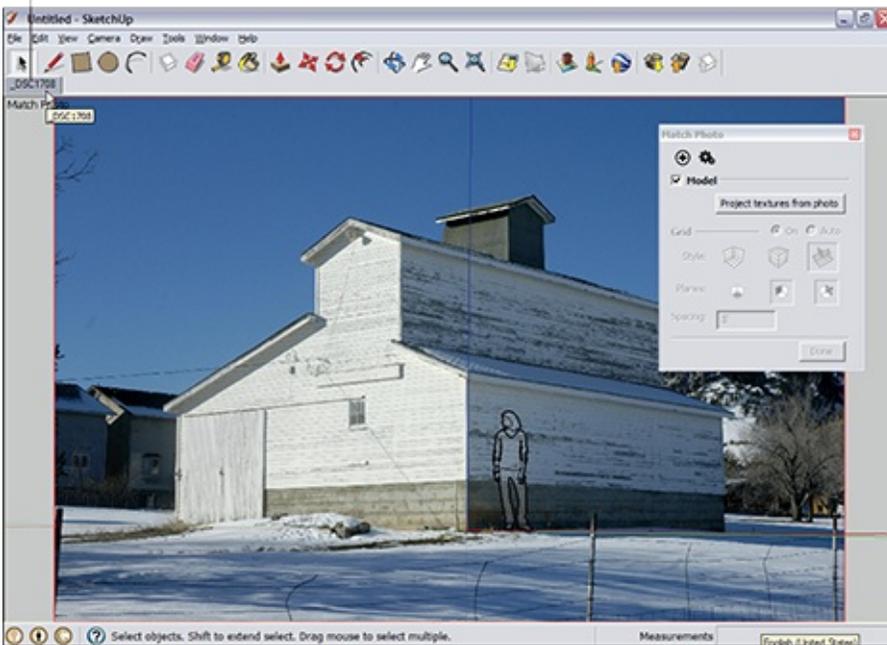
Make sure that you're drawing in one of the three main directions: red, green, or blue. Color Plate 15 shows this in action.

**3. Keep tracing with the Line tool until you have a rectangular face, watching the color of your edges as you draw.**

You always want your lines to turn red, green, or blue when you're starting. Have a look at Color Plate 16 to see what this looks like.



Be careful not to orbit while you draw — if you do, repeat Step 1 and keep going. You *can* zoom and pan all you want, though.



**Figure 8-17:** Clicking the scene tab for your matched photo zings you back to that vantage point (and brings back your photograph).

#### 4. Use SketchUp's modeling tools to continue to trace the photograph in three dimensions.



Here are pointers for doing this successfully:

- *Always start an edge at the end of an edge you've already drawn.* Doing so helps to assure that your results are what you expect.
- *Never draw an edge in midair.* Okay — this is the same as the last one, but it bears repeating: When you draw edges based on other edges, you get the best results.
- *Orbit frequently to see what's going on.* You'll be surprised what you have sometimes — tracing a 2D image in 3D is tricky business. Get in the habit of orbiting around to check on the results and draw certain edges. Click the matched photo scene tab to return to the proper view.
- *Use other tools (such as Push/Pull and Offset) when appropriate.* Nothing prevents you from using the full complement of SketchUp's modeling tools. I just prefer to stick to Line and Eraser while I draw the basic skeleton of my model with SketchUp's photo-matching tools. I think it's simpler.
- *Pay attention to the colors.* With a color photograph as an overlay, seeing what you're doing can be tricky. Watching to make sure that you're drawing the edge you intend to draw is critical.
- *Draw angles by connecting the dots.* If you need to trace an edge in your photo that doesn't line up with any of the colored axes (an angled roofline, for example), figure out where the endpoints are by drawing perpendicular edges and connecting them with an angled line. Color Plate 18 shows this in glorious, full-spectrum detail.
- *Show or hide your photograph.* You can fiddle with the visibility of the picture you're

using — doing so sometimes helps you see what you’re working on. You can find the controls in the Modeling Settings section of the Styles dialog box’s Edit tab. Have a look at Chapter [10](#) for more detail.

If you have more than one photo of your modeling subject, you can have multiple matched photos in the same SketchUp file. Just get as far as you can with the first photo and then start again with the next by using the geometry you created as an “existing building.” See the section “[Getting set up for photo-matching](#),” earlier in this chapter, and follow the steps to line up an existing model with a new photograph.

Color Plate 19 shows a model I started to build of Habitat 67, in Montreal. I used two pictures to create two matches in the same SketchUp file, which let me build more of the model than I could see in a single picture.



You can edit any texture in your model — including ones produced by photo-matching — by opening them in image-editing software (such as Photoshop) directly from SketchUp. This trick is handy for taking out stuff you might not want in your photos, such as trees, cars, and ex-husbands. Take a look at the section “[Editing the pixels in a texture image](#),” earlier in this chapter, for all the juicy details.

## Modeling on Top of Photo Textures

After you place a photo texture on the right face and in the right place on that face (I’m turning into Dr. Seuss), I wouldn’t blame you a bit for wanting to use the information in your photograph to help with adding geometry to your model. It’s a great way to be roughly accurate without having to measure much, and the combination of photo textures and a few simple push/pull operations can be very convincing.

### Making a texture projected

Modeling with photo-textured faces isn’t hard, but you *have* to take one critical step before you can do it: You have to make sure that your texture is *projected*.

Figure [8-18](#) shows what happens when you try to push/pull an opening in a photo-textured face: On the left, when the texture *isn’t* projected, the inside faces are painted with random parts of the texture, making your model look like a sticker-laden eye puzzle. On the right, when it *is* projected, note how the “inside” faces that are produced by the push/pull operation are a plain, easy-to-discern gray. I call this painting with *stretched* pixels, and the result is typically more appropriate for what you’re doing.

Textures not projected

Wallpaper effect

Textures are projected

Stretched Pixels effect

No Textures



**Figure 8-18:** Pushing/pulling an opening in a textured face when the texture *isn't* projected (left) and when it *is* projected.



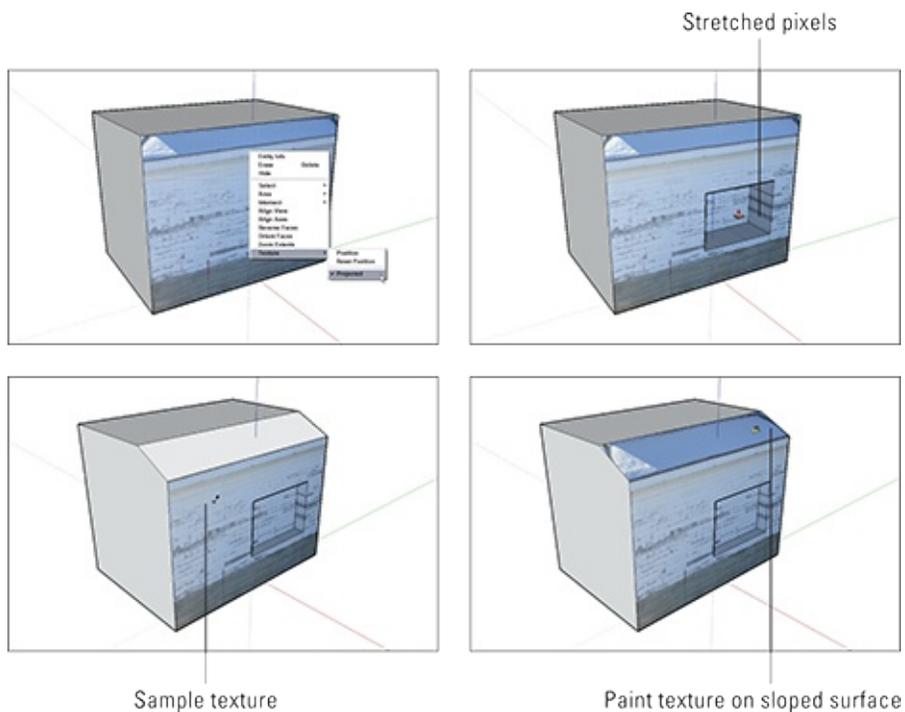
It's a good idea to make sure that your face's texture is projected *before* you start drawing on top of it. Happily, telling SketchUp to make a photo texture projected is just a matter of flipping a switch. Right-click the face with the photo texture and choose Texture⇒Projected from the context menu. If you see a check mark next to Projected, your texture is already projected; don't choose anything.

## ***Modeling with projected textures: A basic workflow***

Follow these steps to get the hang of working with projected textures (and see the steps in action in Figure 8-19):

- 1. Make a basic rectangular box and then apply a photo texture to one of the side faces.**

Check out the section, "[Adding photos to flat faces](#)," earlier in this chapter.



**Figure 8-19:** Working with projected textures.

- 2. Right-click the textured face and choose Texture⇒Projected from the context menu.**

Make sure that Projected has a check mark next to it.

- 3. Draw a rectangle on the textured face and push/pull it inward.**

Notice the stretched pixels effect?

- 4. (Optional) Add other angles or features to your model.**

In Figure 8-19, I create an angled face.

5. **Switch to the Paint Bucket tool, hold down the Alt key (Command on a Mac), and click somewhere on the textured face to sample the texture. (Your cursor looks like an eyedropper when you do this.)**

This step loads your Paint Bucket with the projected texture.

6. **Release the Alt (Command) key to switch back to the Paint Bucket cursor and then click the angled face once to paint it with the projected texture.**

You see the stretched pixels effect here, too.

## *Adding Geographic Data from Google*

As I mention in this chapter’s introduction, SketchUp is the only 3D modeling tool to be granted full access to Google’s massive storehouse of geo-wonderfulness — that’s what happens when you spend six years as a full-fledged member of the Google stable. Here are three things you can do with all the stuff that SketchUp’s connection with Google provides:

- ✓ **Perform accurate shadow studies.** For most designer-types, this is probably the biggest benefit of being able to specify a precise geographic location. By doing so, you give your model a latitude, a longitude, and a cardinal orientation, which is all SketchUp’s shadow engine needs to display crazy-accurate shadows for any time of day, any day of the year. You can find all the juicy details in the second half of Chapter [10](#).
- ✓ **Build photo-textured context models.** If you’re designing a building, it’s probably surrounded by other buildings, and those other buildings are probably major influences on the design of *your* building, no? Wouldn’t it be nice to have them in your model? You can combine high-res, color, aerial (taken by airplanes or satellites) imagery with street-level photography to build the quickest, most useful context models you’ve ever had. Heck — you might not even need to visit the site in person. Try a web search for “*Site Modeling in SketchUp video*” to find an in-depth YouTube tutorial I put together on just this subject.
- ✓ **View your model in Google Earth.** After you’ve endowed your model with an idea of where on the planet it belongs, it’s an easy matter to package it up and send it to your copy of Google Earth. Flying from the Eiffel Tower to the Taj Mahal and then to your proposed new tool shed gives your design a level of seriousness that proclaiming “Look what I’ve spent the last 37 hours working on!” to your spouse simply can’t match. It’s also impressive to clients.

The sections that follow outline the nitty-gritty steps for telling SketchUp where on Earth your model is (literally), looking at it in Google Earth, and saving it as a Google Earth file that you can share with other humans.

### *Geo-locating your model*

Follow these steps to add a geo-location snapshot to your SketchUp file:

1. **Make sure you’re online.**

All Google's geo-data is stored on its far-flung servers; if you don't have an Internet connection, you can't use the geo-data.

**2. Open the SketchUp file you want to geo-locate.**

You can add a geo-location snapshot to your model anytime as you work on it. If you haven't started modeling yet, it's perfectly okay to add a geo-location to an empty file.

**3. Choose File⇒Geo-Location⇒Add Location from the menu bar.**

A new window that you may recognize opens: It's a simplified version of Google Maps.

**4. Find the area where you want your model to be located.**

You can type an address into the search bar in the upper-left corner if you like. You can also just use your mouse or the controls on the left side of the window to navigate around. Scroll your mouse wheel to zoom; click and drag to pan.

When you're zoomed in close enough, you see a white, 1 km x 1 km square: This is the largest snapshot you can import all at once. That's still a very big area, so you probably want to keep zooming.

**5. Click the Select Region button to display a cropping rectangle.**

**6. Drag the blue pins to specify the precise corners of your geo-location snapshot, as shown in Figure 8-20.**

Try to frame an area that's just big enough to provide a base for your model. Importing too much terrain data can bog down your computer. You can always bring in more terrain data later.

**7. Click the Grab button to add a geo-location to your SketchUp file.**

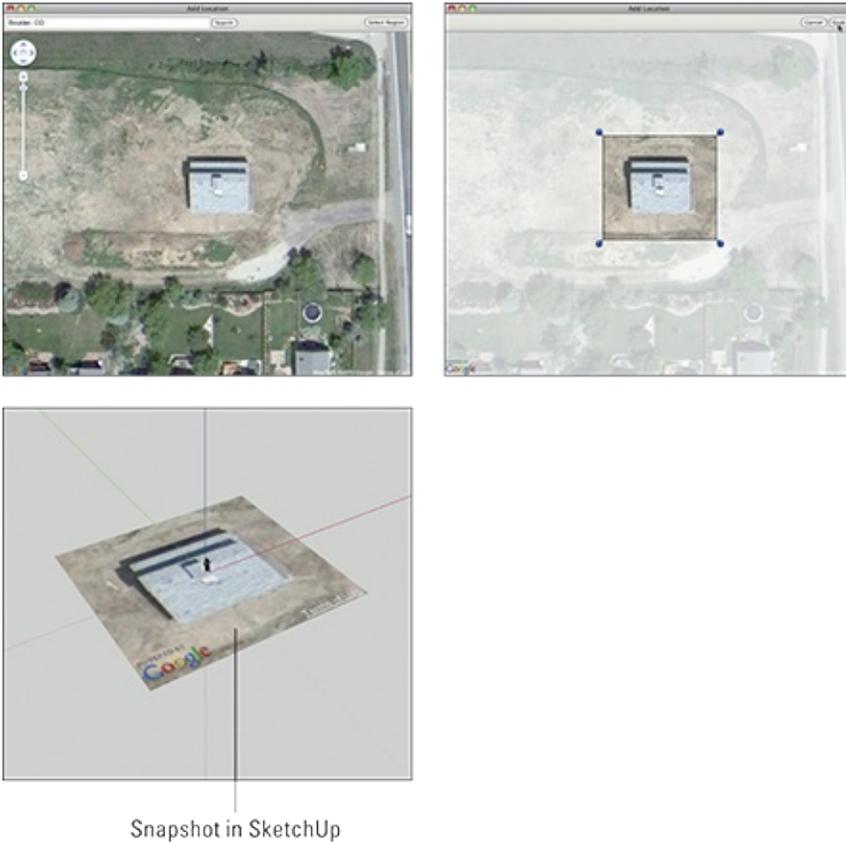
The separate window closes, and a big, colorful rectangle appears in the middle of your model. That's your new geo-location snapshot.

**8. If you're geo-locating a model you've built already, move it into position on the snapshot.**

Use the Move tool (and maybe the Rotate tool) to pick up your model and place it where it belongs. You're not done yet, though — you still need to make sure your model is *vertically* situated on the terrain. Follow these steps to do just that:

- a. *Choose File⇒Geo-location⇒Show Terrain to switch to the 3D version of your geo-location snapshot.*
- b. *Select everything you want to move and use the Move tool to start moving; tap the up- or down-arrow key to constrain your move to the blue axis.*
- c. *Sink your model into the terrain until it sits properly — avoid the dreaded floating model*

*syndrome at all costs.*



**Figure 8-20:** The area you frame with blue pins is imported into your model as a geo-location snapshot.



If you want to import another snapshot into SketchUp, you can. SketchUp automatically tiles all the snapshots you take to form a patchwork in your model. This feature is super-handly if you find that you didn't get everything you needed the first time.

## All about geo-location snapshots

When you import a geo-location snapshot, you access Google's huge repository of geographic data; snapshots are a lot more than just pretty pictures:

- **Importing a snapshot geo-locates your position automatically.** This means that the snapshot sets your model's latitude and longitude and orients itself in the right cardinal direction. Any shadow studies you do with the Shadows feature are automatically accurate for your model's new geo-location. See Chapter [10](#) for more information.
- **Everything is already the right size.** Perhaps you take a snapshot of a football field; when you measure that football field in SketchUp, it is exactly 100 yards long. That's because SketchUp scales your snapshot to the correct size as part of the import process.
- **Snapshots look flat but contain terrain data, too.** The snapshot that SketchUp imports is more than just a color aerial photo — it also includes a chunk of topography — terrain. The *terrain* is flat when you first import it because it's easier to build on that way, but you can toggle between flat and 3D (not flat) views by choosing File⇒Geo-Location⇒Show Terrain. Don't fret if you don't see any difference when you flip between the views — you probably just chose a flat site.

## Viewing your model in Google Earth

After you make (or simply position) a model on top of a geo-location snapshot, sending it to your copy of Google Earth is a simple operation. And after you do that, you can save your model as a Google Earth KMZ file and e-mail it to all your friends. If you model for clients instead of friends, you can send the file to them, too.

## Exporting from SketchUp to Google Earth

This process is so simple you can probably figure it out while you talk on the phone. Follow these steps to send your model from SketchUp to Google Earth on your computer:

### 1. Choose File⇒Preview in Google Earth.

Doing this sends everything in your modeling window (with the exception of the geo-location snapshot) over to Google Earth. Your computer automatically switches to Google Earth and flies you in so that you look at your model. (See Figure 8-21.)

### 2. If you want to make changes to your model, go back to SketchUp, make your changes, and then choose Preview in Google Earth again.

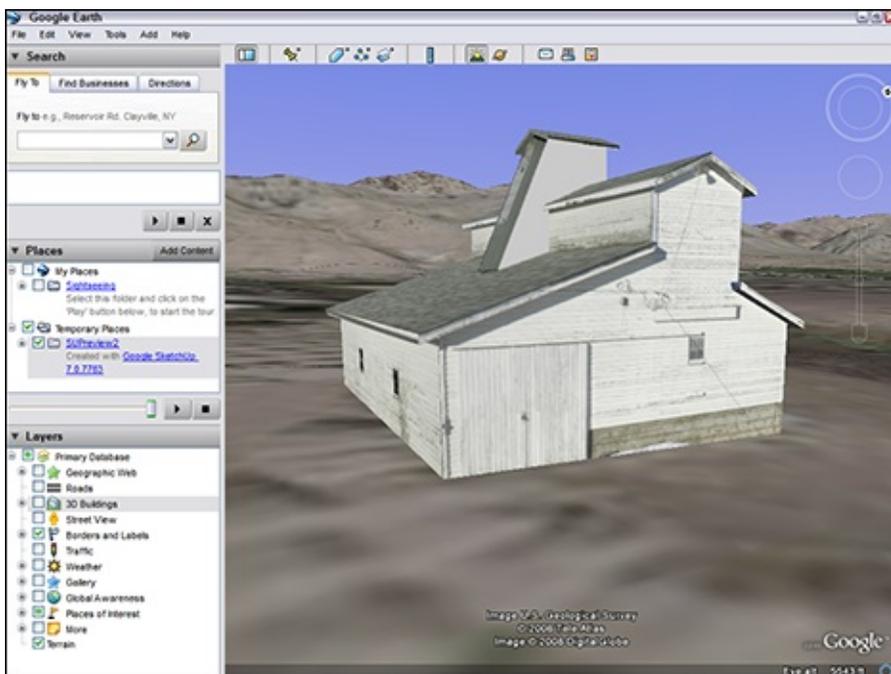
Google Earth pops up a dialog box that asks whether you want to overwrite the old version of the model you placed the first time.

### 3. Click the Yes button if you're sure that's what you want to do.

### 4. Continue to go back and forth between SketchUp and Google Earth until your model looks exactly the way you want.



When you preview your SketchUp model in Google Earth, it's visible only on your computer — no one else can see it.



**Figure 8-21:** Your SketchUp model (actually, my SketchUp model) in Google Earth.

## *Saving your model as a Google Earth KMZ file*

You can save your SketchUp model as a Google Earth KMZ file that you can send to anyone. When someone opens the KMZ file, Google Earth opens on his computer (if he has Google Earth), and he's "flown in" to look at the model you made. Try sending directions to your next party this way; your friends will think you're a genius. Follow these steps to save your model:

- 1. In Google Earth, select your model by clicking it in the Temporary Places list on the left of the screen.**

Unless you've renamed it, your model is SUPreview1.

- 2. Choose File⇒Save⇒Save Place As.**

The Save File dialog box opens.

- 3. Give your file a name and figure out where to put it on your hard drive.**
- 4. Click the Save button to save your model as a KMZ file.**



I prefer to save KMZs from Google Earth because doing so forces me to preview my models first. You can skip the Google Earth step altogether if you're in a hurry. Choose File⇒Export⇒3D Model while you're still in SketchUp and then select Google Earth File (.kmz) from the Format drop-down list.

## *Working with Imported CAD files*

On the SketchUp Spectrum of Fun, importing and preparing CAD files is located right between latrine digging and cat milking — it's not something many folks look forward to doing. This section is a collection of tips and tricks I've come across in my many years of dealing with other people's CAD files.

### *Importing a CAD file into SketchUp Pro*

This would probably be a great time to let you know (just in case you missed the heading right above this paragraph) that only SketchUp Pro can import 2D CAD files in DWG and DXF format; SketchUp Make doesn't include this functionality.

There's a chance that the CAD file you're dealing with is one you made yourself, but it's more likely that you've received one from someone else. In that case, the absolute best thing to do is to open it in the same software that created it. If you have an AutoCAD file, open it in AutoCAD and take a look at its layer structure. Make a copy of the file, delete everything you don't need to bring into SketchUp Pro, and proceed from there.

Simple, right? But what if (like me) you don't have AutoCAD? That's okay — most folks don't. You'll have a fair amount of cleanup work to do in SketchUp after you've imported the CAD data,

but it's manageable. The section after this one describes a series of things you can do to wrangle the drawing into shape before you can start modeling.



One more thing before you start: SketchUp Pro 2014 can import CAD files in AutoCAD 2013 format and earlier. SketchUp Pro 2013 can import files in AutoCAD 2010 format and earlier. If someone else is sending you a CAD file, be sure to tell that person which version you need.

Actually importing CAD data into SketchUp Pro isn't very complicated. Follow these steps, and you'll do just fine:

- 1. Open a fresh, new SketchUp file.**

You can't just open a DWG or DXF file in SketchUp Pro; you have to import the data into an existing model. I strongly recommend starting with a new SketchUp file because most CAD files are super complex. Bringing all of that complexity — thousands of edges and tons of layers — into an already-complex SketchUp model is just asking for trouble. Keep things separate and stay sane.

- 2. Choose File⇒Import.**

The File Import dialog box opens.

- 3. Select AutoCAD files (\*.dwg, \*.dxf) from the Formats drop-down list.**

For some reason, you have to tell SketchUp what kinds of files you want to import before it will let you select them on your file system.

- 4. Locate the CAD file (DWG or DXF) that you want to import and select it.**

Don't click Import just yet.

- 5. Click Options.**

The DWG Import Options dialog box opens.

- 6. Set the Units to match the default measurement units of the CAD file you're about to import.**

If the CAD file is from someone in the U.S., there's a good chance the units are Inches or Feet. Other countries (wisely) use the metric system. Most of the time, I have no idea what units I'm supposed to choose here, so I start with Inches and see whether that works.

- 7. Decide what to do about the other three options in the dialog box:**

- *Preserve Drawing Origin* is useful if you'll be importing more than one CAD file into the same SketchUp model. You might do this if you're bringing in multiple floor plans

of the same building and you want them to line up.

- *Merge Coplanar Faces* tells SketchUp to automatically combine adjacent faces that are coplanar into a single face. This can save you cleanup time if the CAD file you're importing actually has faces in it, but I don't think I've run across one that does. If you select this check box and your import fails (it happens), try deselecting it the next time.
- *Orient Faces Consistently* instructs SketchUp to do its best to make sure that the faces in your imported data (if there are any) are all facing the same way. Again, this might save you some cleanup time, but it also might throw a wrench into your import process.

8. **Click OK to close the DWG Import Options dialog box.**

9. **Click Import ... .**

... and cross your fingers. With a few tries, I'm usually able to import the CAD data I'm interested in. If you get a failure message, try again with a different Units setting in the Import Options dialog box (Step 6). If that doesn't work, the file might have been saved in a CAD format that's newer than the ones that SketchUp Pro can import. (See the Tip right before this step list.) Contact the person who sent you the file and ask her to save another copy for you in an older CAD format.

10. **Take a look at the Import Results dialog box to see where you stand.**

If, after the import progress bar goes all the way to the right and the import itself is successful, SketchUp Pro will present you with a dialog box with statistics about what it imported and what it ignored. The simple version is that CAD layers, blocks (which translate to components in SketchUp), and edges of all sorts are importable. Text objects, dimensions, and hatches (of the sort that denote different materials) aren't. When you're satisfied, click OK and breathe a sigh of relief.



After you've gone through the CAD import process and SketchUp has plunked the resulting geometry into your model, make sure everything went according to plan: Measure a couple of things with the Tape Measure tool to see whether they're the sizes you expect them to be. Doorways are a good place to start; if you measure one and it's many times smaller or bigger than it should be, your Units (in Step 6 of the preceding steps) were set wrong. Close the file, open a new one, and try again.

## ***Cleaning up imported CAD data***

Most of the time, your imported CAD file looks something like the mess shown in the top image of Figure [8-22](#). Walls, annotations, grid lines, and other stuff are all jumbled up, and it seems like you're going to have to spend the rest of the week deleting edges. Probably not, actually — the following sections explain improvements you can make.

### ***Switch to a style that's easier to read***

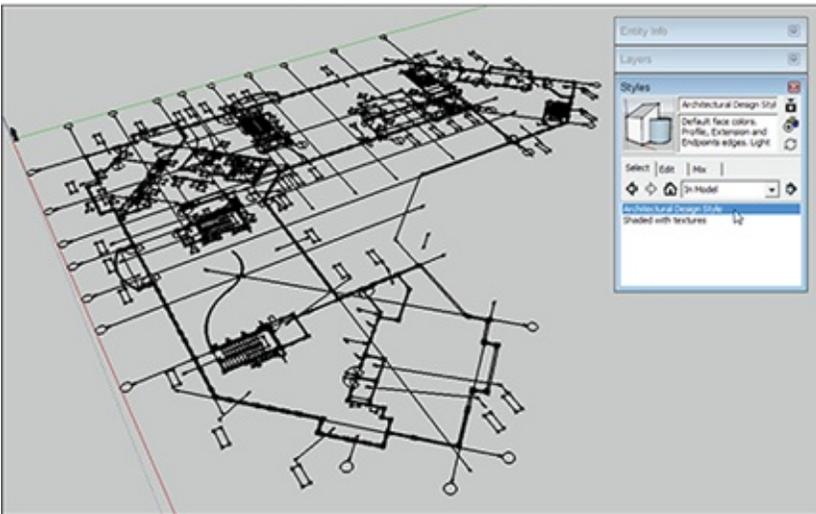
If you're using a display style that includes lots of edge embellishments (such as Profiles, Extensions, and Endpoints), dense geometry of the sort in most CAD drawings looks like your

model received an unwelcome visit from the Mascara Fairy. Yuck. Use the Styles dialog box (Window⇒Styles) to apply a style that's plain and simple. I recommend either Shaded or Shaded with Textures, both of which you can find in the Default Styles collection. You can read all about styles in Chapter 10. Figure 8-22 shows what a difference a style can make.

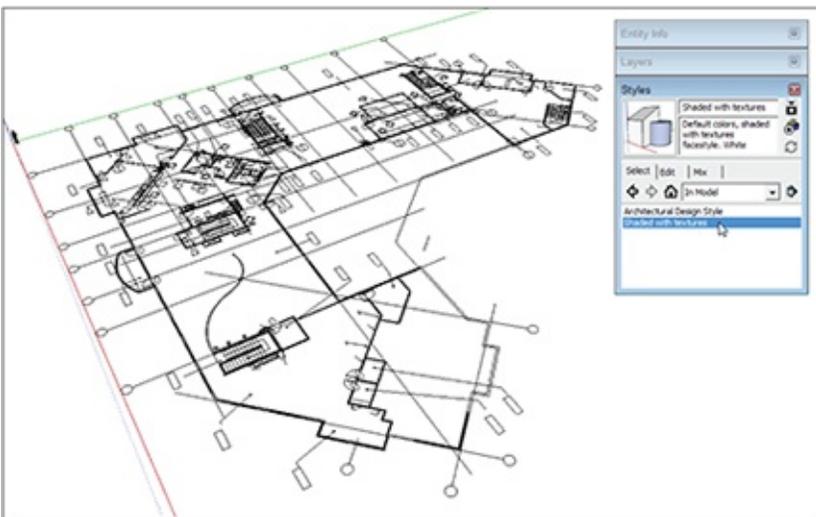
### **Turn off layers you don't need**

Most of the drawing symbols and other annotations you brought into SketchUp aren't things you need, at least right away. The simplest and safest way to get rid of them is to turn off their layers. Remember that SketchUp Pro also imports all of the layer information associated with the CAD data you brought in; now's the time to use all of that complexity to your advantage.

Architectural Design Style



Shaded with Textures



**Figure 8-22:** Applying a simple display style to a model with imported CAD data makes it a lot easier to work with.

Follow these steps to identify and hide the stuff you don't need:

- 1. Choose Window⇒Layers to open the Layers dialog box.**

CAD files usually come with dozens of layers. Make the Layers dialog box nice and big so you can see more of them.

- 2. Choose Window⇒Entity Info.**

The Entity Info dialog box appears and tells you which layer a selected entity is on.

**3. Right-click any part of the imported CAD drawing and choose Edit Component.**

As long as your model contains at least one entity when you do a CAD data import, SketchUp Pro automatically puts all of the imported geometry into a single component. Whatever you do, try not to explode this component — you find out why later on in this chapter.

**4. Select an entity that you don't want to see right now.**

In Figure [8-23](#), I've selected one of the grid lines that I don't think I'll need for awhile (or at all).

**5. Look at Entity Info to see what layer contains your selected entity.**

In this case, the selected grid line is on layer A-GRID. I guess I could've figured that out myself.

**6. Find the offending layer in the Layers dialog box and turn it off.**

In the second part of Figure [8-23](#), switching off the A-GRID layer temporarily hides all of the entities on that layer. Better already! If you're positive you won't need the contents of a particular layer, you can delete it altogether, but I'm the kind of person who doesn't like to get rid of things. (I have the basement to prove it.)

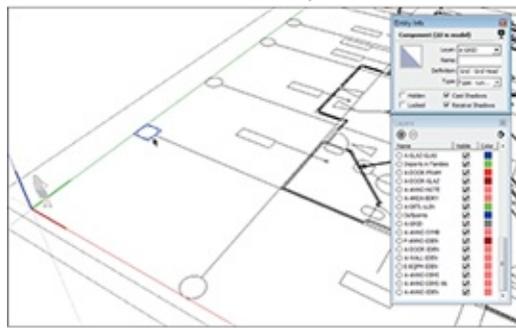
**7. Repeat Steps 4–6 for all of the entity types you want to hide.**

This part of the cleanup process is pure SketchUp catharsis. It takes time, but the results are immediately visible. The last part of Figure [8-23](#) shows what I ended up with after I hid a bunch of layers.

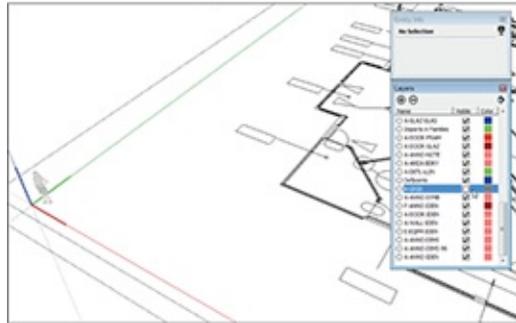


Of course, you can also dive right into the Layers dialog box and start turning off individual layers, especially if you know what entities they contain. The preceding steps are useful for situations where layers aren't named descriptively or for when you're overwhelmed and don't know where to begin.

In Entity Info, see which layer  
the selected entity is on



Use Layers to hide that layer



Repeat for all unnecessary entities



Figure 8-23: Select things you don't need and hide the layers they're on.

## Modeling on top of imported CAD data

So you've successfully imported a CAD drawing and stripped down its style and visible layers to make it more manageable. Kudos — it's time to start having some fun. Building a 3D model based on underlying (literally) CAD linework can be a surprisingly Zen experience *if* you follow one simple rule:



**Keep the imported CAD data isolated inside of its own component and build your model on top of it.** *Don't* be tempted to use the imported edges to create faces directly.

Here are three reasons why:

- ✓ **CAD data is almost always full of gaps.** Lines that should extend all the way to their neighbors are sometimes short by tiny, invisible amounts, meaning you'll spend hours drawing edges and trying to figure out why faces won't appear where you want them to.
- ✓ **CAD lines that should be parallel to one of the colored axes often aren't.** Think that edge is parallel to the red axis just because it looks like it might be? Not necessarily. Blithely turning imported edges into faces and then pushing/pulling them into 3D geometry is like building a house on quicksand; things get wonky quick. (As we said in Texas, where I went to architecture

school.)

- ✓ **Imported CAD drawings aren't always flat.** Sometimes different parts of your imported linework are located at slightly, maddeningly different heights. I'm talking thousandths of an inch — not enough to notice initially but certainly enough to mess up your work later on in your process.

Instead of trying to use the imported edges as part of your 3D model, use them as references for new geometry that you draw on top of them. It doesn't take as much time as you'd think, and the result is a model whose geometry is far more accurate and predictable. The following two sections talk about strategies for “tracing” imported CAD content.

### ***Modeling straight, vertical walls based on imported CAD edges***

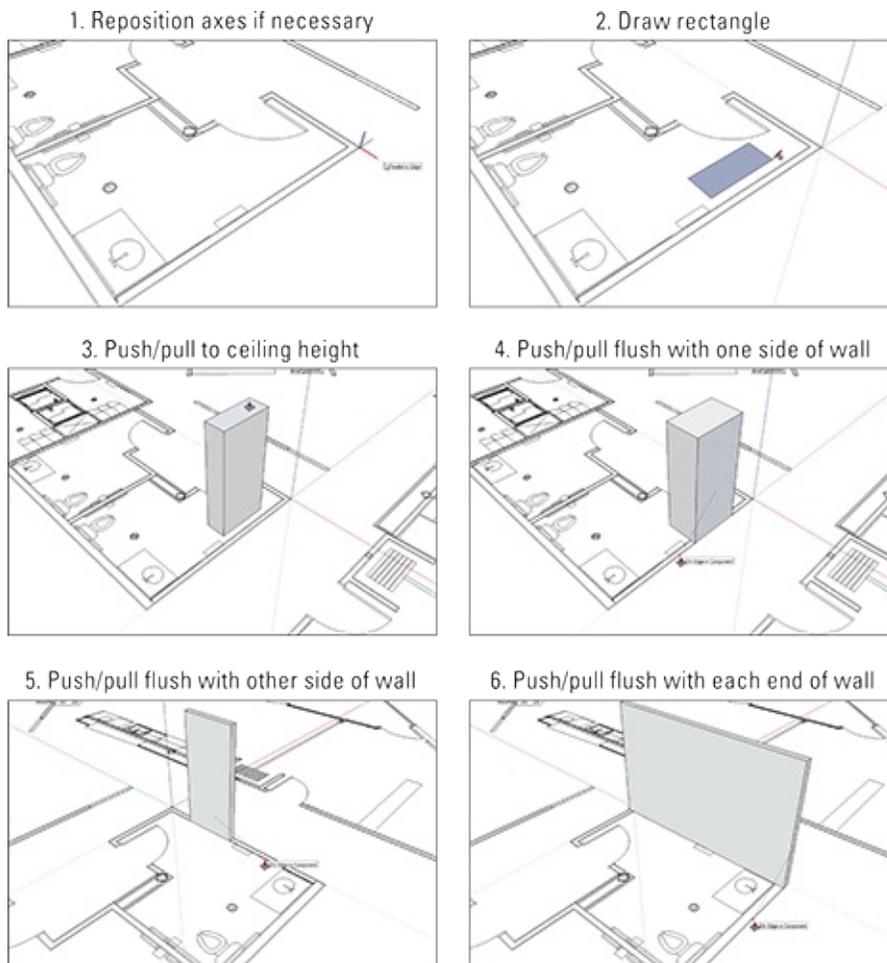
There's a technique for modeling simple walls and other straight elements on top of imported CAD linework that's so simple and — dare I say — *enjoyable*, that audiences regularly applaud when I demonstrate it. I wish I'd come up with it, but the credit goes to my friend (and colleague) Mike Tadros for showing it to me.

The Push/Pull tool is the hero of this method; follow these steps (and see Figure [8-24](#)) to model a straight wall based on edges in an imported CAD drawing:

1. **Make sure you're not editing the component that contains your imported CAD linework.**



Remember that you're using the CAD drawing as a reference underlay for your own 3D modeling activities. You'll be working “on top” (outside) of the component.



**Figure 8-24:** Modeling a simple wall based on a couple of edges in an imported CAD drawing.

**2. Use the Axes tool to line up the colored modeling axes with the wall you're about to model.**

If the axes are already parallel to the wall, you can skip this step. If not, just choose Tools⇒Axes and line up the modeling axes with an edge in the CAD drawing that represents the wall you're working on.

**3. Draw a rectangle next to the wall.**

It doesn't matter how big it is; you'll see why in a moment.

**4. Use the Push/Pull tool to extrude the rectangle up to the height of the wall you're modeling.**

If you don't know it just yet, just guess. It's easy to change this later.

**5. Use the Push/Pull tool to extrude the box you just made so that it's flush with one side of the wall.**

If you drew the rectangle in Step 3 to the *outside* of the wall, push/pull the face so it's flush with the *inside* of the wall. Have a look at Figure [8-24](#) to see what the heck I'm talking about.

The key to this step is pure SketchUp Inferencing 101: Click to start pushing/pulling, hover your pointer over the edge (or its endpoint) that you're aiming for, and then click again to stop pushing/pulling. You're using the imported CAD edge as an inferencing reference for your

tool. It's cake after you've done it once or twice.

6. **Use the Push/Pull tool to make the opposite face of the box flush with the other side of the wall.**

See what's happening? You're using the Push/Pull tool and carefully chosen inferences to turn the box *into* the wall.

7. **Push/pull the ends of the 3D wall so they match the underlying drawing.**

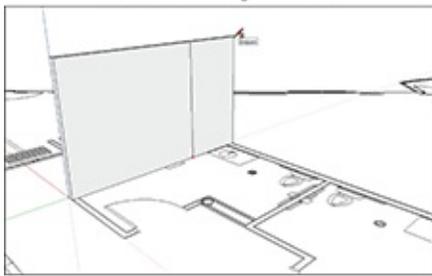
I told you this was fun.

What happens when walls meet up at corners? Well, that can happen at right angles (which is common) or at other angles (which isn't uncommon).

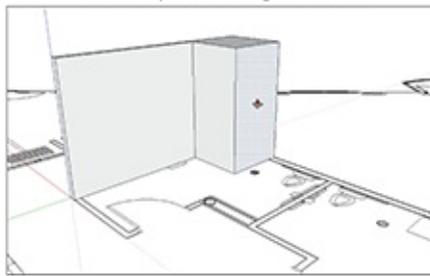
### Modeling right-angled walls

For 90-degree corners, all you have to do is draw a rectangle on the inside face of your wall and use the Push/Pull tool to extrude it out. After that, use the same tool to make it flush with the edges in the CAD drawing. Figure 8-25 provides a visual.

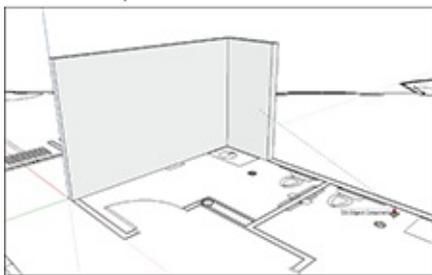
1. Draw rectangle on wall



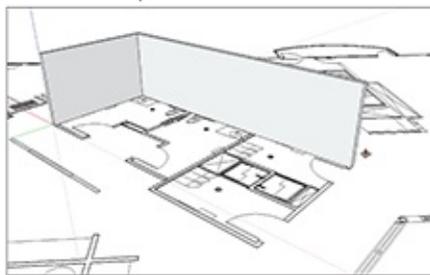
2. Push/pull rectangle into 3D



3. Push/pull flush with inside of wall



4. Push/pull flush with end of wall



**Figure 8-25:** Use the Rectangle and Push/Pull tools to model walls that meet at right angles.

### Modeling walls that meet at non-right angles

If you're dealing with a corner that isn't 90 degrees, you can proceed in a few different ways, but my favorite is to use the Intersect Faces tool. The following steps (and Figure 8-26) elaborate on the technique:

1. **Model each straight wall segment independently but don't overlap their ends just yet.**

Follow the steps in the section "[Modeling straight, vertical walls based on imported CAD edges](#)," a few pages earlier, to build each wall so it's parallel with the CAD edges to which it corresponds. Don't worry about the two wall ends that will eventually meet; keep them apart for now.

2. **Use the Push/Pull tool to extend each wall well past the point at which it should meet the other.**

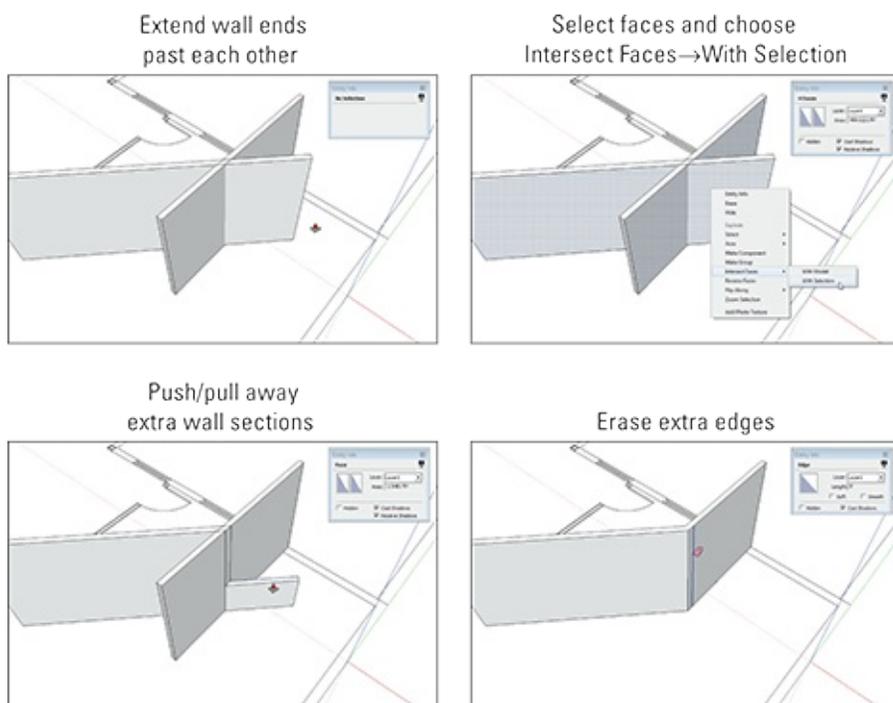
You're modeling something that looks like an X from above.

3. **Select the inside and outside faces of each wall.**

You should have a total of four faces selected.

4. **Choose Edit⇒Intersect Faces⇒With Selection.**

This action tells SketchUp to draw an edge wherever two faces intersect. If you had four faces selected, you should now have two new edges.



**Figure 8-26:** Use Intersect Faces to model walls that form non-90-degree corners.

5. **Use Push/Pull to push away the wall segments you don't need.**

Pushing their top faces all the way down to their bottom faces makes them disappear.

6. **Use the Eraser tool to get rid of any extra edges.**

### ***Modeling curved and irregular forms from CAD data***

For rectilinear walls, stairs, and other shapes, SketchUp's Rectangle and Push/Pull tools are rock stars. Rounded forms (such as concrete patios and castle turrets) and irregular lines (such as riverbeds and Frank Gehry buildings) call for other, more drastic measures.

The following steps give a general example dealing with features in your CAD file that aren't worth painstakingly tracing with the Line tool but which need to appear in your SketchUp model. In these situations, I rely on the handy Paste in Place command:

1. **Dive into the component that contains the imported CAD linework.**

By “dive into,” I mean edit it, which you can do by double-clicking it with the Select tool.

**2. Select the edges you want to reuse.**

**3. Make a group out of the edges.**

Choose Edit⇒Make Group to do this. Grouping your selection accomplishes two things: Grouping makes reselecting it easier (in case things go awry), and it keeps things nice and separate for the next couple of steps.

**4. Choose Edit⇒Copy.**

**5. Stop editing the CAD linework component.**

You can exit a component (or a group) by double-clicking with the Select tool somewhere outside its bounding box.

**6. Choose Edit⇒Paste in Place.**

*Voilà!* The edges in question are now a part of your model, and (thanks to Step 3) are quarantined from the rest of your geometry by means of a group.

For shapes that are made up of simple arcs (segments of circles), your best bet is to try to re-create them by using SketchUp’s own Arc tools. Why not just use the Paste in Place method (described in the preceding steps) to copy them? When it comes to arcs, I find it’s nice to have control over their number of sides, and drawing them from scratch is the only way to do that.

Follow these steps to accurately trace an arc from underlying CAD linework (see Figure [8-27](#)):

**1. Draw an edge that’s perpendicular to one of the arc’s line segments, heading in the direction of the arc’s center point.**

You can use SketchUp’s Perpendicular linear inference to help you draw a perpendicular edge. This is the first step in figuring out the precise location of the arc’s center point.

**2. Repeat Step 1 for another of the arc’s line segments, crossing your new edge over the one you just drew.**

The point at which these two edges intersect is the center point.

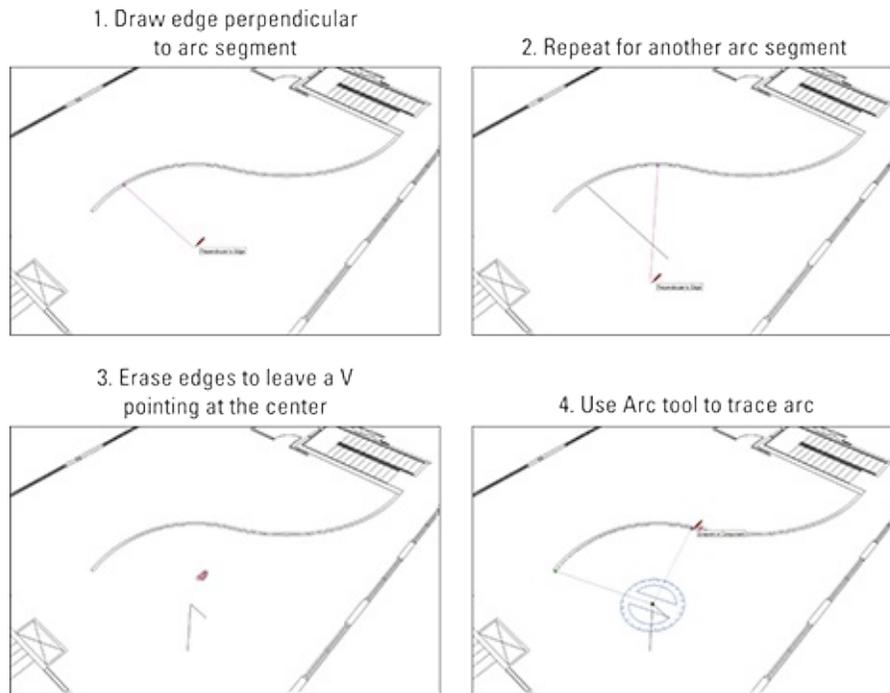
**3. Erase two of the edges that you just drew, leaving a small V that points to the arc’s center point.**

Look at the third image in Figure [8-27](#) to see which two edges I’m referring to.

**4. Choose Draw⇒Arcs⇒Arc to activate SketchUp 2014’s new Arc tool.**

What is now called *2 Point Arc* used to be SketchUp’s *only* Arc tool; it works by first setting endpoints and then setting a bulge. The new Arc tool, which is called simply *Arc*, lets you start

by defining a center point; this is much more useful for situations like the one you're in now.



**Figure 8-27:** In SketchUp 2014, the new Arc tool lets you easily draw arcs with a given radius.

**5. Click once to set the center point of your new arc.**

This is, of course, at the tip of the V you drew in Step 3.

**6. Complete the arc by clicking to set each of its endpoints.**

**7. (Optional) Change the number of edge segments in your new arc.**

Before you move onto anything else, type the number of segments you want, followed by the letter **s**, and then press **Enter**. I mention this because it's quite likely that you'd want more than the default 12 segments on arcs that represent major features in your design.

## Chapter 9

# 3D Printing with SketchUp Models

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### ***In This Chapter***

- ▶ Dividing your model into layers
  - ▶ Using SketchUp files for 3D printing
  - ▶ Preparing a SketchUp model for 3D printing
  - ▶ Knowing your 3D printers
  - ▶ Going beyond basics with joints and motion
- 

Seeing your masterpiece in SketchUp is cool. You can twist and turn and view it from every angle. But wouldn't the world be so much cooler if you could hold your creation in your hands?

This chapter talks about using SketchUp with a 3D printer.

In organizing the chapter, I am dangerously assuming that you didn't just skip all the way forward to get here, and have a working understanding of SketchUp and its tools. I'm also assuming you've heard about 3D printers and are curious to learn more. The focus is on desktop 3D printers, the most common class of 3D printers on earth. You get a look at 3D printing technology in general, and touch briefly on a few types of professional machines.

Most of this chapter discusses guidelines, methods, and tools to help you modify your SketchUp models to be 3D printed. I also point out a few limitations of 3D printers, and how you can work within them.

## ***Building Up a View of 3D Printing***

It may sound like magic, but 3D printing is a process that uses the 3D information from your SketchUp model to build a physical version of that model in the real world. It's science fiction come true.

3D printing got its start as the hot new technology of the mid-1970s — and spent 35 years stuck as the high-priced plaything of prototyping engineers and the lucky people who build fighter jets. And that's where it stayed until the first DIY desktop 3D printers appeared in 2009. Overnight, the cost of a 3D printer fell from \$500,000 to \$500. What was the coveted technology of the chosen few is now found on the desk of any well-equipped designer, engineer, or model maker.

## ***Building a Model in Layers***

There are many different 3D printing technologies and manufacturers, but they all use a process called *additive manufacturing*: An object is built from thin horizontal slices of material, with each new layer extruded slightly above the previous layer and then fused to it. Layer by layer, the object

is built up until finished.

## ***Supporting layers from below***

SketchUp's world is an amazing place where you can rapidly build a 3D model while ignoring little things like the laws of physics. An object being 3D printed, however, is subject to all the forces of the physical world, including that pesky omnipresent one, gravity. New layers can't be printed floating in open space; they need to have something below them.

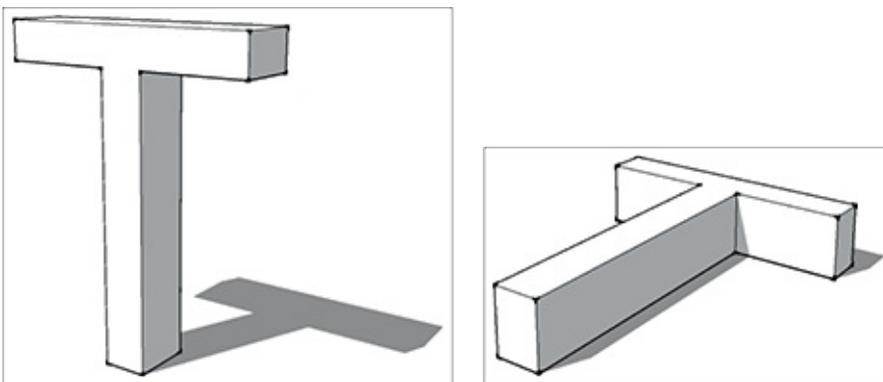
The need to support each layer is the most important guideline to keep in mind while you're designing objects for 3D printing. You can use either of two strategies to support new layers as you're printing out objects:

- ✓ **Use the 3D printer's support-material function**, which creates a secondary structural lattice around the part. The lattice holds up any layers that would otherwise be free-floating in space. Support material may be dissolvable after printing or have to be manually removed with fingers and tweezers, depending on your type of 3D printer. Either way, removal of support material can become the most labor-intensive part of 3D printing; it also increases the amount of materials used and the time it takes to print the object.
- ✓ **Design and print your parts in a way that limits the conditions that allow unsupported layers to exist.** Smooth transitions and sweeping curves not only look awesome; they can also be easily printed without resorting to the use of support material.

## ***Designing to avoid support material***

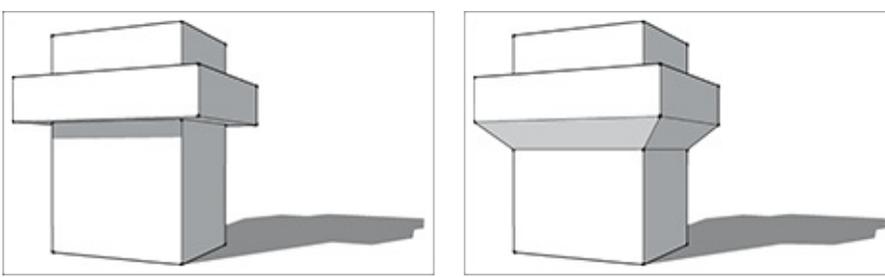
With a little forethought, you can avoid the use of support material entirely by adhering to a few basic guidelines:

- ✓ **Think about your parts orientation.** Orient the part so that it prints with the smallest number of overhangs. This may mean printing your object upside down or on its side. The capital T in Figure [9-1](#) could be printed standing upright, but laying it on its back allows it to print much faster — without support material.



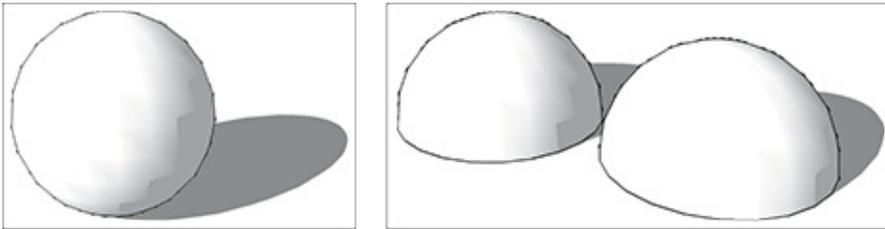
**Figure 9-1:** Re-orienting a part can make it print faster and leave less support material to clean up.

- ✓ **Try rethinking your angle.** Most printers can print a slope between 45 and 60 degrees from vertical without using support material. Keep this limit in mind as you design. Chamfers and fillets are great for supporting features and smoothing out rough transitions. In Figure [9-2](#), a chamfer turns a part with an unsupported overhang into an easily printable part. As an added bonus, fillets and chamfers make your part stronger by eliminating stress points.



**Figure 9-2:** A chamfer can turn an unprintable 90-degree angle in to a printable 45-degree one.

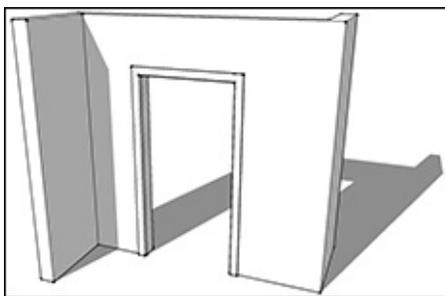
✓ **Consider breaking your object into multiple prints.** The sphere in Figure 9-3 could be printed using support material, but it will print faster and with less cleanup if you split it in half and attach it back together afterwards. Later in the chapter, I talk about systems you can include to make it lock together quickly.



**Figure 9-3:** Often a subdivided part is faster and cleaner to print than a part printed all at once.

## ***Bridging***

*Bridging* is a feature on 3D printers that lets you print a structure across a gap without using support material. To bridge a gap, the structure being printed must be parallel to the build platform and have a secure point of attachment on either side, as with the top of the door frame shown in Figure 9-4. The printer will attach plastic to one side of the gap and stretch a line across to the other side. The process is repeated until the gap is filled. Future layers are printed on top as usual.



**Figure 9-4:** When is a door frame a bridge? When it's 3D printed.

## ***Preparing a SketchUp Model for 3D Printing***

The longer you work on a SketchUp model, the more it tends to fill with illogical intersections, free-floating cantilevers, and other quick shortcuts. When you're making an image or walk-through, these are minor trade-offs that help get a big job quickly. Drawing something that looks right on the outside in SketchUp doesn't necessarily mean it can be 3D printed with one click of a button. A 3D printer can't interpret that mishmash of geometry to guess what you were really thinking.

In this section, I talk about how to clean up that SketchUp madness and make it into a 3D printable object. The cleanup process uses tools discussed in earlier chapters, but the method of usage

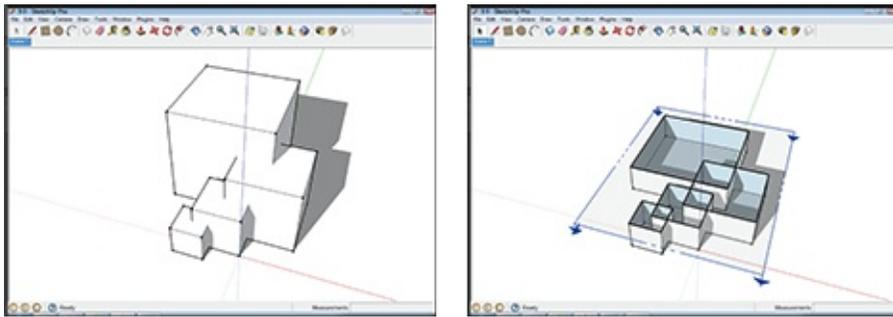
differs. Cleaning up a messy SketchUp model can look like a daunting task when you start. Remind yourself that it's just like eating an elephant: Divide the job into manageable chunks and work on them one at a time. Even if the trunk can be a bit chewy.



Before you start cleaning, make sure you've saved a separate copy of your SketchUp file, just to be safe.

## *The Section Plane tool, your secret cleanup weapon*

Although you can use the Section Plane tool to create sectional views through your model, this awesome tool has another use: It can show you what's going on inside your model's geometry. 3D printers see a SketchUp model as a series of 2D horizontal slices. Figure 9-5 moves the Section Plane through the model horizontally to show what the 3D printer is going to see.



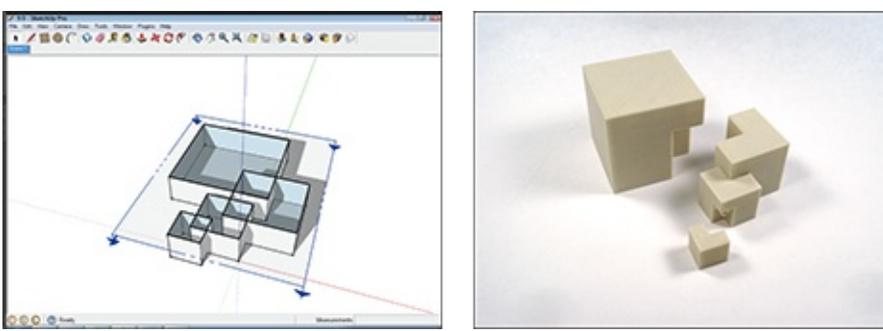
**Figure 9-5:** Using a section plane to look at all overlapping parts that make up your model.

To get a watertight solid object, all groups need to be combined into one, and all that extraneous geometry has to be eliminated from the model. Chapter 11 discusses the Section Plane tool in detail.

## *Solid objects and 3D printing*

To 3D print your parts successfully, they will need to be solid objects, or as close to solid as possible. No missing or extra faces, overlapping sections, or extraneous bits allowed. Your SketchUp model needs to describe all aspects of the outer surface of the shape. For example, to print an egg, a SketchUp model would need to describe 100 percent of the outside of the egg's shell. That's not as simple as it sounds ... .

- ✓ **Zero thickness = Zero printing.** A wall that is a single plane has a thickness of zero and will not print.
- ✓ **No cheating!** It's easy to get things done quickly (in the abstract, anyway) by pushing parts through each other and building revisions on top of old geometry. If you've created an illogical mess that would make M.C. Escher cry, your 3D printer doesn't stand a chance. You'll need to clean everything up so that only the outer surface remains.
- ✓ **3D printers aren't very smart.** If you make them guess what your part should look like, they will usually guess wrong. Figure 9-6 is a testament to the carnage.



**Figure 9-6:** This poor print never stood a chance.

Chapter [6](#) gives you lowdown on solid objects in SketchUp.

## *Groups and components*

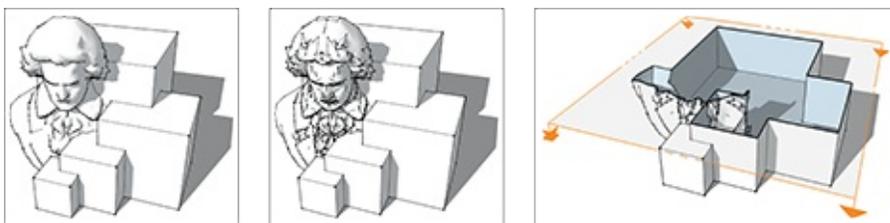
Chapter [5](#) explains groups and components, and how to use them to keep your SketchUp model organized as you work. Groups and components are great for keeping parts from sticking together as you work, but to make your SketchUp model a solid shell that can be 3D printed, you'll need to merge everything together.

Before you start exploding things and sticking them together, spend a moment thinking about how you want your actual 3D printed model to work. For most projects, you need to merge all your groups and components into one printable object before exporting your model from SketchUp. For larger projects, think about assembling the blocks into sections that you can 3D print and attach together later.

## *Using Solid Tools to combine groups*

Chapter [6](#) explains how to use SketchUp's Pro's Solid Tools to perform Boolean operations. Solid Tools are great for unifying groups made up of simple solid parts. They can save significant time. Unfortunately, complex shapes cause the Solid Tools to act unexpectedly — and, after multiple iterations, to break down.

In Figure [9-7](#), Solid Tools had no problem intersecting several simple cubes together, but adding a complex shape to the object caused the tools to break down. The accompanying sidebar takes a closer look at why this happens.



**Figure 9-7:** Booleans are great for simple things. But don't rely on them for complex cleanup.

## **What's wrong with Solid Tools?**

You may have been looking at the Outer Shell button in the Solid Tools menu and thinking, "Wow, making this into one outer shell is going to be easy." So you decided to save your work, select your whole model, and click Outer Shell. Oops. (Come back when you're done screaming.)

In the discussion of Solid Tools in Chapter [6](#), you find out that they are also called Boolean operations. Boolean operations started out as computer programming tools that help sort and manipulate data. In the early days of computer graphics,

programmers used Boolean operations to work directly with the data that makes up 3D models. Boolean operations still exist in every piece of 3D modeling software today. If you take a class in 3D Modeling, they'll be the first thing you'll learn, and then you'll be told to never use them ever again.

The problem is Boolean operations are the blunt instruments of 3D. They work within a narrowly defined set of parameters, and are notorious for the way they indifferently modify geometry. After a few uses, the damage caused by the tool itself starts to compound, and the model becomes too garbled for the Boolean to interpret again. Basically, after being confounded by the sum total of its own mistakes, it gives up in failure. Outer Shell is trying to run a whole series of Boolean operations at once, and if your model is made up of anything except simple shapes, those operations won't succeed.

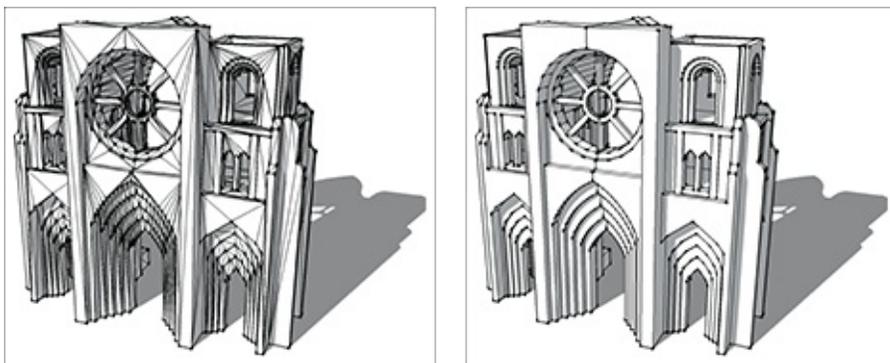
Unfortunately, cleaning up your model just isn't going to be single-click simple. Also, Santa Claus isn't real.

## *CleanUp<sup>3</sup> and Solid Inspector*

Before getting into how to start modifying your model, I want to touch on two tools from the SketchUp Extension Warehouse that I consider essential for 3D printing: CleanUp<sup>3</sup> and Solid Inspector, both created by Thomas Thomassen.

CleanUp<sup>3</sup> is a tool that checks and simplifies the geometry of your SketchUp model. It combines multiple faces, eliminates extraneous data, and erases any lines that don't make a face. Two of the most useful CleanUp<sup>3</sup> options are Erase Duplicate Faces and Repair Split Edges, which can be enabled in the CleanUp<sup>3</sup> menu. Duplicate faces and split edges are errors that inevitably appear in your model as you work in SketchUp, and they drive 3D printers nuts. Both errors are hard to recognize and repair manually.

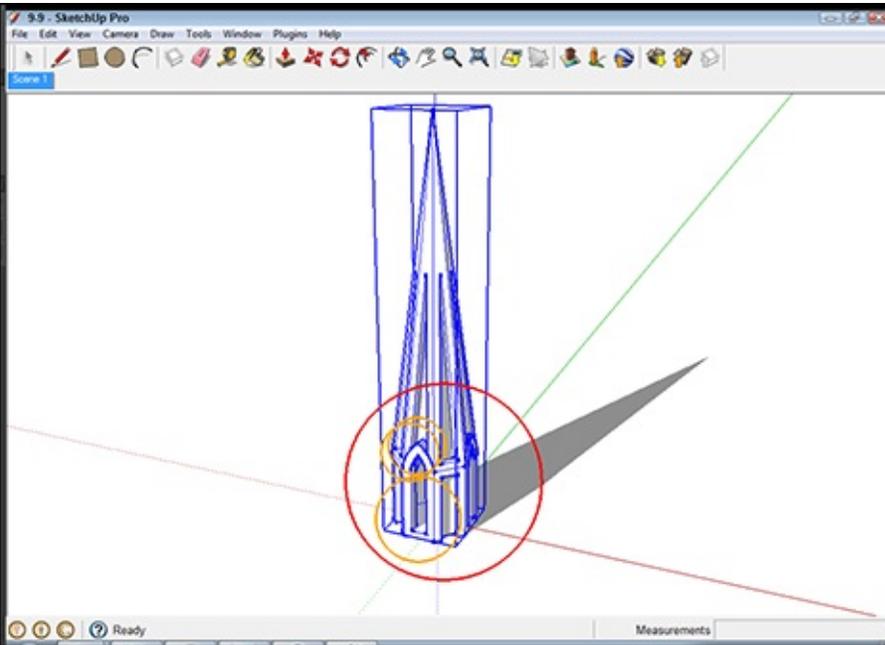
CleanUp<sup>3</sup> is also great at simplifying STL files you import into SketchUp. In Figure 9-8, which shows the triangulated data you get from an imported STL file, the faces have been broken into hundreds of triangles. By removing that triangulation, CleanUp<sup>3</sup> makes files downloaded from 3D printing communities (such as Thingiverse at [www.thingiverse.com](http://www.thingiverse.com)) easier to edit in SketchUp.



**Figure 9-8:** An imported STL file, before and after running CleanUp<sup>3</sup>.



Solid Inspector finds and highlights problems that are preventing your model from being a solid shell, and I can't overstress its usefulness. It highlights problem areas and helps you automatically move from one error to next, making repairs much faster (see Figure 9-9). It's a tool no one using SketchUp for 3D printing should be without.



**Figure 9-9:** Solid Inspector is great at finding problems that need a quick fix.



As you work on your model, get in the habit of running CleanUp<sup>3</sup> periodically. Run Solid Inspector before you export from SketchUp to 3D print. It will catch any errors that would cause the print to fail.

## *Using the Intersect tool to combine groups*

An alternative way to assemble your groups into one object is to use the Intersect tool. I touched on the Intersect in Chapter 4. Here you're going to use it differently to help eliminate overlapping geometry and leave behind a Solid object. This method is slower than using the Solid Tools, but will work on very complex objects and groups that aren't already solid.

In a complex model, isolate and work on one small part of the SketchUp model at a time, making each section into one solid part. Repeat the process on those sections until you up have one Solid model.

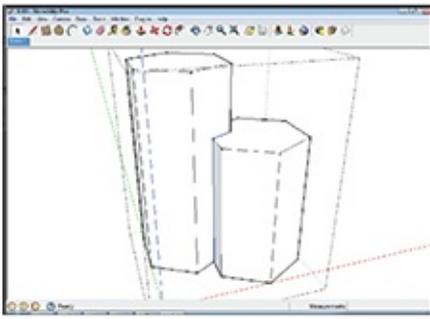
### **1. Select the groups you are going to combine and group them together.**

Your original groups are now subgroups that exist together inside a new group.

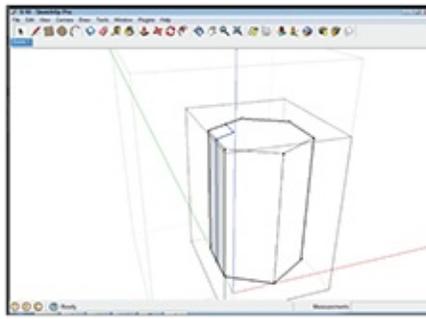
### **2. Choose Edit⇒Intersect Faces with Context.**

Doing so opens your new group and selects all the subgroups, drawing lines at all the places that groups intersect. These new lines of intersection exist outside the subgroups and aren't stuck to anything yet, as shown in Figure [9-10](#).

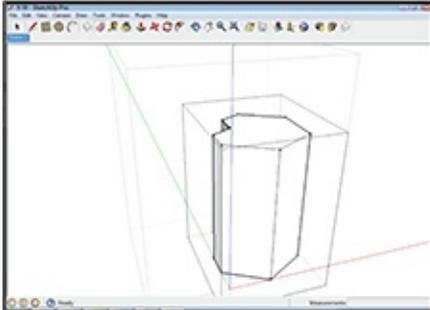
Intersect Faces creates new lines where lines intersect



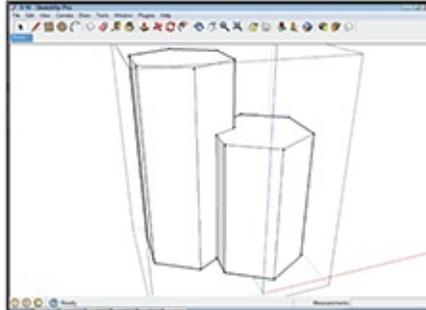
Lines of intersection pasted onto the object



Erase overlapping geometry



Final outer shell



**Figure 9-10:** Erase overlapping geometry to create an outer shell.

3. **Select the lines of intersection and copy them by choosing Edit⇒Copy.**
4. **Open each of the subgroups and paste the lines of intersection into them, using Edit⇒Paste in Place.**

Figure [9-10](#) shows the procedure.

5. **Go into each of the subgroups and erase all the areas of overlap beyond the lines of intersection.**

Work deliberately, moving back and forth between the subgroups to make sure you're erasing the right areas.

6. **When you've got all the overlapping areas erased, move back into the main group, select all the subgroups, and use the Explode tool from the right-click menu.**

You end up with one outer shell of an object in its own group. Figure [9-10](#) shows this result.

7. **Run CleanUp<sup>3</sup> on the new part and use Solid Inspector to check for any accidental holes.**



Individual faces and short line segments can get lost during this process. You may need to make minor touch-ups with the Line tool.

## ***What about the normals?***

From a highly technical computer-science perspective, every face in your model has two sides: an inside and an outside. The two sides are set apart by a bit of data called the face's *normal*.

SketchUp is smart enough that it doesn't matter how the normals (also known as the front and back) are oriented; both sides are treated the same. 3D printers aren't that clever; they need to have all the normals oriented so the outside are pointing out and the insides are pointing in.

To check your model's normals you'll need to look at it styled with SketchUp's default texture. Choose View⇒Face Style⇒Monochrome to hide any colors or textures you've added to the model and see the default material. (Chapter [10](#) covers styles in detail.)

Any faces that show up shaded the default blue have their normals reversed. These will need to be corrected, or the 3D printer will see them as missing. To correct a single face, follow these steps:

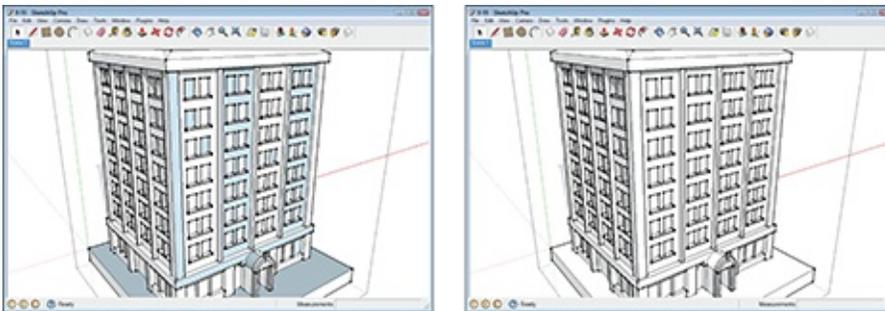
1. **Right-click the reversed face you want to correct.**

The right-click menu appears.

2. **Choose the Reverse Faces tool.**

3. **If you have a lot of misaligned faces, select one of the faces that is white and use the Orient Faces tool from the right-click menu.**

Doing so flips all the faces in the model to match the view shown in [Figure 9-11](#).



**Figure 9-11:** A correct normal is a happy normal.



If the Orient Faces tool causes everything to flip randomly, it's a sign that you have extraneous faces inside your model. Use the Section Plane tool to look inside, find the face, and erase it.

## *Sizes Matter*

Every 3D printer has a minimum and maximum size of object it can build, as shown in [Figure 9-12](#). These sizes are usually set by the size of the tool printing the material and by the overall size of the printer. To build something bigger, you have to get creative. To build something smaller, you'll need a more expensive 3D printer.



**Figure 9-12:** Too big and too small. There is something there on the right; it's just very small.

## Too small to print

In the SketchUp world, you can design a skyscraper small enough to fit on the head of a pin, but the 3D printer can't print it. Every 3D printer has a minimum size for what it can build; anything smaller than that won't be printed. You'll see these values listed as Minimum Feature Size and Minimum Wall Thickness. Feature Size and Wall Thickness can turn into stumbling blocks when you're trying to 3D print a SketchUp model that was constructed at full size and then scaled down.

- ✓ Minimum Wall Thickness tells you how thin a freestanding piece of geometry can be and still be printed. That thickness is typically between 1.0mm and 0.5mm.
- ✓ Minimum Feature Size is the smallest size that a feature can be on the surface of the object that will be printed. It's typically between 0.7mm and 0.2mm.

## Too big to print

The biggest object you can 3D print at one time is set by the printer's *build volume*. If your model won't fit in the Build Volume, you're going to have to either scale your object down, or print it in parts. The next section talks about how to split up a model so you can print it in parts. For now, remember: Although the maximum size of any single part is limited by the size of your 3D printer, the size of what you can 3D print is limited only by your creativity and patience. (I know of a man in New Zealand who's 3D printing himself an Aston Martin, one 6-inch cube at a time.)

Here are some handy hints for making best use of Build Volume:

- ✓ The Build Volume, or *envelope*, is given by manufacturers as measurements of X, Y, Z. X and Y are the width and depth of the build surface; Z is the maximum height.
- ✓ It's helpful to create a representation of your 3D printer's maximum build volume in your SketchUp model. Make a translucent block representing the maximum build volume and check to see whether your SketchUp model or its components will fit inside that volume.
- ✓ A 3D printer's build platform is much longer diagonally than it is on any one side. To take advantage of the extra length, rotate long parts so they stay inside the build volume.
- ✓ Printing large objects comes with its own issues and complexities. Large objects are more prone to failure and breakdowns. Make sure you're comfortable with your 3D printer before you start printing your own sports car.

# Breaking Your Model into Parts

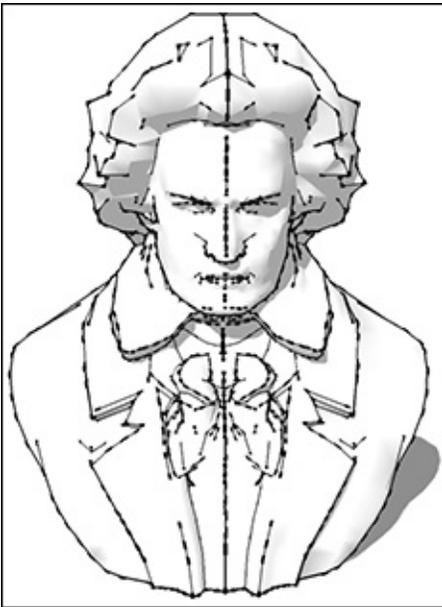
As you do more 3D printing with SketchUp, you'll run into the need to split your model into parts. Some ideas are just too big to fit into your 3D printer's build volume. Other ideas want to be 3D printed in a rainbow of colored plastic. And sometimes a model just needs to be split to make it easy to print.

## Where to cut

When subdividing a SketchUp model into printable parts, start by thinking about what you're going to do with the seams. If you're going to sand, paint, and finish the model, then have at it and cut wherever you want. But sanding and finishing is a huge amount of work, especially if you've never done it before. It's much easier to make your cuts and seams look like they're intentional parts of the model.

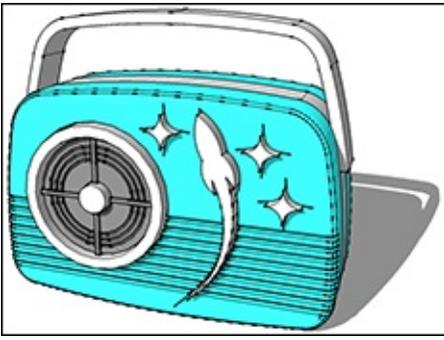


For a seam to look intentional, it has to work with the logic of the object. Every object has its own logic, an underlying order that informs how it's shaped and structured. For example, in Figure 9-13, the object is symmetrical left and right. A seam on the axis of symmetry is less objectionable than one that runs randomly in another direction. By following a line that's already conceptually present in the object, the seam reinforces what the eye already perceives.



**Figure 9-13:** The line is far less objectionable when it's well thought out.

Another good place to hide a cut is at a change in elevation, curvature, or color, as shown in Figure 9-14. Placing a seam where the surface of a part is already interrupted or in transition will make it far less noticeable. This is the strategy most commonly employed for injection-molding parts. Pick up something around you that's made of plastic and find the seams where the parts come together. If you can imitate that type of seam, people will readily accept that your object is a “real” thing. It will feel correct among manufactured things in our injection-molded world, and you'll fool people into thinking your 3D printed part came from a factory somewhere.



**Figure 9-14:** Do the seams look out of place?

For very large constructions, the only option may be to establish a grid and cut into build-volume-size blocks. Sanding, finishing, and painting can work well on large parts, but expect to spend substantial time doing it right. If you’ve spent the energy to build a something that big, it’s worth the extra time to make it amazing.

### *How to cut*

Cutting a model into parts is very similar to using the Intersect Faces tool to combine groups (discussed earlier in the chapter). You’re going to use a piece of geometry as a cutter that will be intersected with the larger object and become the new edges of the cut.

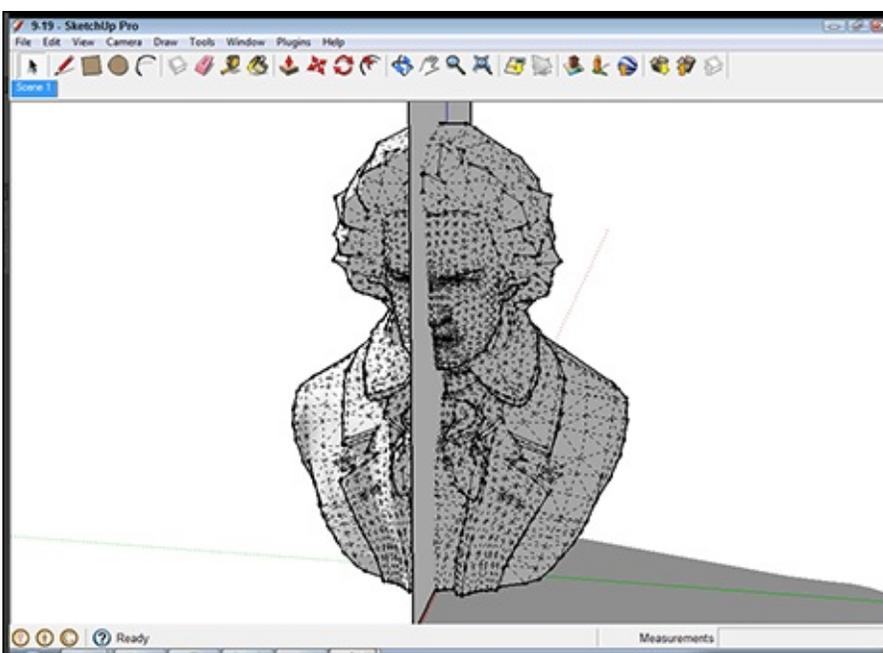
If your model is fairly simple and you have SketchUp Pro, you can use Solid Tools to short-circuit this process. Create a solid block as a cutting object and use the Solid Tools⇒Trim command. Remember to run CleanUp<sup>3</sup> and Solid Inspector on the new parts when you’re done. For more complex models, or users with the basic version of SketchUp, use the Intersect Faces method:

- 1. Select the group you want to cut and make a new group around it.**

The original group becomes a subgroup.

- 2. Working inside the new group, create geometry in the shape of the cut you want to make.**

Work on top of the subgroup, so you get the placement of the cut right, as shown in [Figure 9-15](#).



**Figure 9-15:** The Cutter object can be a single plane; it's going to become part of the solid object.

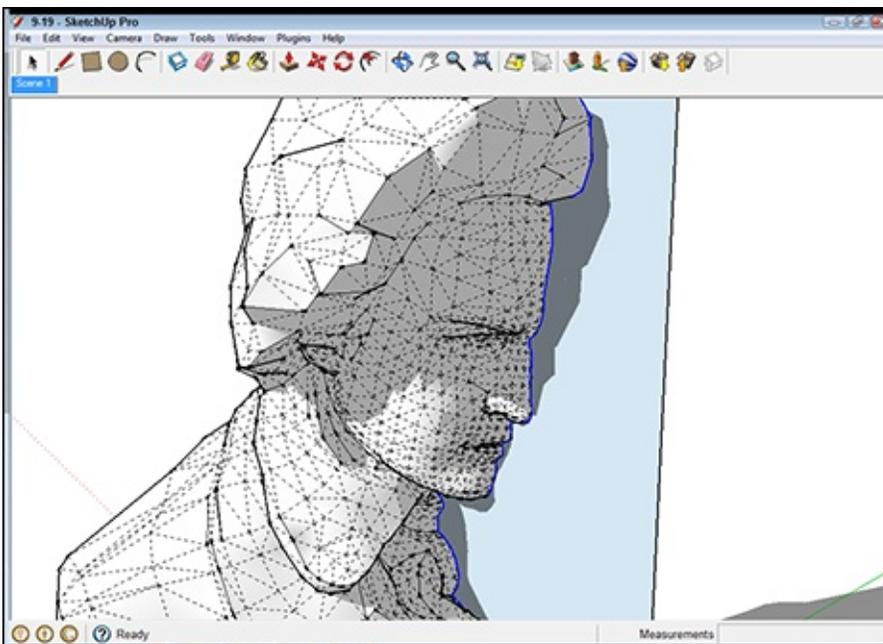
3. **When you're done placing cuts, make the new geometry into its own group.**
4. **Select the Cutter object and choose Edit⇒Intersect Faces with Context (or choose Edit from the right-click menu).**

Doing so draws a line at every place where groups touch. These new lines of intersection exist outside the subgroups and aren't stuck to anything yet, as shown in Figure 9-16.

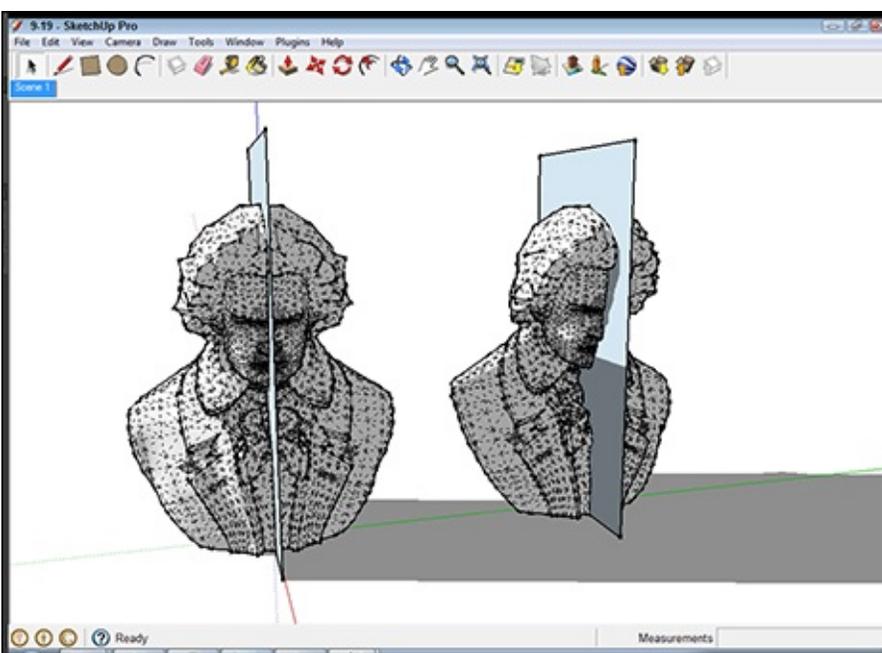
5. **Inside each group, use Explode to stick the intersection lines, cutting object, and base object together.**

The surface of the cutting object will become the sides of the new part.

6. **Move back out to the master group and make as many copies of that group as the number of parts you're dividing it into (see Figure 9-17).**



**Figure 9-16:** Lines of intersection created between the two groups.

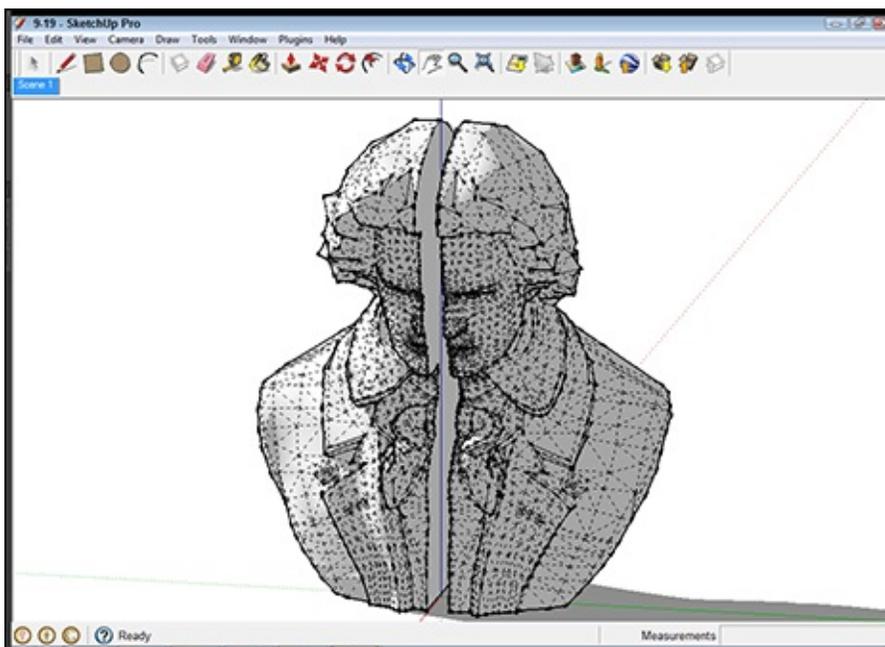


**Figure 9-17:** Here I'm dividing into two parts, so I need two copies.

7. **Move into each copy and erase everything you don't need in that part. Do the same in the other parts.**

Just make sure you don't erase what the object needs to do its job.

8. **Run CleanUp<sup>3</sup> on the new parts and use Solid Inspector to check for any accidental holes.**
9. **Position the parts back together to make sure everything lines up as expected, as shown in [Figure 9-18](#).**



**Figure 9-18:** It still fits!

## *Exporting Your SketchUp File*

After you've cleaned up your SketchUp model and you're ready to print it, you have to get your 3D model out of SketchUp and into your 3D printer's control software. Before your 3D printer

can open your model, you have to export the model as a SketchUp file, in either STL or OBJ file format.

If you're using SketchUp Pro, you already have the option of exporting an OBJ file. To export an STL file from either version of SketchUp, you'll need to install a free extension from the SketchUp Extension Warehouse called SketchUp STL. It's a great tool created by the SketchUp team to make 3D printing easier.

## ***Knowing Your 3D Printers***

3D printers are available that print objects in materials ranging from plastic to titanium. The medical research world has even created machines that can build structures from human tissue. All that separates these technologies is cost. Affordable desktop 3D printers are limited to printing in plastics. So that 3D printer you bought for \$500 can't print you a new kidney. (Not yet, anyway, but don't hold your breath.)

The two main ways 3D printers are compared to each other are in terms of *cost per cm<sup>3</sup>* (that is, cost per cubic centimeter of printed object) and *minimum layer height*. Cost per cm<sup>3</sup> is the cost of one cubic centimeter of printed volume; it's typically the number used when comparing the cost of one 3D printing technology to that of another. Minimum layer height is the thickness of one layer in the object. The smaller the height between layers, the smoother the surface of the finished object will look and feel.

### ***Desktop 3D printers***

Desktop 3D printers are still an emerging technology. When starting out with your first desktop 3D printer, don't expect it to work perfectly the first time out of the box. The machines haven't reached that level of polish yet. It helps to see a 3D printer as a tool you're learning to use, rather than as an appliance you just plug in. Before you dive into printing your own creations, spend some time going through the printer's training materials. Print a few test objects and get a feel for using the machine. I recommend printing skulls; they make great gifts for friends.

Desktop 3D printers tend to be based on tried-and-true technologies that have been used in industrial machines for decades. The two technologies that are available now are fused deposition modeling and stereolithography. The following sections give you an overview.

### ***Fused deposition modeling (FDM)***

FDM printers represent the mostly widely available type of desktop 3D printer. They build objects using solid plastic fed through a fancy robotic glue gun-style nozzle. FDM printers are inexpensive to buy, with desktop models ranging from \$500 to \$2,500. FDM-printed parts are done the moment the printer is finished; no secondary process is needed to finish or strengthen the object. The parts that FDM printers make can be as strong as parts from injection molding, and cost around \$0.04 per cm<sup>3</sup>. On the downside, FDM 3D printers have limited maximum resolution and tend to have a lot of moving parts, which can impact their reliability.

FDM Printers consume plastic filament as they build objects. Filament is drawn into the printer, heated, and then fused to form the object. Filament comes coiled on spools that look a bit like brightly colored weed-whacker wire. Spools are available inexpensively through vendors online

and are starting to become available in large office supply stores.

Examples of FDM 3D printers are MakerBot Replicator ([www.makerbot.com](http://www.makerbot.com)), Ultimaker ([www.ultimaker.com](http://www.ultimaker.com)), 3D Systems Cube (<http://cubify.com>), Affinia H-Series ([www.affinia.com](http://www.affinia.com)), and Solidoodle ([www.solidoodle.com](http://www.solidoodle.com)).

## **Stereolithography**

SLA 3D printers represent one of the oldest 3D printing technologies. They use a laser to build solid parts in a vat of liquid resin, selectively hardening the resin layer by layer. Desktop SLA machines cost between \$3,500 and \$8,000, but you'll hear ongoing speculation about a printer emerging at a price below \$1,000. Stereolithography offers superior printing resolution, which gives finished parts a glassy smooth surface. The machines are typically small and nearly silent, with a few moving parts. Prints from an SLA machine typically cost around \$0.15 per cm<sup>3</sup> and require some cleanup after printing. Also, due to the resin's toxicity, printed objects must be washed in isopropyl alcohol before handling.

Stereolithography's consumable resin is an amazing bit of chemical engineering. It's a liquid at room temperature until it's exposed to intense ultraviolet light, which hardens the resin into a solid plastic. Resin comes as a bottle of liquid; usually you have to buy it from the maker of your 3D printer to ensure compatibility. Resin has a set shelf life and needs to be stored with some care; it can begin to harden if left in sunlight.

Two examples of SLA machines are Formlabs Form 1 (<http://formlabs.com>) and B9 Creator (<http://b9creator.com>).

## **Do-it-yourself and kit printers**

Both FDM and SLA printers are available as kits and open-source DIY plans. In general, these 3D printers are good options for people who are interested in exploring printer technology and modifying their printers. Kits are cheaper than buying a printer, but often less reliable. The saying is, "If you build it yourself, you fix it yourself."

Two examples of DIY and kit machines are RepRap (<http://reprap.org>) and Printrbot (<http://printrbot.com>).

## **Professional 3D printers**

Professional 3D printers are typically housed in a dedicated department and operated by full-time employees. They are expensive, with prices in the hundreds of thousands of dollars, but offer capabilities beyond what is available in desktop models. As desktop 3D printing grows, and patents continue to expire, expect to see these technologies becoming cheaper and move into the desktop realm. Here's the current lineup:

- ✓ **Selective laser sintering (SLS):** *Selective laser sintering* uses a laser to melt and fuse a finely powdered plastic. SLS machines can reproduce fine detail without adding any supporting structure to the model. (By and large, lasers that can manage these feats are still relatively expensive.)
- ✓ **Inkjet, powder-based:** Similar to SLS machines, these 3D printers use a powder that is selectively hardened by liquid glue sprayed from an inkjet printhead. The ink can be colored

and mixed; this is one of the few technologies that can offer full-color 3D printing.

- ✓ **Inkjet, resin-based:** These machines are an expansion of stereolithography technology. They use an inkjet printhead to spray fine layers of a UV-sensitive resin, which is then hardened by a powerful UV light. Advertising materials for these printers talk about layer heights measured in atoms.
- ✓ **Paper-based:** These printers build objects out of copy paper by gluing the sheets together then cutting away the excess. The parts are immensely strong, and can be treated like wood after printing.

## 3D printing services

3D printing services offer access to professional-level machines on a pay-per-print basis. Cost is based on volume of material printed, and you receive your printed object by mail in a few working days. Each company offers detailed instructions on minimum part sizes, wall thicknesses, and feature size. Pay attention to these rules. The services know what their machines can do, and you don't want to be stuck waiting a week for a part that didn't come out right.

Two examples of 3D printing services are Shapeways ([www.shapeways.com](http://www.shapeways.com)) and Ponoko ([www.ponoko.com](http://www.ponoko.com)).

## Can I 3D print in metal?

This is the single most common question I get when introducing people to 3D printing. Short answer: Yes, 3D printers that print in metal exist. But unless you live in a hollowed-out volcano and race fighter jets in your free time, you probably can't afford to use them. Based on selective laser sintering (SLS) technology, they use an electron laser to fuse powdered metals in a hard vacuum. The parts they make are fantastically strong and complex, surpassing anything possible with traditional manufacturing technology. Current uses for SLS in manufacturing include custom medical implants, military jet engines, and spacecraft components. So if cost is no object, you can 3D print in metal.

If you need your 3D printed part made in metal, use a 3D printing service bureau or take a part printed with an FDM or SLA printer to a foundry. At the foundry, a process called a *burnout* makes a cast-metal version of the part.

## Using Your 3D Printer

Your new 3D printer's manufacturer will have documentation to help you learn how to use the printer and the software, so I won't go into detail on specific machines. I do touch on a few general concepts of 3D printing that are often not explained well. For a closer look at 3D Printers, check out *3D Printing For Dummies*.

### *Print early, print often*

Desktop 3D printing is cheap. Really, unbelievably, remarkably cheap. Cost for running a typical desktop 3D printer is about 60 cents an hour. Once you've started the printer, it doesn't need any more input from you, which frees you to continue work on the design. With such an amazing tool that's so cheap to use, don't be afraid to print constantly. Print your SketchUp model over and over as you improve it; doing so develops it.

Nothing annoys me more than the sight of a 3D printer that's not doing anything. 3D printers are built to print; they don't like to stand idle. Print more often! You'll become an old hand at using your machine, and get to see your design as it evolves in real time.

Test prints are great for catching errors and mistakes. It's also a great way to document the evolution of a design. It's a good idea to save a version of your SketchUp model that corresponds to each file you 3D print. If the print has an unexpected error, you can look back at that file and understand what went wrong, without having to dig too deeply into the version you have continued to work on. Keep some general points in mind:

- ✓ Test prints that use your 3D printer's Low Quality setting will print faster, but with a rougher surface.
- ✓ Save test prints as the project goes on. They're a great way to show progress, and clients love to see a physical expression of the work being done.
- ✓ Many 3D printing plastics are recyclable or biodegradable. When you're done with your models made of this stuff, toss them in the recycling bin or on the compost heap.

## *Inside your model*

3D printed parts are unique in the world of fabrication. After you've created the outside of your part, you also get to decide what happens on its inside. Usually you let the 3D printer automatically handle the inside of the part, filling it with automatically generated structure. It's also possible to model a part's interior structure to change how it behaves. For example, you might want to hollow out the center of a part to make it lighter or add space for internal components. Some possible variations include

- ✓ **Internal voids:** On SLS and stereolithography machines, a common cost-saving strategy is to build parts as a thin shell with an empty interior. The resulting parts have compromised structural strength, but are printed using as little material as possible. Be sure to include drain holes so the un-hardened material you saved can escape from the part.
- ✓ **Part density:** FDM printers automatically generate a structure to fill the interior of their prints. The density of the structure is controlled by a setting called fill, which is stated as a percentage. Parts with 100% fill will be solid plastic all the way through, and are as strong as injection-molded parts. Typically, FDM printers default to building parts at 10% fill, meaning that 10 percent of the interior is filled with plastic. Higher fill percentage means more plastic used — and longer print times. In my experience, anything over 40 percent is a waste of time and plastic.
- ✓ **Outer wall thickness:** Another FDM printer setting, this deals with the amount of material put into the walls of the object before starting the Infill. Look for a setting called Shells, which is the number of layers of plastic the printer will use to make the outside of the model. If you're having trouble with parts crushing, increase the number of Shells; otherwise leave it alone.
- ✓ **Flexibility:** Flexible materials are available on most 3D printers, usually by using a special flexible plastic filament. You can also make structures flexible by making them very thin with 0 percent infill.

# Going beyond Basic 3D Printing

The more you use your 3D printer, the more you may find it affecting your SketchUp designs. Don't be surprised if your designs become a bit more ambitious and mechanically complex. This section of the chapter outlines some possible directions and some factors to watch out for.

## Designing parts that connect

So you cut your model into parts. Now you need a way to get it to all stay together after it's printed. In this section, I talk about different strategies and features, mechanical and otherwise, that you can build into your model for attaching its parts together.

### Tolerance and clearance

Before I get into a discussion about mechanical connections, I need to touch on two more of those pesky real-world realities that crop up when you move out of SketchUp's idealized environment: tolerance and clearance.

*Tolerance* is the difference between the measurement of your part in SketchUp and the measurement of the part produced by your 3D printer. If you draw a 10mm cube in SketchUp and 3D print it, none of the measurements of the printed cube will be exactly 10mm. The differences are small — just a few tenths of a millimeter more or less — but they can cause problems if your 3D printed parts have to connect to parts that already exist in the real world. The 3D printer's manufacturer provides a number for the machine's tolerance as a plus or minus value, usually something like  $\pm 0.05\text{mm}$ . This is the *maximum* variation for that machine, and you should be aware of it as you work.

*Clearance* is the extra space you need for parts to slide past one another. If you try to install a 10mm peg in a 10mm hole, you're in for a bit of a surprise when the two won't go together. The peg and hole can fit perfectly in SketchUp, but that's not what's going to happen in the real world where you have friction to contend with. The surface of the peg is so much like the surface of the hole that the friction between them will keep the peg from ever going in if the fit is too exact. You need to add a small amount of space called *clearance* so the two parts can slide past each other. How much clearance you use depends on how the part needs to move. A spinning shaft, for example, needs more clearance than a simple snap fitting.

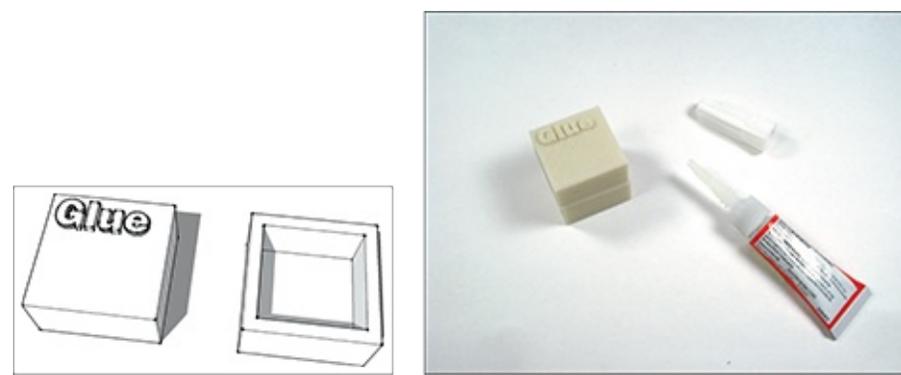
You'll come to an inherent understanding of clearance and tolerance as you do more designing in SketchUp for 3D printing. As you use your 3D printer, you'll be able to find values that work well with your equipment.



I typically add 0.2mm to all holes and 0.5mm to any points of rotation.

## Glue

Glue, the universal way to stick something to something else. I include it here (and in [Figure 9-19](#)) because it's the most obvious way to attach two 3D printed parts together. Unfortunately, it's also the weakest and most unreliable method. Glue joints in plastics have very little strength and will tend to break under stress, in response to temperature change, or if you look at them funny. If your part is meant to be anything more than a visual model, use one of the other attachment systems.



**Figure 9-19:** Works cosmetically, but don't expect much durability unless you used epoxy.

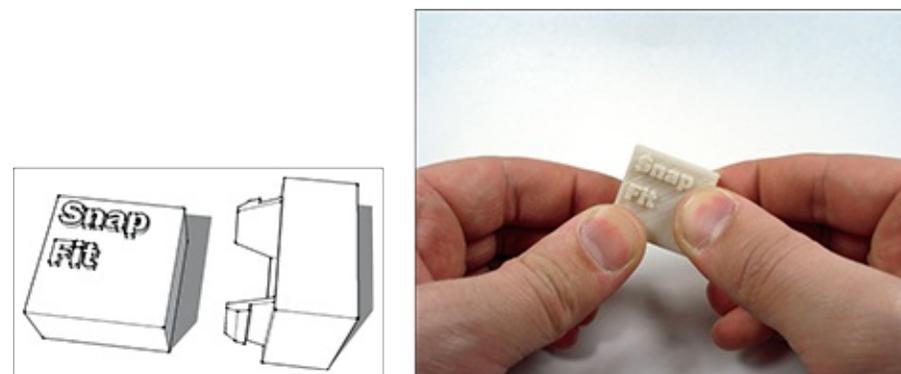
- ✓ The plastics used in 3D printers — ABS, PLA, PVA, nylon, and PETT — all require special glues to bond. These glues are available, but must be ordered from an online retailer.
- ✓ Biodegradable starch plastics such as PLA have a crystalline structure that doesn't work well with liquid superglue. The glue tends to stay liquid and migrate unexpectedly across the surface of the part.
- ✓ When in doubt, use epoxy. Its messy stuff, but will stick to pretty much anything.
- ✓ There are no glues that will stick to the flexible materials that are available for 3D printers. To attach parts made of that stuff, you'll need to look into a process called thermal welding, which is way outside the scope of this guide.

### *Snap fittings*

Snap fittings are an awesome way to take advantage of your 3D printer. Properly designed, they'll let you pop your model together as soon as the parts come off the printer. Snap fittings can also be removable, so you can change out various parts of your model as the design evolves.

In SketchUp, you create snap fittings like those shown in Figure [9-20](#) by following two general steps:

1. Create the tongue with the Line and Push/Pull tools.
2. Create a matching capture point on the opposing part.



**Figure 9-20:** A snap fit joint is great for reusable connections.



As you create your snap fittings, keep these points in mind:

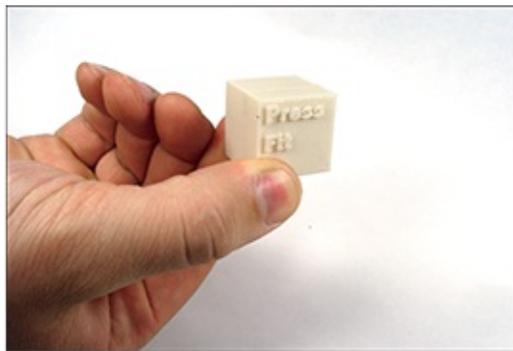
- ✓ Be sure to leave enough space for the tongue to bend backward as it slides into place.
- ✓ Include a clearance of between 0.2mm and 0.5mm, depending on how tight you need the joint to be.
- ✓ Always position snap fittings so they print horizontal to the 3D printer's build platform. Snap fittings printed in the Z direction, perpendicular to the platform, have a tendency to break off.
- ✓ If you want your snap fitting to be re-openable, make sure that you provide a way for the tongue to disengage from the capture. This can either be a ramp in the geometry that forces the tongue backward as you pull on the joint, or an access point that lets you release the tongue manually.
- ✓ Don't make the tongue too thick. It has to bend for the joint to go together.

## Press fit

A *press fit* is when two parts are designed with very little clearance between them. When the parts are forcibly pressed together, friction keeps the joint together with no additional hardware or glue.

To make a press fit like the one shown in Figure 9-21, use the Offset Tool to create an outer lip on one side of the connection and an inner lip on the other side. Include a clearance of 0.2mm or less between parts, so you can still assemble them. Keep a few points in mind about press fits:

- ✓ For a press fit to work well, it needs to be a tight connection. You might need a small hammer, large clamp, or your whole body weight to press the parts together.
- ✓ A press fit is usually a one-way connection. Once you put it together, don't expect to ever get it back apart.
- ✓ Press fits don't scale up well. Always design them at the size at which they'll be printed.
- ✓ The tight clearance of a press fit can make it difficult to get started. Running a hobby knife or deburring tool around the edge of the hole will widen that area a bit and help you get the parts together.



**Figure 9-21:** A press fit is an easy connection to draw in SketchUp.

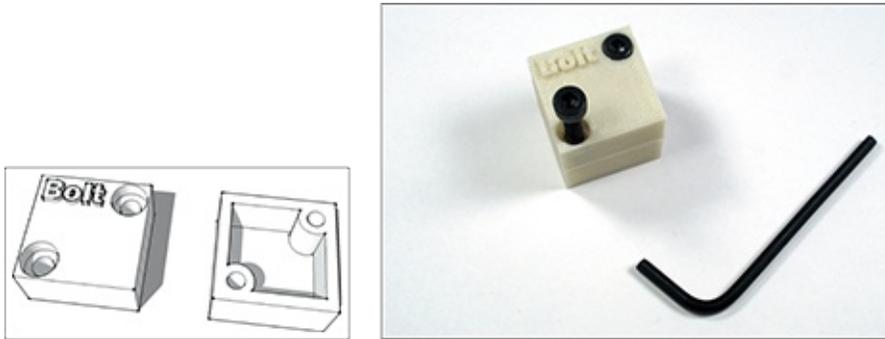
## Bolts, screws, and hardware

The strongest connection you can make between 3D printed parts is one held together with metal hardware. These connections are great for things that are more than just prototypes — for example, parts for robots or mechanisms.

When integrating hardware into your design, it's best to have the hardware represented in your SketchUp model. Take measurements of the parts you're planning to use; model them in SketchUp.

I always make these components and save them to the component library; that way, parts I use a lot are available with a click. Keep these points in mind:

- ✓ Remember to include enough clearance in your holes for the hardware to be installed.
- ✓ If you're using bolts or screws and don't want to include a matching nut, a trick is to slightly undersize the holes. The threads of the bolt will cut into the excess plastic and hold it firmly in place. That's what I did in Figure [9-22](#).



**Figure 9-22:** Nothing says strength like an exposed bolt.

- ✓ Online hardware supplies like McMaster Carr and Amazon Supply stock every fastener known to the human race. If your local hardware store doesn't have what you're looking for, they will have it.

## Testing your model's moving parts

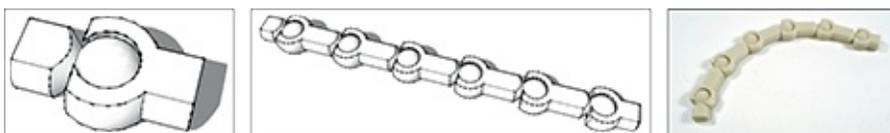
Whatever connection system you are using, always test it first. Before you start printing a giant project, build a small version of the attachment. It only takes a few minutes to design and 3D print, and will give you a chance to make sure the joint works properly. There is nothing worse than modeling a system of joints, then discovering they won't go together properly.

# Designing Things That Move

3D printing something you've designed in SketchUp is cool. 3D printing something that moves is even cooler. This section focuses on a few features you can include to make your creations more than just interestingly shaped hunks of immobile plastic.

## Captive joints

A *captive joint* is a moveable connection that comes out of your 3D printer already assembled and working. Captive joints tend to be mechanically simple hinges, ball joints, and chain links. Their simplicity is their power. A 3D printer can quickly build objects with hundreds of captive joints that would take days to construct by hand. Poseable action figures, clothing, and the chainmail in Figure [9-23](#) are examples of simple captive joints assembled into complex structures.



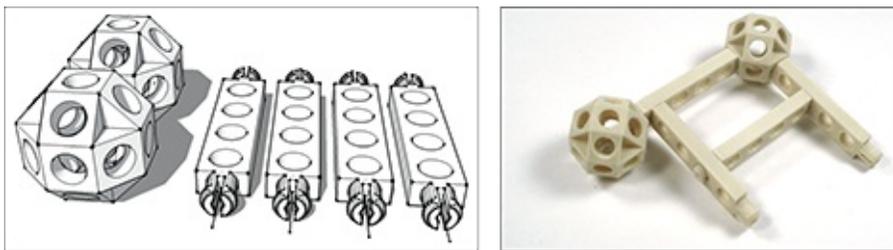
**Figure 9-23:** Captive joints bring the power of multiplication to life.

Creating a captive joint requires trial and error. You'll have to experiment to get the right combination of clearances and shapes. Keep these principles in mind while you work on captive joints:

- ✓ Use components when building structures with captive joints; they let you automatically modify all the joints at once as you work.
- ✓ How you design captive joints depends on the specific 3D printing technology you're using. SLS-based 3D printers can build captive joints that are a few millimeters across. FDM printers can make fantastically strong joints, but the printed objects need to be much bigger.
- ✓ A structure is only as strong as its weakest part. Don't make a joint so fine that it falls apart in your hands.
- ✓ Test print parts of your structure as you work. Remember, 3D printing is cheap, and with captive joints, you're pushing the limits of the technology. Test objects will help you check your work and keep your sanity.

## Pins

*Pins* are small, round snap fittings that are pressed into place to make a connection. They can be a versatile replacement for hardware. In Figure 9-24, a single pin acts as a point of rotation, and two or more will hold parts firmly together.



**Figure 9-24:** A system of pin joints used to make a simple toy.

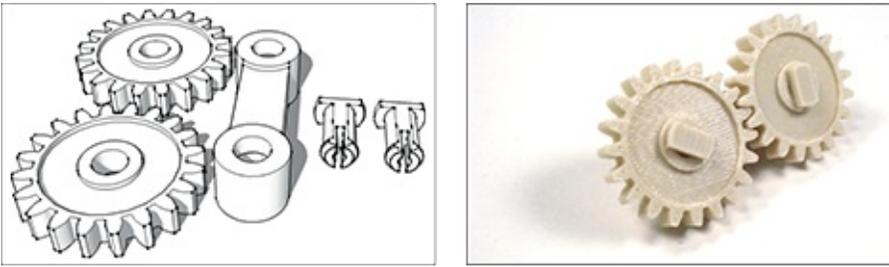
Pins are like bolts, except you get to make them in exactly the size and shape you need. You can also print more when you run out.

- ✓ When designing your pins, give them one flat side. The flat side gives you a way to build the pins without using support material — while keeping the tongues horizontal to the build platform. This process also keeps finished pins from rolling off your desk.
- ✓ Make your pins into components so you can easily modify all of them if you need to.
- ✓ When designing a project with pin joints, make an effort to standardize around a small number of pin sizes. Standardization helps keep things tidy and simplifies assembly.

## Gears

Gears are great for creating complex motions or transferring movement through a mechanism. That is probably the most understated description I can give of the deepest rabbit hole of the industrial age. Gears are in every mechanical device you can imagine. They have existed in some form or other since before recorded history, and are the basis for an incalculable number of clever devices that make everyday life possible.

Making gears is fun; it's one of the reasons I originally became interested in 3D printing. Figure 9-25 shows a simple gear system that can become so much more. For the scope of this guide, I just want to leave you with a few basic principles.



**Figure 9-25:** Welcome to the New Industrial Revolution. Time to gear up.

- ✓ Gears need to have clearance between their surfaces to work properly. Gears that are too perfect a fit will bind up. Include a clearance at both the point of rotation and between the teeth of the gear and the teeth of its mate.
- ✓ A SketchUp extension called Involute Gears automates the process of making gears. The extension's creator hasn't made it available in the SketchUp Extension Warehouse, so you'll need to locate it by searching *sketchup gear plugin* through Google.
- ✓ Creating optimized gears from scratch is a technical art form that has fallen out of practice. If you want to learn more about designing gears, I recommend getting a copy of *Machinery's Handbook* (Industrial Press). After almost a century in print, it's the gold standard for anything gear-related.

## Part III

# Viewing Your Model in Different Ways



Discover handy links and video demonstrations of the steps in this part. Just point your browser to [www.dummies.com/extras/sketchup2014](http://www.dummies.com/extras/sketchup2014).

## *In this part ...*

- ✓ Making models in SketchUp is only half the fun. Styles and Shadows enable to you fine-tune your model's overall look.
- ✓ Don't skip the last part of Chapter [11](#) on using sections to create animations — it's easy and more rewarding than almost anything else you can do in SketchUp.

## Chapter 10

# Working with Styles and Shadows

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### *In This Chapter*

- ▶ Giving your model some styles
  - ▶ Editing, saving, and sharing styles
  - ▶ Finding out about the Shadow Settings dialog box
  - ▶ Using shadows to make models look better
  - ▶ Displaying and studying accurate shadows
- 

It's all fine and dandy to build elegant and efficient models, but that's only part of what this software's all about. SketchUp is also a very capable tool for presenting the stuff you build. Deciding how your models should look — loose and sketchy, quasi-photorealistic, or anything in between — can be lots of fun, and making the right decisions can help your models communicate what they're supposed to.

The first half of this chapter is about styles. If you're the sort of person who likes to draw, you're in for a treat. If you can't draw a straight line with a ruler, you're in for an even bigger treat. SketchUp styles is all about deciding how your geometry — all your faces and edges — will actually *look*. Take a peek at Color Plate 20 for an idea of what styles can do.

I've dedicated the second half of this chapter to SketchUp's Shadows feature. Displaying shadows is an easy operation; it's a matter of clicking a button. When you add shadows to your model views, they look more realistic, more accurate, and more readable. And, well, more *delicious*. You'll see what I mean.

## *Styling Your Model's Appearance*

This section provides a complete rundown of how to use styles in SketchUp 2014. First off, I talk about *why* you'd want to use styles in the first place. With so many options, I go into how you can avoid *stylesitis* — an inflammation of your styles related to trying to decide how to make your model look.

### *Choosing how and where to apply styles*

Styles are endless. With a million permutations of dozens of settings, you can spend all day fiddling with the way your model looks. But you don't have all day, so keep one question in mind: Does this setting help your model say what you want it to say? Focus on what's important. Styles are cool, no doubt, but making them *useful* is the key to keeping them under control.

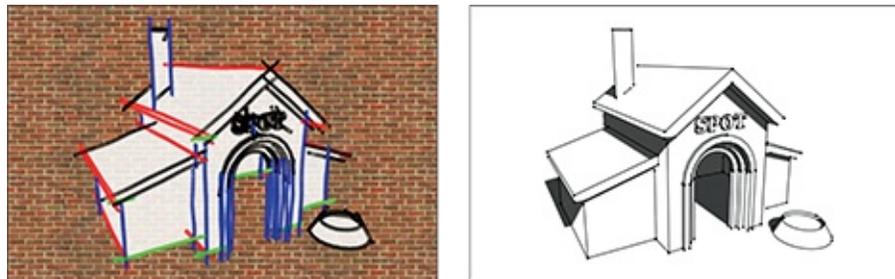


To help you make smart decisions about using SketchUp styles, consider at least two

factors when you're styling your model:

- ✓ **The subject of your model's level of completeness:** I like to reserve sketchy styles for models that are still evolving. The message that a sketchy style sends is "this isn't permanent/I'm open to suggestions/all this can change if it has to." As my design gets closer to its final form, the appearance of my model generally gets less rough and more polished. I use styles to communicate how much input my audience can have and what decisions still need to be made.
- ✓ **How much your audience knows about design:** An architecture-school jury and a nondesigner client who's building a house for the first time perceive styles differently. Design professionals are more experienced at understanding 3D objects from 2D representations, so they don't need as many visual clues to help them along. Styles' essential purpose is to provide these clues, so here's a rule of thumb: The more your audience knows about design, the simpler you should keep your styles.

Before you dive into styles, remember also that a little style goes a long way. No matter how tempting it is to go hog-wild with the styles settings, please resist the urge. Remember that the purpose of styles is to help your model communicate, *not* to make it look "pretty" or "cool." If the *style* of your work overpowers its content, tone down the styles. Figure [10-1](#) shows an example of going overboard with styles and then reining them in.



**Figure 10-1:** Abusing styles is altogether too easy.

## ***Applying styles to your models***

The easiest way to get started with styles is to apply the premade styles that come with SketchUp. You find scads of them, which is great because seeing what's been done is the best way to see what's possible. As you go through this section, you'll no doubt get ideas for your own styles, and that's where the fun begins.

Applying a SketchUp style to your model is a three-step process that goes like this:

1. **Choose Window⇒Styles to open the Styles dialog box.**
2. **Click the Select tab and then choose a styles collection from the Styles Collections drop-down list.**

I introduce you to the collections that come preinstalled with SketchUp in a moment.

3. **Click a style in the Styles window to apply it to your model.**



This may come as a surprise, but it's not possible to view your model without any style at all because styles are really just combinations of display settings. Some styles are fancier than others, but no matter what you do, you always have to have a style applied. If you want a relatively neutral view of your model, I suggest choosing a style in the Default Styles collection.

Wonderfully, SketchUp doesn't leave you out in the cold when it comes to content. SketchUp comes with plenty of examples to get you started. Figure 10-2 shows the Styles Collections drop-down list that you get when SketchUp 2014 is new out of the box.



**Figure 10-2:** The Styles Collections drop-down list is where you find all your styles.

Here's a quick introduction to the most interesting options in the Styles Collections drop-down list:

- ✓ **In Model:** The In Model collection shows you all the styles you've applied to your model. It keeps track of every style you've *ever* applied to your model, whether or not that style is still applied. To see a current list of styles in your SketchUp file
  - Choose the *In Model* styles collection to show a list of styles you've applied to your model.
  - Click the *Details* flyout menu and choose *Purge Unused* to get rid of any styles you aren't currently using.
- ✓ **Default Styles:** Think basic. With the exception of the first one (which is the default style for all new SketchUp files you create), these styles are as minimal as it gets: white background, black edges, white-and-gray front-and-back faces, and no fancy edge effects. I use these styles to get a clean starting point for all my models; I like to start simple and build from there.
- ✓ **Photo Modeling:** These styles make it easier to work when you're building models that are *photo-textured* — completely covered in photographs. Use them when you build models that will be viewed primarily in Google Earth. Chapter 8 covers modeling with photos in detail.
- ✓ **Sketchy Edges:** The Sketchy Edges styles in SketchUp 2014 are the result of more than a year's work on *nonphotorealistic rendering*; see the nearby sidebar, "[Running from realism: NPR styles](#)," for the whole story. Basically, the miracle (okay, technological innovation) involves using real hand-drawn lines instead of digital ones to render edges, making your models look more like manual sketches than ever before. Before SketchUp 6, this effect has always looked unbelievably cheesy on the computer, like an anxious robot trying too hard to seem human. Not anymore, though. You can safely use the Sketchy Edges styles to convey any

of the following:

- That your design is in process
- That your model is a proposal and not a finished product
- That you welcome feedback in any and all forms



## Running from realism: NPR styles

In the world of 3D modeling software, the trend has been toward *photorealism*. Rays of digital light are bounced around a billion times inside your computer until you can see every glint of sunlight in every dewdrop on every blade of grass on the lawn. The standard of perfection is how close the model comes to looking like a photograph, and in a lot of cases, that standard has been met — I've seen computer renderings that look more lifelike than life itself.

But what about models of buildings or other things that aren't completely finished? Perhaps you're an architect who's designing a house for a client. If you aren't sure what kind of tile you'll use on your roof, how are you supposed to make a photorealistic rendering of it? You *could* just go ahead and throw any old tile up there as a placeholder, but that could backfire. Your client could hate the tile and decide not to hire you without ever telling you why, and all because of something you didn't even choose.

What you need is a way to show only the decisions you've made so far, and *that* is exactly why architects and other designers make sketches instead of photorealistic renderings. When you're designing, decisions don't all happen at once, so you need to be able to add detail as your design evolves. Sketching allows you to do that because it offers a *continuum* from "cartoony" to photographic, with everything in between. The following figure is an illustration of this.

Programs like SketchUp offer *NPR*, or *nonphotorealistic rendering*, as a way to solve this problem for people who design in 3D. Instead of spending processor power on making representations that look like photographs, the people who make SketchUp went in the opposite direction; they've made a tool that lets you make drawings that are useful throughout the design process. And because SketchUp's NPR engine works in real time, you can make changes on the fly, in front of your audience.



## Editing your styles

If you're handy in the kitchen, you've probably heard that cooking is an art and baking is a science. Cooking allows you to experiment — adding a little of this and a dash of that while you're making a sauce that won't wreck anything. Taking liberties with a cake recipe, however, can easily turn the cake into a doorstop. I found this out when I made a lovely chocolate doorstop for my wife's birthday not so long ago...

Luckily, making your own styles has a lot more in common with cooking than it does with baking. Go ahead and fiddle around; you can't do any irreversible harm. Playing with styles doesn't affect the geometry in your model in any way, and because styles are just combinations of settings, you can always go back to the way things were before you started.

Of the three tabs in the Styles dialog box, Edit is definitely the blue whale of the group. Because

you find so many controls and settings here, SketchUp's designers broke the Edit tab into the following five sections:

- ✓ **Edge:** The Edge section contains all the controls that affect the appearance of edges in your model. This includes their visibility, their color, and other special effects you can apply.
- ✓ **Face:** This section controls the appearance of faces in your model, including their default colors, their visibility, and their transparency.
- ✓ **Background:** The Background section has controls for setting the color and visibility of the background, the sky, and the ground plane in your model.
- ✓ **Watermark:** *Watermarks* are images that you can use as backgrounds or as overlays. The Watermark section gives you control over these.
- ✓ **Modeling:** The Modeling section provides controls for setting the color and visibility of a bunch of elements in your model, including section planes and guides.

The following sections explain each part of the Edit tab in detail; I also provide suggestions for using some of the settings.

## Introducing Style Builder

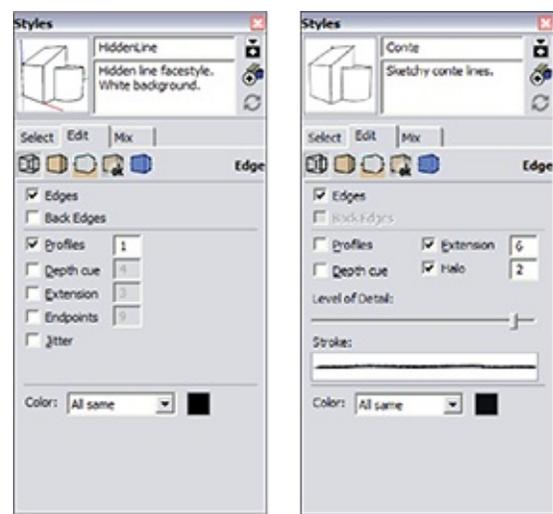
If you're using the Pro version of SketchUp 2014, you have access to Style Builder. It's a completely separate application (just like LayOut) that's put on your computer when you install SketchUp.

Style Builder lets you create NPR styles based on edges *you* draw. Yep, that's right — you can make your SketchUp models look like you drew them by hand with *your* medium of choice (finger paint, Sharpie, bloody knife ...). All you need is a scanner and a piece of software like Photoshop, and you're good to go. The best thing about the styles you create with Style Builder is that they're completely unique. Unless you share them with someone else, no one can ever make SketchUp models that look like yours.

Because Style Builder is a whole other program and because it's only included in the Pro version of SketchUp, this is all I'll say about it in this book.

### *Tweaking edge settings*

The Edge section is tricky because it changes a little bit depending on what kind of style you currently have applied to your model. NPR styles have different settings than regular, non-NPR styles. Figure [10-3](#) shows both versions of the Edge section, which you open by choosing Window⇒Styles, selecting the Edit tab, and then clicking the box icon on the far left.



**Figure 10-3:** The Edge section comes in two flavors: regular and NPR.



SketchUp comes with two kinds of styles: regular and NPR. In NPR, SketchUp uses digitized, hand-drawn lines to render the edges in your model. All the styles in the Sketchy Edges collection, as well as all the ones in the Assorted Styles collection, are NPR styles. Because you can create your own styles based on existing ones, all the styles you create using edge settings from one of these NPR styles is an NPR style, too.

Here's the lowdown on some of the less-obvious settings in the Edge section; check out [Figure 10-4](#) for a visual reference:

- ✓ **Back Edges:** Switching this on tells SketchUp to draw all your model's *obscured* (hidden behind a face) edges as dashed lines. This comes in surprisingly handy. For instance, I've discovered the ability to infer edges and points I couldn't see before. Also, there's nothing like a bunch of dashed lines to make a technical drawing look impressive and complex.
- ✓ **Profiles:** Selecting the Profiles check box tells SketchUp to use a thicker line for edges that outline shapes in your model. Using profile lines is a pretty standard drawing convention that's been around for a long time. I think SketchUp looks better with Profiles on, but it comes at a price; Profiles take more computer horsepower to draw, which can seriously affect your model's performance. If your model's big, think twice before you turn on Profiles.
- ✓ **Depth Cue:** Using different line thicknesses to convey depth is another popular drawing convention. Objects closest to the viewer are drawn with the thickest lines, whereas the most distant things in the scene are drawn with the thinnest lines.

Depth Cue automatically applies this effect to your models. When its check box is selected, Depth Cue dynamically assigns line thicknesses (draftspeople call them *line weights*) according to how far away from you things are in your model. The number you type is both your desired number of line weights *and* the thickness of the fattest line SketchUp will use. I like to use a maximum line weight of 5 or 6 pixels.



One more thing: When I'm using Depth Cue, I turn off Profiles. I don't think these two

drawing conventions work well together, so I always choose to use one or the other.

- ✓ **Halo:** I *really* wish Halo was available for non-NPR styles because it's just that great. Halo simply ends certain lines before they run into other ones, creating a halo of empty space around objects in the foreground. This keeps your model looking neat and easy to read. In fact, this is a drawing trick that pencil-and-paper users have been using forever to convey depth; look closely at most cartoons, and you'll see what I mean.

The number you type into the Halo box represents the amount of breathing room SketchUp gives your edges. The unit of measure is pixels, but there's no real science to it; just play with the number until things look right to you. For what it's worth, I like to crank it up.

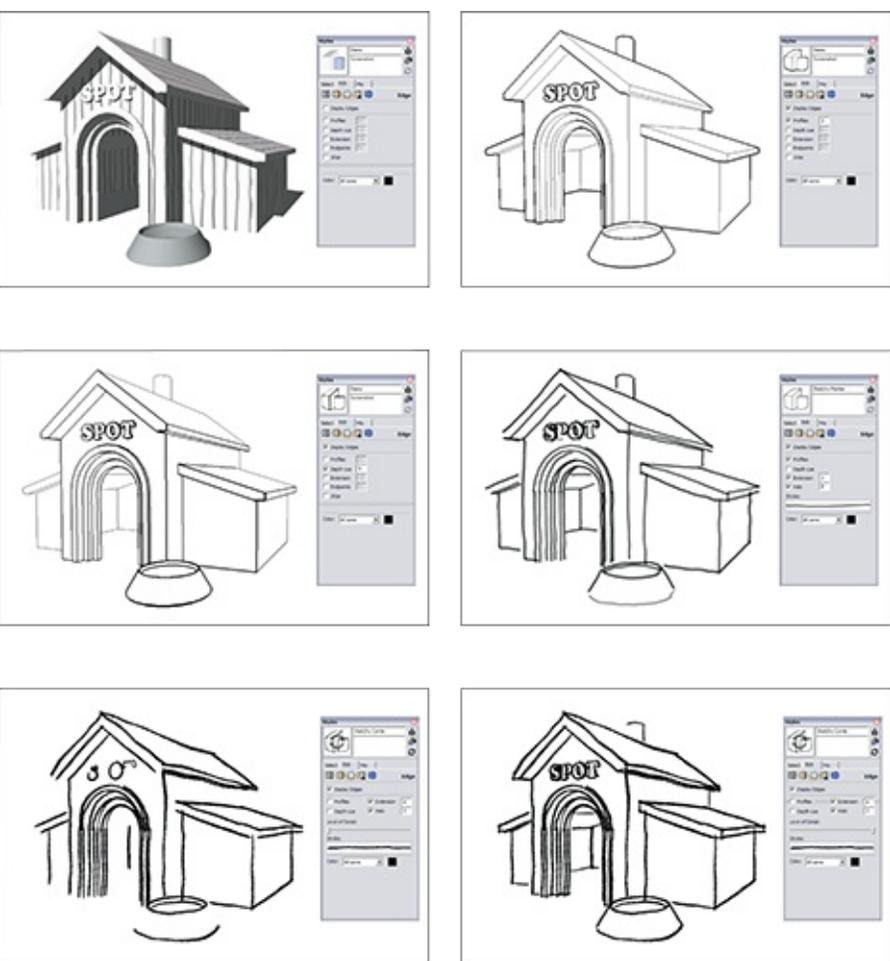
- ✓ **Level of Detail:** When you slide the Level of Detail controller (which appears only when you've applied an NPR style) back and forth, you're effectively telling SketchUp how *busy* you want your model to look. The farther to the right you slide it, the more of your edges SketchUp displays. Experiment with this setting to see what looks best for your model. The last two images in Figure [10-4](#) show what happens when I slide the Level of Detail controller from left to right.

- ✓ **Color:** Use the Color drop-down list to tell SketchUp what color to use for all the edges in your model. Here's what each option does:

- *All Same:* This option tells SketchUp to use the same color for all the edges in your model. Select a color by clicking the color well on the right and choosing a color.
- *By Material:* This option turns your model's edges the color of whatever material they're painted with. Because most people don't know that you can paint edges different colors, this doesn't get used very often.



- *By Axis:* Now *here's* a useful, but hidden, gem. This option tells SketchUp to make everything that's parallel to one of the colored axes the color of that axis. Edges that aren't parallel to any axis stay black. Why is this so important? When something is screwy with your model — faces won't extrude or lines won't sink in — switching your edge colors to *By Axis* is the first thing you should do. You'll be surprised how many of your edges aren't what they seem. Have a look at Chapter [16](#) for more about this.



**Figure 10-4:** Choose among the edge settings to give your model the desired look, from realistic to sketchy.



## In a fog?

If you're looking for something to provide a sense of depth in your model views, look no further than the Fog feature. Fog does exactly what it says — it makes your model look like it's enshrouded in fog (see the accompanying figure). You'd think that a feature this neat would be a little complicated, but it's the opposite. Follow these three steps to let the fog roll into your model:

1. **Choose Window⇒Fog to open the Fog dialog box.**
2. **Select the Display Fog check box to turn on the fog effect.**
3. **Fool around with the controls until you like what you see.**

I wish the process of controlling how fog looks was more scientific, but I'm afraid it's not. You just play around with the sliders until you have the amount of fog you want. But just in case you absolutely need to know, here's what the sliders do:

- **Top slider (0%):** This controls the point in space at which fog begins to appear in your model. When it's all the way to the right (toward infinity), you can't see any fog.
- **Bottom slider (100%):** This controls the point in space at which the fog is completely opaque. As you move the slider from left to right, you're moving the "completely invisible" point farther away.



## Changing the way faces look

The Face section of the Styles dialog box is very simple — at least compared with the Edge section (what isn't, really?). This area of the SketchUp user interface controls the appearance of faces, or surfaces, in your model. From here, you can change their color, visibility, and translucency.

Figure 10-5 shows the Face section in vivid grayscale, and you can open it by choosing Window⇒Styles, selecting the Edit tab, and clicking the box icon that's second from the left. The following sections describe each element in detail.



Figure 10-5: The Face section controls the appearance of your model's faces.

### Front color/Back color

In SketchUp, every face you create has a back and a front. To choose the default colors for all new faces you create, click the Front and Back color wells, and then pick a color. I recommend sticking with neutral tones for your defaults; you can always paint individual faces later.



Sometimes when you model in SketchUp, a face is turned inside out. Follow these steps to flip a face so that the right side shows:

1. **Select the face you want to flip.**
2. **Right-click and choose Reverse Faces.**



Knowing which face is the front and which is the back is especially important if you plan to export your model to another program. Some of these, such as Autodesk 3ds Max, use the distinction between front and back to determine what to display. In these cases, showing the wrong side of a face can produce unexpected results.

### Style

Face styles have nothing to do with *Styles*, the SketchUp feature that half of this chapter is about. *Face styles* may as well be called Face modes because that's what they are: different modes for viewing the faces in your model. You can flip among them as much as you like without affecting your geometry. Each Face style has its purpose, and all are shown in Figure 10-6:

✓ **Wireframe:** In Wireframe mode, your faces are invisible. Because you can't see them, you can't affect them. Only your edges are visible, which makes this mode handy for doing two things:



- When you select edges, switch to Wireframe mode to make sure that you've selected what you meant to select. Because no faces block your view, this is the best way to make sure that you select only what you want. The Back Edges setting is handy for this, too.
- After you use Intersect Faces, you usually have stray edges lying around. Wireframe is the quickest way to erase them because you can see what you're doing. See Chapter 9 for details on Intersect Faces.

✓ **Hidden Line:** Hidden Line mode displays all your faces using whatever color you're using for the background; it's really as simple as that. If you're trying to make a clean, black-and-white line drawing that looks like a technical illustration, make your background white. (I talk about how later in this chapter.)

✓ **Shaded:** This Face style displays colors on your faces. Faces painted with a solid color appear that color. Faces to which you've added textures are shown with a color that best approximates their *overall color*. If your texture has a lot of brown in it, SketchUp picks a brown and uses that. For models with a lot of these textures, switching to Shaded mode can really speed up orbiting, zooming, and otherwise navigating around. Unless I absolutely need to see textures I've applied to my faces, I tend to stay in Shaded mode whenever I work on my model.

✓ **Shaded with Textures:** Use Shaded with Textures when you want to see your model with textures visible. Because this mode puts a lot of strain on your computer, it can also be the slowest mode to work in. I turn it on only when I work on a small model, or when I need to see the textures I've applied to my faces. Obviously, if you're going for a photorealistic effect, this is the mode to choose.

✓ **Display Shaded Using All Same:** When you want to quickly give your model a simplified color scheme, use this Face style; it uses your default front and back face colors to paint your model. You can also use this setting to check the orientation of your faces if you're exporting your model to another piece of 3D software.

✓ **X-Ray:** Unlike using translucent materials on only *some* of your faces (such as glass and water), flipping on X-Ray lets you see through *all* your faces. I tend to use it when I want to see through a wall or a floor to show what's behind it. If you're in a plan (overhead) view, it's a great way to demonstrate how a floor level relates to the one below it.

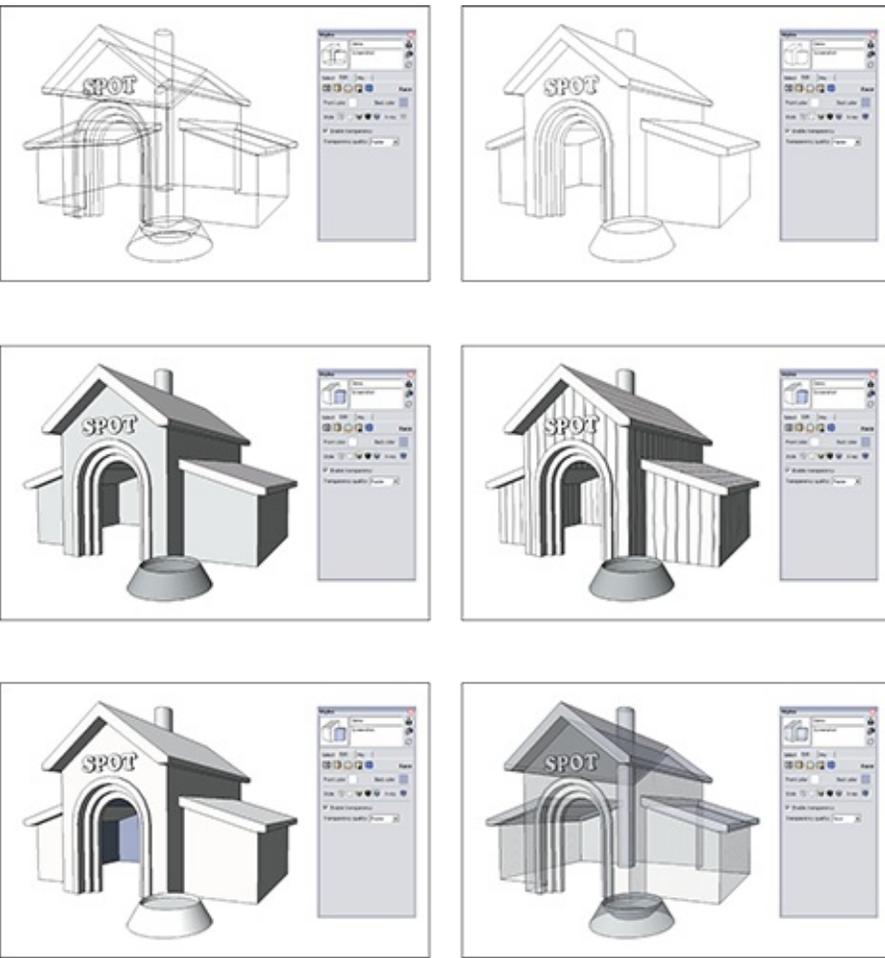
## Transparency

Displaying *transparency* (as in translucent materials) is an especially taxing operation for SketchUp and your computer to handle, so you can decide how to display translucent materials:

✓ **Enable transparency:** Deselect this check box to display translucent materials as opaque. Turn off transparency to speed up SketchUp's performance if you find that it has slowed down.

✓ **Transparency quality:** If you decide to display transparency, you can further fine-tune your

system's performance by telling SketchUp how to render that transparency: You have the choice of better performance, nicer graphics, or an average of the two.



**Figure 10-6:** Use Face styles to change the way your faces appear.

### *Setting up the background*

In the Background section of the Styles dialog box, you choose colors and decide whether you want to see a sky and a ground plane. Check out Figure [10-7](#) to get a view of the Background section, along with an idea of how it works. To open these options in your own copy of SketchUp, choose Window⇒Styles, select the Edit tab, and click the middle icon at the top of the tab. You have the following options in the Background section:

- ✓ **Background:** For most models, I set the background to white — I guess I'm a traditionalist.
- ✓ **Sky:** Displaying a sky in your modeling window makes things slightly more realistic, but the real purpose of this feature is to provide a point of reference for your model. In 3D views of big things like architecture, it's nice to be able to see the horizon. Another reason for turning on the sky is to set the mood — keep in mind that the sky isn't always blue. I've seen some beautiful SketchUp renderings wherein the sky was sunset (or maybe nuclear winter) orange.
- ✓ **Ground:** I have to admit that I'm not a big fan of turning on the Ground feature, and here's why: It's *very* hard to find a ground color that looks halfway good, no matter what you're building. I also don't like that you can't dig into the earth to make sunken spaces (such as courtyards) with Ground turned on. Instead of turning on this feature, I prefer to make my own ground planes with faces and edges. It's more flexible, and I think it looks better.



**Figure 10-7:** Use the Background section to turn on the sky and the ground and to choose colors.

### **Working with watermarks**

Watermarks are much easier to understand if you don't think about them as actual watermarks. In fact, they're much more useful. If I had to define them (and because I'm writing this book, I guess I do), I'd put it this way: *Watermarks* are graphics that you can apply either *behind* or *in front of* your model to produce certain effects. Here are a few of the things you can do with SketchUp watermarks:

- ✓ Simulate a paper texture, just like some of the styles in the Assorted Styles collection.
- ✓ Apply a permanent logo or other graphic to your model view.
- ✓ Layer a translucent or cutout image in the foreground to simulate looking through a frosted window or binoculars.
- ✓ Add a photographic background like Outer Space or Inside My Ileum to create a unique model setting.

### **Eyeing the watermark controls**

Figure 10-8 shows the Watermark section of the Styles dialog box. Here's a brief introduction to what some of the less-obvious controls do:

- ✓ **Add, Remove, and Edit Watermark buttons:** The +, -, and gears icons allow you to add, remove, and edit (respectively) watermarks in the style you're editing.
- ✓ **Watermark list:** This list shows all your watermarks in relation to *Model Space*, which is the space your model occupies. All watermarks are either in front of or behind your model, making them overlays or underlays, respectively.
- ✓ **Move Up or Move Down arrows:** Use these buttons to change the stacking order of the watermarks in your model view. Select the watermark you want to move in the list and then click one of these buttons to move it up or down in the order.



Figure 10-8: The Watermark section.

## Adding a watermark

Watermarks are by no means simple, but working with them, miraculously enough, is. Follow these steps to add a watermark to your model view:

1. **Click the Add Watermark button to begin the process of adding a watermark.**

The Open dialog box appears.

2. **Find the image you want to use as a watermark and then click the Open button to open the first Create Watermark dialog box shown in Figure 10-9.**

You can use any of these graphics file formats: TIFF, JPEG, PNG, and GIF.



This is way beyond the scope of this book, but I think it's worth mentioning because you're bound to need this sooner or later: If you want to make a watermark out of an image that isn't a solid rectangle (such as a logo), you need to use a graphics file format that supports alpha channels (such as PNG). An *alpha channel* is an extra layer of information in a graphics file that describes which areas of your image are supposed to be transparent. It sounds complicated, but it's really a straightforward concept. To make an image with an alpha channel, you need software like Photoshop or GIMP (GNU Image Manipulation Program). Try searching for *alpha channels* on Google for more information.



Figure 10-9: The Create Watermark series of dialog boxes.

3. **Type a name for your watermark in the Name box.**
4. **Choose whether you want your new watermark to be in the background or in the foreground as an overlay and click the Next button.**

## 5. **Decide whether to use your watermark as a mask.**

Selecting this check box tells SketchUp to make your watermark transparent, which kind of simulates a real watermark. *How* transparent each part becomes is based on how bright it is. White is the brightest color, so anything white in your watermark becomes completely transparent. Things that are black turn your background color, and everything in between turns a shade of your background color. The possibilities for this feature are interesting, but I haven't found any good uses for it yet.

## 6. **Adjust the amount that your watermark blends with what's behind it and then click the Next button.**

In this case, Blend is really just a synonym for Transparency. By sliding the Blend slider back and forth, you can adjust the transparency of your watermark.



Blend comes in handy for making paper textures because that process involves using the same watermark twice: once as an overlay and once as an underlay. The overlay version gets blended in so that your model appears to be drawn on top of it. To see how this works, apply one of the Paper Texture styles to your model and then edit each of the watermarks to check out its settings.

## 7. **Decide how you want your watermark to be displayed and then click the Finish button.**

You have three choices for how SketchUp can display your watermark: stretched to fit the entire window, tiled across the window, and positioned in the window. If you select Stretched to Fit the Screen, be sure to select the Lock Aspect Ratio check box if your watermark is a logo that you don't want to appear distorted.

### [Editing a watermark](#)

You can edit any watermark in your SketchUp file at any time. Follow these simple steps to edit a watermark:

#### 1. **Select the watermark you want to edit in the Watermark list.**

You can find the Watermark list in the Watermark section of the Edit tab of the Styles dialog box.

#### 2. **Click the Edit Watermark button (it looks like a couple of tiny gears) to open the Edit Watermark dialog box.**

#### 3. **Use the controls in the Edit Watermark dialog box and then click OK when you're done.**

For a complete description of the controls in this dialog box, see the description of the Create Watermark dialog box in "Adding a watermark," earlier in this chapter.

## Tweaking modeling settings

All you need to know about the controls in the Modeling section — shown in Figure 10-10 — of the Styles dialog box is that there’s not much to know. Use the controls to adjust the color and visibility of all your model elements that aren’t geometry. To open these options, choose Window⇒Styles, click the Edit tab, and then click the box icon on the far right, at the top of the tab. The controls are described as follows:

- ✓ **Controls with color wells:** Click the wells to change the color of that type of element.
- ✓ **Section Cut Width:** This refers to the thickness of the lines, in pixels, that make up the section cut when you use a section plane. For more about this, have a look at the information on cutting sections in Chapter 11.
- ✓ **Controls with check boxes:** Use these to control the visibility of that type of element in your model. Three of them are a little confusing:
  - *Color by Layer:* Tells SketchUp to color your geometry according to the colors you’ve set up in the Layers dialog box. Check out Chapter 7 for more on this.
  - *Section Planes:* This refers to the section plane objects that you use to cut sections. They’re gray with four arrows on their corners.
  - *Section Cuts:* Unlike section planes, this setting controls the visibility of the section cut effect itself. With this deselected, your section planes don’t appear to cut anything.
- ✓ **Match Photo settings:** When you photo-match (which you can read all about in Chapter 8), adjusting the visibility of your photograph is sometimes helpful. Use these controls to hide, show, and adjust the photo’s opacity in both the background and the foreground.



Figure 10-10: The controls in the Modeling section are every bit as simple as they look.

## Mixing styles to create new ones

You can use the Mix tab to combine features of multiple styles to make new ones. Instead of working through the sections of the Edit tab, flipping controls on and off, sliding sliders, and picking colors, the Mix tab lets you build new styles by dropping existing ones onto special “category” wells. In addition to being a nifty way to work, this is the only way you can switch a style’s edge settings between NPR and non-NPR lines.



NPR refers to the styles in the Assorted Styles, Sketchy Edges, and Competition Winners collections. These nonphotorealistic rendering styles use scanned, hand-drawn lines to draw the edges in your model. If you have SketchUp Pro, you can use Style Builder to make your own NPR styles from lines you draw and scan in. Take a look at the sidebar “[Introducing Style Builder](#),” earlier in this chapter, for more information.

Follow these steps to change a style using the Mix tab, as shown in Figure 10-11:

**1. Choose Window⇒Styles and click the Mix tab in the Styles dialog box.**

As part of the Mix tab, the secondary section opens at the bottom of the dialog box. This provides you with a way to view your styles without having to switch from the Mix to Select sections.

**2. Find the style you want to sample *from* in the Select section.**

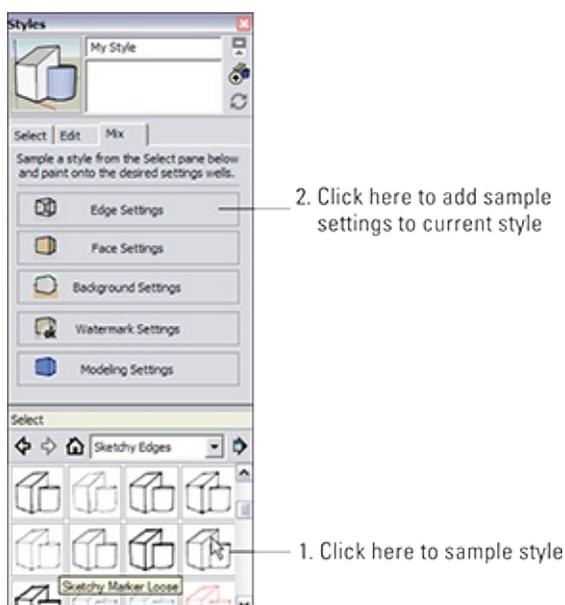
You can call this your *source* style. Say that you’re working on a new style and you want your edges to look just like those in the Marker Loose style that came with SketchUp. In this example, choose the Sketchy Edges collection from the Styles Collections drop-down list, where you’ll find the Marker Loose style.

**3a. (Windows) Click the source style from the Styles list in the Select section to sample it and then click the category well that corresponds to the style setting you want to apply.**

**3b. (Mac) Drag your source style from the Styles list in the Select section to the category well that corresponds to the style setting you want to apply.**

In this case, sample the Marker Loose style from the Select section and drop it on the Edge Settings Category well because you want the edge settings from that style to be applied to the style you’re working on.

**4. To save your style after you’re done adding all the bits and pieces, see the following section.**



**Figure 10-11:** Sample from different styles to update the style you’re working on.

## Creating a new style

Creating a new style adds it to your In Model collection of styles, so you can come back and apply it to your model anytime you like. Follow these steps to create a new style:

1. **Click the Create New Style button in the Styles dialog box.**

This duplicates the style that was applied to your model before you clicked the Create New Style button. Your new style appears in your In Model collection as *[name of the original style]1*.

2. **Use the controls in the Edit tab to set up your style the way you want.**



Frequently, you want to make a new style *after* you already make changes to an existing one. If you want to create a new style that reflects modifications you've made already, just switch Steps 1 and 2.

3. **In the Name box (at the top of the Styles dialog box), give your new style a name and press Enter.**

If you want, you can also give your new style a description in the Description box, though you may want to wait until later.

4. **Click the Update button.**

This updates your new style with all the changes you made in Steps 2 and 3.

5. **Check the In Model collection in the Select tab to make sure that your new style is there.**

6. **Click the In Model button (which looks like a little house) to see your In Model Styles collection.**

Your new style appears alphabetically in the list.



If a bunch of styles exist in your In Model collection that you don't use anymore and you want to clean up, right-click the Details flyout menu and choose Purge Unused. This gets rid of any styles that aren't currently applied to any scenes in your model. Have a look at [Chapter 11](#) to find out more about scenes.



Creating a new style *doesn't* automatically make it available for use in other SketchUp files. To find out how to do this, keep reading.

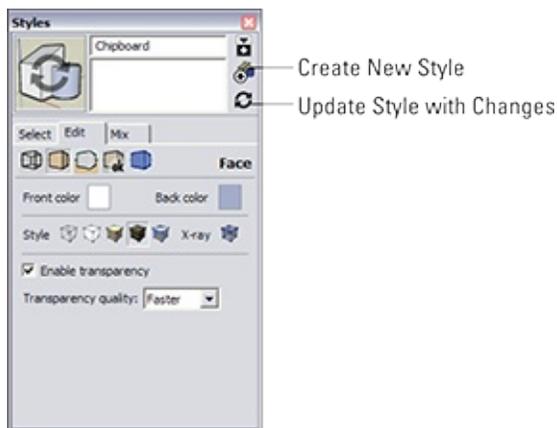
## Saving and sharing styles you make

As you work in SketchUp, you'll want to create your own styles and save them so that you can use them in other models. If you're part of a team, everyone will likely want to access the same styles so that all your models look consistent.

## *Saving the styles you make*

When creating your own styles, you can approach things in two ways. Each of these ways gets its own button, as shown in Figure 10-12:

- ✓ **Create New Style:** Clicking this button creates a new style with the settings you currently have active. When you create a new style, it appears in your In Model collection of styles and is saved with your model. The Create New Style button can be found in the upper-right corner of the dialog box and looks like a couple objects with a + sign on it.
- ✓ **Update Style with Changes:** This button updates the current style with any changes you've made in the Edit or Mix tabs. If you want to modify an existing style without creating a new one, this is the way to go. You can find the update button right below the create button in the upper-right corner of the dialog box; it looks like two arrows chasing each other in a circle.



**Figure 10-12:** The update and create buttons in the Styles dialog box.

## *Updating an existing style*

To make adjustments to a style in your model, you need to update it. Follow these steps to update a style:

### **1. Apply the style you want to update to your model.**

If you need help with this, follow the steps in the section, "[Applying styles to your models](#)," earlier in this chapter.

### **2. Use the controls in the Edit tab to make changes to the style.**

### **3. Click the Update Style with Changes button in the Styles dialog box to update the style with your changes.**



Use the Update Style with Changes button to rename existing styles, too. Just type the new name into the Name box (at the top of the Styles dialog box), press Enter, and then click the Update Style with Changes button.



When you update a style, only the copy of the style that's saved with your model is updated. You aren't altering the copy of the style that appears in every new SketchUp file you create.

## Using your styles in other models



After you update or create a style, you probably want to make that style available in other SketchUp models. To make this happen, you need to create your own styles collections. *Collections* are folders on your computer that contain the styles that appear in the Styles dialog box. You can create your own collections to keep the styles you invent neat and tidy.

Follow these steps to create a collection to contain your styles:

1. **Choose Window⇒Styles to open the Styles dialog box.**
2. **Click the Select tab, click the Details flyout menu, and choose Create a New Collection.**

The Add New Collection dialog box opens.

3. **Navigate to the folder on your computer or network where you want to create your collection.**
4. **Click the Make New Folder button (Windows) or the New Folder button (Mac).**

The new folder you create becomes your new collection.

5. **Type a name for your new collection.**

Call your new collection Josephine's Collection. You can call it something else if your name isn't Josephine.

6. **(Mac) Make sure that the Add to Favorites check box is selected.**
7. **Click the Save button.**

The Add New Collection dialog box closes, and your collection is added to the Favorites section of the Collections drop-down list. It will be there in every SketchUp model you open on this computer.

After you create a new collection, you can add styles to it to make them available from any model you work on.

Follow these steps to make a style available for use in other SketchUp files:

1. **Choose Window⇒Styles.**

The Styles dialog box appears.

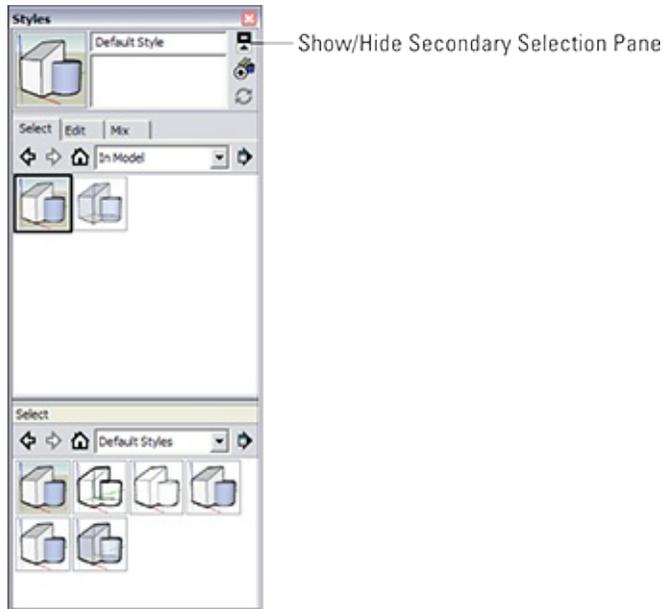
2. **Click the Select tab and then click the In Model button to display your In Model**

## collection.

The In Model button looks like a little house. The In Model collection contains all the styles you've used in your model, including the ones you've created.

### 3. Click the Show Secondary Selection Pane button.

This button looks like a black-and-white rectangle and is in the upper-right corner of the Styles dialog box. When you click it, a second copy of the Select section pops out of the bottom of the Styles dialog box, as shown in Figure 10-13. Use this section to drag and drop styles between folders on your computer, which makes it easier to keep them organized.



**Figure 10-13:** Use the Select section to manage your styles without leaving SketchUp.

### 4. In the Select section, choose the collection to which you want to add your style.

If you've created a collection specifically for the styles you make, choose that one; or you can pick any collection in the Collections drop-down list.

### 5. Drag your style from the In Model styles list to the Styles list in the Select section.

By dragging and dropping your style from the upper list to the lower one, you make the style available to anyone who has access to that collection. This means that you can use the style in other SketchUp models you build on your computer. To share it with other members of your team, copy your style to a collection where other people can get to it, such as on a network.

## Working with Shadows

Typically, you add shadows to a SketchUp drawing for two key reasons:

- ✔ **To display or print a model in a more realistic way:** Turning on shadows adds depth and realism, and gives your model an added level of complexity that makes it look like you worked harder than you really did.

✔ **To study the effect of the sun on what you've built (or plan to build) in a specific geographic location:** Shadow studies are an integral part of the design of any built object. If you're making a sunroom, you need to know that the sun is actually going to hit it, no? You can use SketchUp to show exactly how the sun will affect your creation, at every time of day, on every day of the year.

In this section, I start with a brief, nuts-and-bolts description of how all the controls work, without diving too much into why you'd want to pick one setting instead of another. The second part of this section is devoted to running through each of the preceding scenarios and using the controls to make SketchUp do exactly what you want it to.

## *Discovering the shadow settings*

The basic thing to understand about shadows in SketchUp is that, just like in real life, they're controlled by changing the position of the sun. Because the sun moves exactly the same way every year, you just pick a date and time, and SketchUp automatically displays the correct shadows by figuring out where the sun should be. Hooray for math!

You do all these simple maneuvers in the Shadow Settings dialog box, as shown in Figure 10-14. The sections that follow introduce how the controls work so you can apply them to your model.



**Figure 10-14:** Dial up the sun in the Shadow Settings dialog box.

## *Turning on the sun*

Shadows aren't turned on by default, so the first thing you need to know about applying shadows is how to turn them on. Follow these simple steps:

1. **Choose Window⇒Shadows to display the Shadow Settings dialog box.**
2. **In the upper-left corner of the dialog box, click the Show/Hide Shadows button.**

Clicking it turns on the sun in SketchUp, casting shadows throughout your model and, generally speaking, making everything much more exciting.

## *Setting a shadow's time and date*

The Shadow Settings dialog box has time and date controls, which you use to change the position of the SketchUp sun. The time and date you choose, in turn, controls the appearance of shadows in your model:

✔ **Setting the time:** You don't have to be Copernicus to figure out how to set the time of day; move the Time slider back and forth, or type a time into the little box on the right. Notice the

times at each end of the slider? These represent sunrise and sunset for the day of the year you've set in the Date control, described in the next bullet point.

- ✓ **Setting the date:** Just like the time of day, you set the day of the year by moving the Date slider back and forth, or by typing in a date in the little box on the right. If you slide the Date control back and forth, notice that the sunrise and sunset times change in the Time control, in the preceding point.



To toggle open or closed the extra shadow controls, click the triangular Expand button in the upper-right corner of the Shadow Settings dialog box.

## Choosing where shadows appear

The Display check boxes in the Shadow Settings dialog box enable you to control *where* shadows are cast. Depending on your model, you may want to toggle these on or off.

- ✓ **On Faces:** Deselecting the On Faces check box means that shadows aren't cast on faces in your model. This is on by default, and should probably be left on, unless you want to cast shadows only on the ground. For what it's worth, I always have it selected.
- ✓ **On Ground:** Deselecting the On Ground check box causes shadows not to be cast on the ground plane. Again, this is on by default, but sometimes you want to turn it off. A prime example is when something you build extends underground.
- ✓ **From Edges:** Selecting the From Edges check box tells SketchUp to allow edges to cast shadows. This applies to single edges that aren't associated with faces — things like ropes, poles, and sticks are often modeled with edges like these.

## Adding depth and realism

The neat thing about shadows in SketchUp is how easily you can apply them — and how easy they are to adjust. In the previous sections, I give a dry rundown of the basic controls in the Shadow Settings dialog box. In the following sections, I show you how to use those controls to add depth, realism, and delicious nuance to your models. If only Caravaggio had had it so good... .

You often need shadows to make your drawings read better, especially in the following instances:

- ✓ **Indoor scenes:** The sun is the only source of lighting that SketchUp has, so any shadows you use in interior views have to come from it.
- ✓ **Objects that aren't in any particular location:** For things like cars and furniture, it doesn't matter that the shadows are *geographically accurate*; all that matters is that they help make your model look good.
- ✓ **2D views:** Without shadows, reading depth in 2D views of 3D space is next to impossible.

## Lighting indoor spaces

Adding shadows to interior views presents an interesting problem: Because SketchUp has no lights besides the sun, how are you supposed to make anything that looks halfway realistic? With a ceiling in your room, everything's dark. If you leave off the ceiling, your model looks ridiculous.

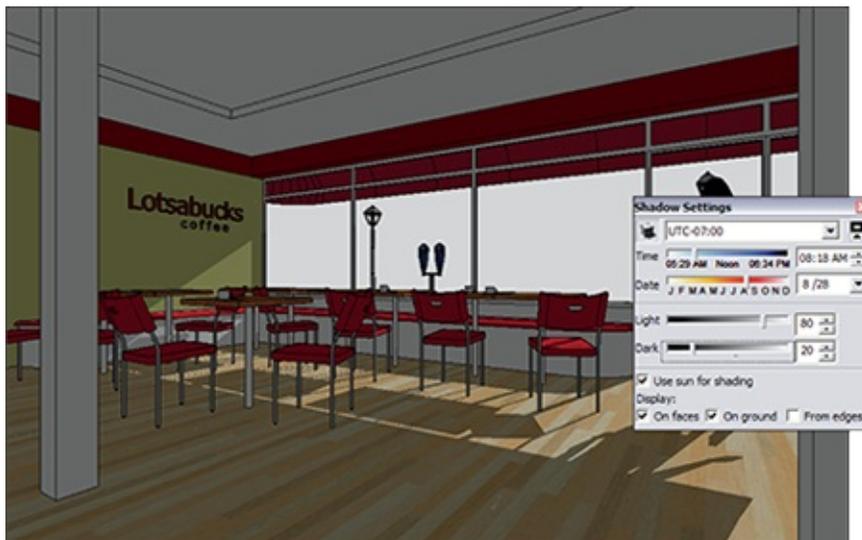
Don't despair — here are some tricks I've learned:

- ✓ **Decrease the darkness of the shadows.** Sliding the Dark slider to the right brightens your view considerably. You can still see the shadows cast by the sun coming through windows and other openings, but the whole room won't look like something bad is about to happen. Check out Figure [10-15](#) to see what I mean.
- ✓ **Make an impossible ceiling.** As long as you haven't modeled anything on top of the interior you're planning to show, you can tell the ceiling not to cast a shadow. That way, sunlight shines directly onto your furniture, casting gloriously complex shadows all over everything.

Figure [10-16](#) shows this ceiling method in action. To create this effect yourself, follow these steps:

1. **Adjust the settings in the Shadow Settings dialog box until the sun shines through one or more windows in your view.**

This ensures that shadows cast by objects in your room look like they're caused by light from the windows.



**Figure 10-15:** Brighten the room by decreasing the Dark slider.



To make it seem like overhead lighting is in your space, set the time of day to about noon and the date to about the end of June. The shadows cast by furniture and similar objects will be directly below the objects themselves. One more thing: If you have lighting fixtures on the ceiling, remember to set them not to cast shadows in the Entity Info dialog box (read on).



**Figure 10-16:** Tell the ceiling not to cast a shadow.

## 2. Choose Window⇒Entity Info.

This opens the Entity Info dialog box.

## 3. Select any faces that make up the ceiling.

Hold down the Shift key to select more than one thing at a time.

## 4. In the Entity Info dialog box, deselect the Cast Shadows check box.

The ceiling now no longer casts a shadow, brightening your space considerably.

## 5. Repeat Steps 3 and 4 for the following faces and objects:

- The wall with the windows in it
- The windows themselves
- Any walls in your view that cast shadows on the floor of your space

## 6. Move the Dark slider to about 50.

This brightens things even more and makes your shadows more believable.

## *Making 3D objects pop*

Adding shadows to freestanding things like tables, lamps, and pineapples is a mostly aesthetic undertaking; just fiddle with the controls until things look good to you and you'll be okay. Keep

the following tips, which I illustrate in Figure [10-17](#), in mind:

✓ **Take it easy on the contrast** — especially when it comes to very complex shapes or faces with photos mapped to them. When your model is too contrasty and dramatic, it can be hard to figure out what’s going on. To decrease the contrast

1. *Move the Dark slider over to about 40 or 50.*
2. *Move the Light slider down to 60 or 70.*

✓ **Shorten your shadows.** It’s strange to see objects lit as though the light source is very far away; overhead lighting looks more natural. To make your shadows look better, follow these steps:

1. *Set the Date slider to a day in the early autumn.*
2. *Set the Time slider to a time between 10:00 a.m. and 2:00 p.m.*

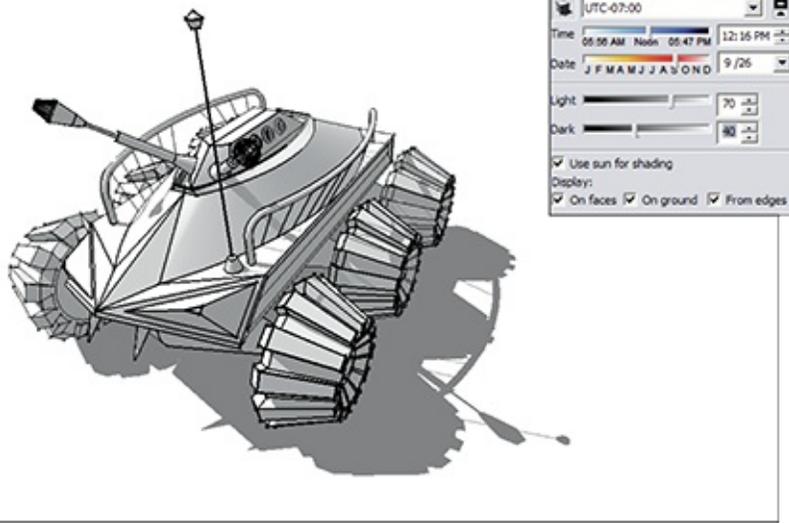


✓ **Don’t be afraid to rotate your model.** Remember that you can’t get every possible shadow position by using only the controls in the Shadow Settings dialog box. To get the effect you want, you may have to rotate your model by selecting it and using the Rotate tool.

✓ **Select the From Edges check box.** Lots of times, modelers use free edges to add fine detail to models (think of a harp or a loom). Selecting the From Edges check box tells SketchUp to allow those edges to cast shadows, which makes complex objects look about 900-percent cooler.

✓ **Pay attention to the transparency of faces.** When you have a face painted with a transparent material, you can decide whether that face should cast a shadow — chances are that it shouldn’t. In SketchUp, the rule is that materials more than 50-percent transparent cast shadows. So, if you don’t want one of your transparent-looking faces to cast a shadow, do one of the following:

- *Select the face and then deselect the Cast Shadows check box in the Entity Info dialog box.*
- *Adjust the opacity of the face’s material to be less than 50 percent in the Materials dialog box. For more information on how to do this, have a look at [Chapter 2](#).*



**Figure 10-17:** Some tips for making objects stand out with shadows.

## Creating accurate shadow studies

SketchUp can display accurate shadows, one of its most useful features. To do this, three pieces of information are necessary:

- ✓ The time of day
- ✓ The day of the year
- ✓ The latitude of the building site



The sun's position (and thus the position of shadows) depends on geographic location — that is to say, *latitude*. The shadow cast by a building at 3:00 on March 5 in Minsk is very different from that cast by a similar building, at the same time of day, on the same date in Nairobi.

If you display shadows on a model of a toaster oven, geographic location probably doesn't matter to you; the shadows are just there for effect. But if you try to see how much time your pool deck will spend in the sun during the summer months, you need to tell SketchUp where you are.

## Telling SketchUp where you are

Do you know the precise latitude of where you live? I sure don't. It's a good thing SketchUp helps you figure out where in the world your model is supposed to be. You can *geo-reference* your model (give it a geographic location) in two ways; which one you choose probably depends on whether you have an Internet connection:

- ✓ **Using a geo-location snapshot:** This is by far the simplest approach, but it requires that you have a precise idea of where your model is supposed to be on the globe. It also requires that you be connected to the Internet for the operation. If you know exactly where your model is supposed to go, and you're online, use this method. Take a look at Chapter 8 for a complete set of instructions.
- ✓ **Using the Model Info dialog box:** This method is a little more complicated, but it's your only

option if you're not online. Read on for all the gory details.

To give your model a geographic location when you're offline, follow these steps illustrated in Figure 10-18:

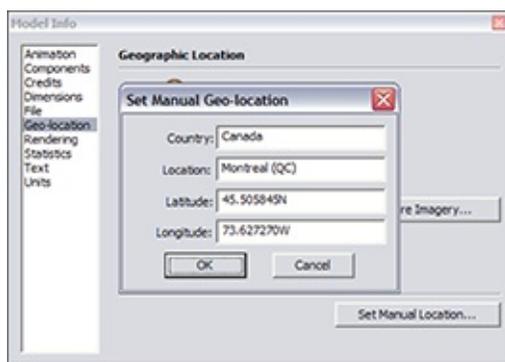
1. **Choose Window⇒Model Info to open the Model Info dialog box.**
2. **On the left side of the Model Info dialog box, choose Geo-Location.**



If you see anything other than `This model is not geo-located`, stop here. Your model has already been geographically located, and you don't need to go through any of the following steps. Close the Model Info dialog box, make yourself some coffee, and waste the time you just saved avoiding the next steps.

3. **Click the Set Manual Location button to open another dialog box.**
4. **Enter the required information and click OK.**

What you type in the Country and Location fields is entirely up to you; it doesn't affect your model's geo-location one bit. The Latitude and Longitude fields are the important parts of this dialog box.



**Figure 10-18:** Giving your model a geographic location when you're not online.

Whether you imported a geo-location snapshot or entered a set of coordinates manually, the next step is to make sure your model is rotated correctly relative to north. If your model faces the wrong way, your shadow studies are completely inaccurate.

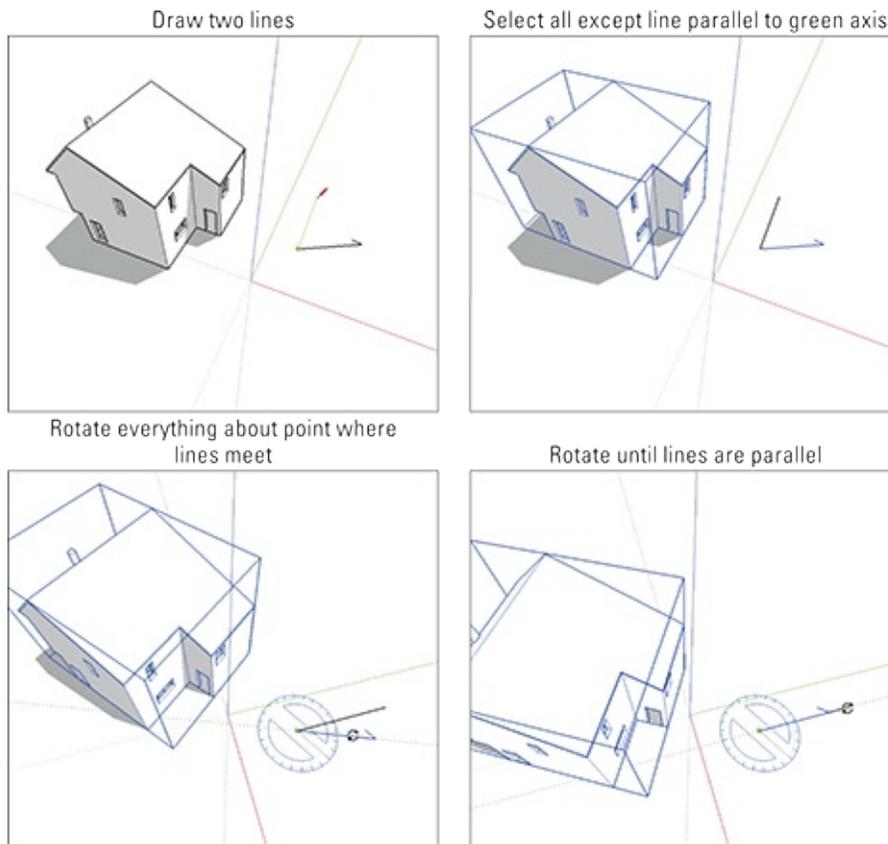


All you really need to know is this: By default, the green axis runs north-south, with the solid part pointing north. If north-for-your-building doesn't line up with the green axis, just select everything and use the Rotate tool to spin the building into place.

Here's a method I find works well, which I illustrate in Figure 10-19:

1. **On the ground somewhere, draw an edge that points to where north *should* be.**
2. **Starting at the southern endpoint of the edge you just drew, draw another edge that's parallel to the green axis.**

You have a V shape.



**Figure 10-19:** Make sure your model is correctly oriented relative to north.

**3. Select everything in your model *except* the edge you drew in Step 2.**

Your geo-location snapshot (if you have one) should have a red border around it; that's because it's locked. If for some reason it isn't, right-click it and choose Lock — you don't want to rotate it accidentally.

**4. Activate the Rotate tool.**

**5. Click the *vertex* (pointy end) of the V to establish your center of rotation.**

**6. Click the north end of the edge you drew in Step 1.**

**7. Click the north end of the edge you drew in Step 2.**

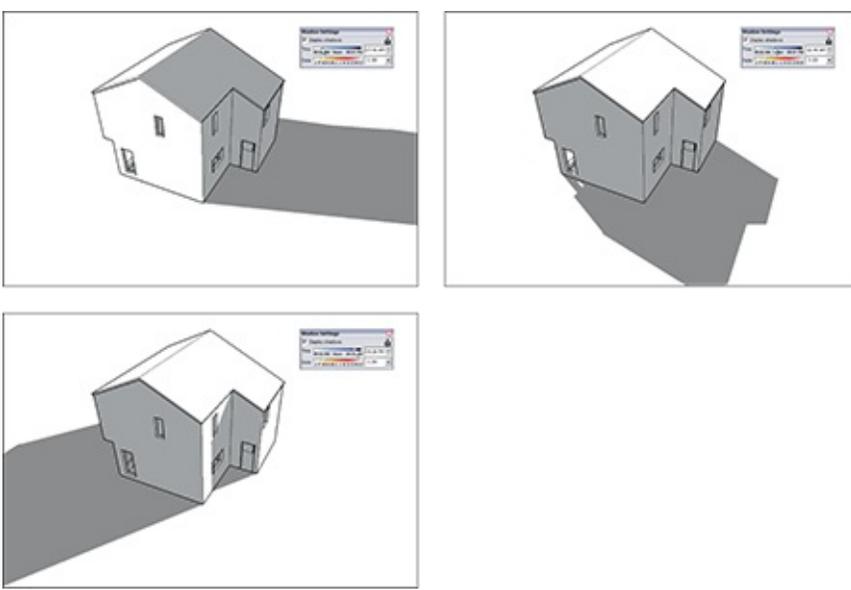
Now everything's lined up properly.

***Displaying accurate shadows for a given time and place***

Now that you've told SketchUp where your model is, it's a pretty simple process to study how the sun will affect your project, as shown in Figure [10-20](#). This is the fun part; all you have to do is move some sliders. If you have an audience, get ready for completely undeserved praise.

To study how the sun affects your project, follow these steps:

- 1. Orbit, zoom, and pan around until you have a good view of the part of your project you want to study.**
- 2. Choose Window⇒Shadows to open the Shadow Settings dialog box.**



**Figure 10-20:** Studying the effect of the sun on your model.

- 3. Select the Show/Hide Shadows button to turn on SketchUp's sun.**
- 4. Make sure the time zone setting is correct for your location.**

SketchUp doesn't always get the time zone right for every location in the world; time zones don't always map directly to coordinates. If the time zone you see in the Time Zone drop-down list (at the top of the Shadow Settings dialog box) isn't correct, choose another one.



Wondering what your time zone is in UTC? Try searching Google for *UTC time zones* to find a list that you can reference.

- 5. Type a month and day into the box to the right of the Date slider and then press Enter.**
- 6. Move the Time slider back and forth to see how the shadows will move over the course of that day.**
- 7. Pick a time of day using the Time controls.**
- 8. Move the Date slider back and forth to see how the sun will affect your project at that time of day over the course of the year.**

## Chapter 11

# Presenting Your Model inside SketchUp

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### *In This Chapter*

- ▶ Walking around inside your model
  - ▶ Creating scenes to capture particular views
  - ▶ Making animations with scenes
  - ▶ Cutting slices through your model with section planes
  - ▶ Generating plans and sections
- 

After you make a model, you probably want to show it to someone. How you present your work depends on the idea you want to convey. The tricky part about using SketchUp to present a model isn't actually using the tools; it's choosing the *right* tools to get your idea across without a bunch of extra information distracting your audience. Most 3D models have so much to look at that the real challenge is finding a presentation method that helps you focus on the stuff you want to talk about.

In this chapter, I talk about three ways to show off your models without ever leaving SketchUp. If you've made a building, you can walk around inside it. You can even walk up and down stairs and ramps — just like in a video game. You can create animated slide shows by setting up scenes with different camera views, times of day, and even visual styles. If you want to talk about what's *inside* your model, you can cut sections through it without taking it apart.

As you read this chapter, keep in mind what you want your model to communicate. Think about how you might use each method to make a different kind of point and think about the order in which you want those points to be made. As with everything else in SketchUp (and in life, I suppose), a little bit of planning goes a long way. That said, presenting a model live in SketchUp is undeniably sexy; you can't really go wrong, so have fun.

## *Exploring Your Creation on Foot*



Few experiences in life are as satisfying as running around inside your model. After you make a space, you can walk around it, go up and down stairs, bump into walls, and even fall off ledges. You can check to make sure that the television is visible from the kitchen, say, or experience what it'd be like to wander down the hall. In a potentially confusing building, such as an airport or a train station, you can figure out where to put the signs by allowing someone who's never seen your model to explore the space "on foot." The following sections, uh, walk you through how to use these features, and you can see the tools in action by watching the videos at [www.dummies.com/extras/sketchup2014](http://www.dummies.com/extras/sketchup2014).

## These tools were made for walking

A couple tools in SketchUp are dedicated to moving around your model as if you were actually inside it. The first step (no pun intended) is to position yourself so that you seem to stand inside your model. This can be tricky with just the Orbit, Pan, and Zoom tools, so SketchUp provides a tool just for this: Position Camera. After you're standing in the right spot (and at the right height), you use the Walk tool to move around. It's as simple as that.



The Position Camera and Walk tools enable you to walk around inside your model.

### Standing in the right spot: The Position Camera tool

The Position Camera tool precisely places your viewpoint in SketchUp in a particular spot. That's really all it does, but it works in two ways.

- ✓ **You want to stand right here.** Choose Camera⇒Position Camera from the menu bar and then click anywhere in the modeling window to automatically position your viewpoint 5 feet, 6 inches above wherever you clicked. Because this is the average *eye-height* of an adult, the result is that you are, for all intents and purposes, standing on the spot where you clicked; see Figure 11-1. After using Position Camera, SketchUp automatically switches to the Look Around tool, assuming that you may want to look around. I talk about Look Around in the “[Stopping to look around](#)” section of this chapter.

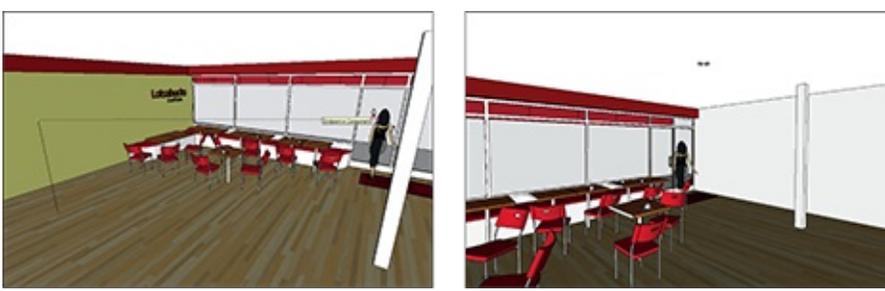


You're not stuck being five-and-a-half-feet tall forever. After you use Position Camera, type the height you'd rather be and press Enter. Type **18"** to see a golden retriever's view of the world, or type **7'** to pretend you play for the L.A. Lakers. Keep in mind that the Measurements box (the spot in the lower-right corner where numbers appear) displays your eye height as a distance from the ground, and not from whatever surface you're “standing on.” To set your eye height to be 5 feet above a platform that's 10 feet high, you'd type **15'**.



Figure 11-1: Drop yourself into your model with the Position Camera tool.

- ✓ **You want your eyes to be right here, and you want to look in this direction.** Select Position Camera, click the mouse button while in the spot where you want your eyes to be, drag over to the thing you want to look at (you see a dashed line connecting the two points), and release the mouse button; see Figure 11-2. Try this technique a couple times; it takes a bit of practice to master. Use Position Camera in this way if you want to stand in a particular spot *and* look in a particular direction. This technique works great with scenes, which I talk about later in this chapter.



**Figure 11-2:** Aim your view by using Position Camera in another way.

## Stepping out with the Walk tool

After you use Position Camera to place yourself in your model, use the Walk tool to move through it.

To walk around, click and drag the mouse in the direction you want to move:

- ✓ Straight up is forward.
- ✓ Straight down is backward.
- ✓ Anything to the left or right causes you to turn while you walk.

The farther you move your cursor, the faster you walk. Release the mouse button to stop. If you've ever played video games, you'll get used to it quickly. If Scrabble is more your speed, it'll take a few minutes to get the hang of things.



You can even use the Walk tool to walk up and down stairs and ramps. Keep in mind that the highest step you can climb is 22 inches — anything higher and you get the “bump” cursor, just like you walked into a wall. Also, if you walk off a high surface, you fall to the surface below. It's times like these that I wish SketchUp had cartoon sound effects...

Using modifier keys in combination with the Walk tool makes SketchUp even more like a video game:

- ✓ **To run instead of walk**, hold down the Ctrl key (Option on a Mac) while you're using the Walk tool with your mouse. This may be useful if you're trying to simulate what it'd be like if a werewolf were chasing you through your model.
- ✓ **To make the Walk tool change your eye height or move sideways**, use the Shift key. To move straight up like you're growing, hold down the Shift key while you move your mouse up. To get shorter, hold down Shift and move your mouse down. To move sideways like a crab, hold down Shift and move your mouse left or right.
- ✓ **To disable collision detection so that you can walk through walls**, hold down the Alt key (Command on a Mac). Burglars find this handy for entering models without breaking any windows.

## Stopping to look around

Look Around is the third tool in SketchUp that's dedicated to exploring your model from the inside. If using Position Camera is like swooping in to stand in a particular spot and Walk is like

moving around while maintaining a constant eye-height, Look Around is like turning your head while standing in one spot. It's pretty well named, I think; it does exactly what it says.

Using Look Around is so simple it hardly merits these steps:

1. **Choose Camera⇒Look Around.**
2. **Click and drag around in the modeling window to turn your virtual head.**

Don't move too fast, or you'll strain your virtual neck.



When you're using any of the navigation tools, right-click to access any other navigation tool; this makes switching between them a little easier.

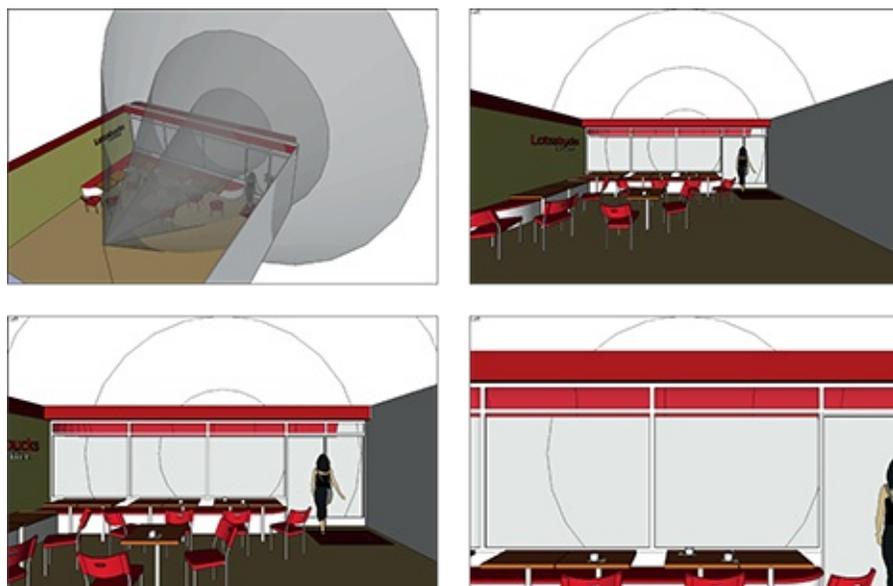
When you use Look Around with the field of view tool I discuss in the next section, you get a pretty darned realistic simulation of what it'd be like to stand in your model.

## Setting your field of view

*Field of view* is how much of your model you can see in your modeling window at one time. Imagine your eyesight kind of like a cone, with the pointy end pointing at your eyes and the cone getting bigger as it gets farther away from you. Everything that falls inside the cone is visible to you, and everything outside the cone isn't.

If you increase the angle of the cone at the pointy end, the cone gets wider, and you see more of what's in front of you. If you decrease the angle, the cone gets narrower, and you see less; see Figure 11-3.

Measured in degrees, a *wide field of view* means that you can see more of your model without having to move around. The bigger the angle, the more you can see. A wide field of view comes in handy when you're inside a SketchUp model because working on a model you can't see is hard.



**Figure 11-3:** The wider your field of view, the more you can see.

It's a good idea to fiddle with your field of view while walking around inside your model. Follow

these steps to do so:

## 1. Choose Camera⇒Field of View.

Notice that the Measurements box in the lower-right corner of your modeling window says `Field of View` and that the default value is 35 degrees. This means that you currently have a 35-degree cone of vision, which is kind of narrow.

## 2. Type 60 and press Enter.

Your field of view increases, and you now have a wider view of your model. The trade-off is that you see more distortion at the edges of your modeling window as more information is displayed in the same amount of space.



A good rule of thumb for setting your field of view is to strike a balance between quantity and quality; a wider view always means more distortion. For views of the *outside* of something I've built, I like to use a field of view of 35 to 45 degrees. For interior views, I use 60 or 70 degrees.



If you know something about photography, you can express field of view in millimeters, just like you're using a camera lens. Typing **28mm** gives you a wide-angle view, just like you're looking through a 28mm lens. For people who think about field of view in these terms, this can be a lot more intuitive than trying to imagine cones of vision.

# Taking the Scenic Route

Wouldn't it be great if you could save a particular view of your model? And wouldn't it be even greater if that view could also save things like styles and shadow settings? What if you could come back to any of these saved views by clicking a button on your screen? What if this whole paragraph were just a series of questions?

SketchUp *scenes* are (you guessed it) saved views of your model. It's probably easiest to think of scenes as pre-saved views of your model, except that scenes can save much more than just camera positions.

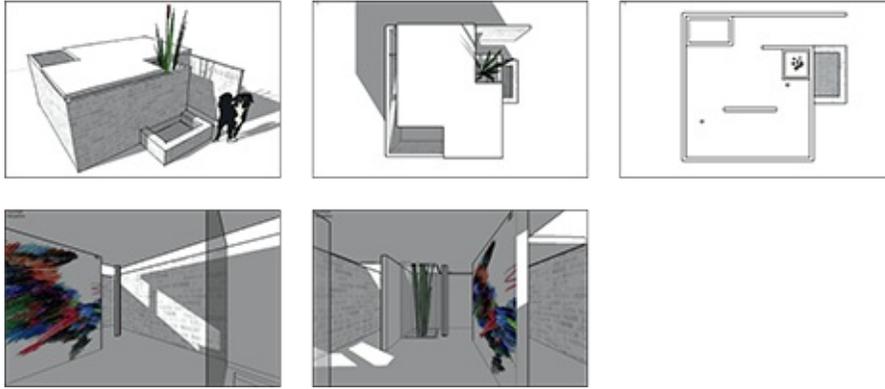


Although they don't get a lot of space in this book (they don't even get their own chapter), scenes are an important feature in SketchUp for three reasons:

✓ **Scenes can save you hours of time.** It's not always easy to get back to exactly the right view by using Orbit, Zoom, and Pan. Sometimes a view involves shadows, styles, sections (you read about those later), and even hidden geometry. Setting up everything the way you need it, every time you need it, can be a pain. It's not that SketchUp's *hard* — it's just that you have a lot of

different ways to view your model. Making a scene enables you to apply dozens of settings with a click of your mouse.

- ✓ **Scenes are *by far* the most effective way to present your model.** Saving a scene for each point that you want to make in a presentation allows you to focus on what you're trying to say. Instead of fumbling around with the navigation tools, turning on shadows, and making the roof visible, you can click a button to transition to the next scene (which you've already set up exactly the way you want it). Figure 11-4 shows a set of scenes I created to present a house I designed for my dog, Savannah.



**Figure 11-4:** To show very specific views, create scenes.

- ✓ **Scenes are the key to making animations.** You make animations by creating a series of scenes and telling SketchUp to figure out the transitions between them. The process, which I explain in later sections, is as simple as clicking a button.

After you get used to scenes, you'll find yourself using them all the time. Here are some of the most common uses for scenes:

- ✓ Showing shade conditions for the same area at different times of the day
- ✓ Saving scenes for each floor plan, building section, and other important views of your model
- ✓ Building a walk-through or flyover animation of your design
- ✓ Creating scenes that show several views of the same thing with different options (the pointy roof or the flat one, madam?)
- ✓ Demonstrating change over time by showing or hiding a succession of components

## Creating scenes

It's time to get one thing straight: Making a scene in SketchUp is *not* like taking a snapshot of your model. If you create a scene to save a view, continue working on your model, and then return to that scene, your model doesn't go back to the way it was when you created the scene. The camera position will be the same, and the settings will be the same, but your geometry won't be. This is a pretty important concept, and one that makes using scenes so powerful.



A *scene* is just a set of view settings, which means that they're automatically updated to reflect your changes every time you edit your model. You can make some scenes and use

them all the way through your process, from when you start modeling to when you present your design to the president. Or to your mother.



Creating scenes is a simple process. The basic idea is that you add a scene to your SketchUp file whenever you have a view you want to return to later. You can always delete scenes, so there's no downside to using lots of them. Follow these steps to make a new scene (and watch the video of these steps at [www.dummies.com/extras/sketchup2014](http://www.dummies.com/extras/sketchup2014)):

**1. Choose Window⇒Scenes to open the Scenes dialog box.**

When the Scenes dialog box first opens, it doesn't look like there's much to it. Expanding it by clicking the Show Details button in the upper-right corner reveals more options, but don't worry about that right now.

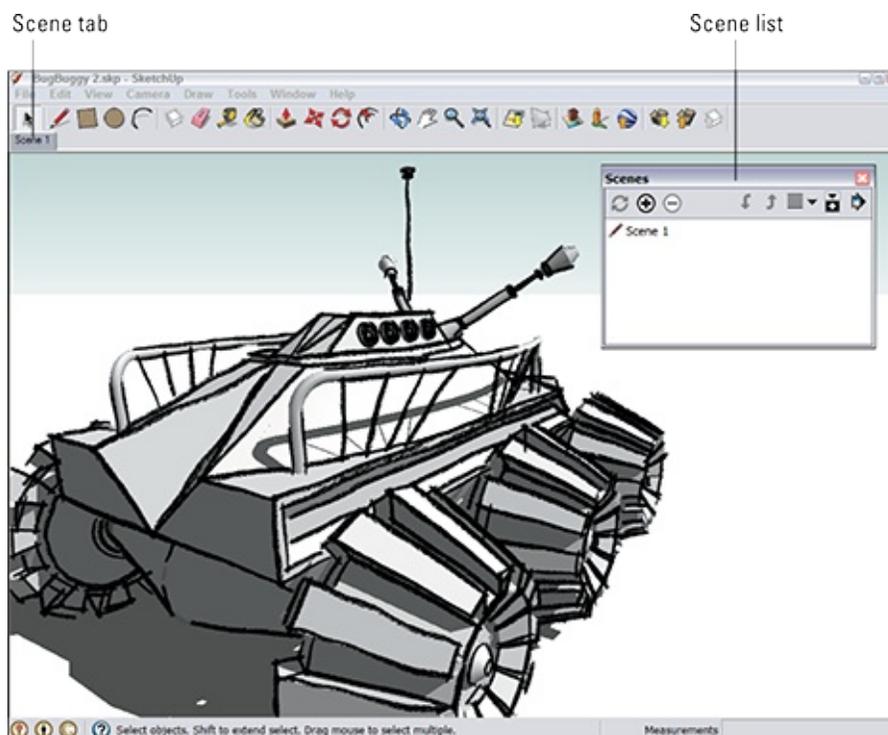
**2. Set up your view however you want.**

Navigate around until you're happy with your point of view. If you want, use the Shadows and Styles dialog boxes to change the way your model looks.

**3. Click the Add button to make a new scene with your current view settings.**

A new scene is added to your SketchUp file. If this is the first scene you've created, it's called Scene 1 and appears in two places, as shown in Figure 11-5:

- As a list item in the Scenes dialog box, right underneath the Add button
- As a tab at the top of your modeling window, labeled Scene 1



**Figure 11-5:** The scene you just added appears in two places.



When you're creating a scene that shows an eye-level view of a building — whether it's an interior or an exterior view — there's a quick, easy step you can take to make it look 500 percent better: Choose Camera⇒Two-Point Perspective to make all of the vertical edges in your model appear vertical in the view. Doing so removes the unprofessional, distorted effect that's the hallmark of improperly wielded 3D modeling software.



Nothing is generated outside of SketchUp when you add a scene; it's not like exporting a JPEG or a TIFF. Scenes are just little bits of programming code that “remember” the view settings in effect when they're created. Scenes also don't add much to your file size, so you don't have to worry about using too many of them.

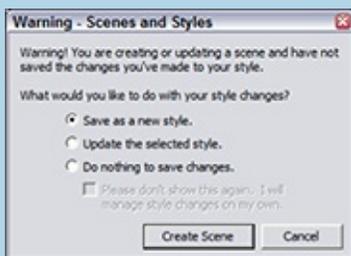


## When scenes and styles collide

Sooner or later, you'll be presented with the Warning — Scenes and Styles dialog box shown here. It pops up whenever you try to create a scene without first saving the changes you've made to the style applied to your model. In other words, SketchUp tries to help by reminding you to keep styles in mind while you work with scenes. (The first part of Chapter [10](#) is all about styles, just in case you need a refresher.)

This warning dialog box gives you three options; here's some guidance on which one to choose:

- **Save as a New Style:** This option adds a new style to your In Model styles library. When you come back to this scene, it looks exactly the way it did when you created it. Choosing this option is the safest way to proceed because it can't affect any other scene.
- **Update the Selected Style:** Choose this option only if you know what effect this will have on the other scenes in your model — if the style you're updating is applied to any of them, you'll affect the way they look. In models with lots of scenes and styles, this can have big implications.
- **Do Nothing to Save Changes:** This option creates a scene with your current style applied, completely ignoring any changes you may have made to that style. When you come back to this scene, it looks different than it did when you created it. Only choose this option if you really know what you're doing, or if you enjoy doing the same thing more than once.



## *Moving from scene to scene*

Activate a scene you've added earlier by doing one of three things:

- Double-click the name (or thumbnail image) of the scene in the Scenes dialog box.

- ✓ Click the tab for that scene at the top of the modeling window.
- ✓ Right-click any scene tab and choose Play Animation to make SketchUp automatically flip through your scenes. Choose Play Animation again to make the animation stop.

Notice how the transition from one scene to the next is animated? You don't have to do anything special to make this happen; it's something SketchUp automatically does to make things look better (and ultimately, to make *you* look better).

You can adjust the way SketchUp transitions between scenes, which is handy for customizing your presentations. Follow these steps to access these settings:

1. **Choose Window⇒Model Info.**
2. **On the left side of the Model Info dialog box, choose Animation.**

The Animation settings panel in the Model Info dialog box isn't very complicated, but it can make a huge difference in the appearance of your scene-related presentations.

3. **In the Scene Transitions area, set how SketchUp transitions from one scene to another.**

These settings apply to both manual (clicking a page tab) and automatic (playing an animation) scene transitions:

- *Enable Scene Transitions*: Deselect this check box to make SketchUp change scenes without animating the transitions between them. You probably want to do this if your model is so complex (or your computer is so slow) that animated transitions don't look good.
- *Seconds*: If you've selected the Enable Scene Transitions check box, the number of seconds you enter here indicates the time SketchUp takes to transition from one scene to the next. If you're "moving the camera" very far between scenes, bump up the transition time so that your audience doesn't get sick. I find three seconds to be a good compromise between nausea and boredom.



If you're presenting an incomplete model (perhaps you've thought about the garage and the living room, but nothing in between), it can be helpful to turn off scene transitions. That way, your audience won't see the things you haven't worked on when you click a tab to change scenes. It's sneaky, but effective.

4. **In the Scene Delay area, set the length of time SketchUp pauses on each slide before it moves to the next one.**

If you want the presentation to seem like you're walking or flying, set this to 0. If you want time to talk about each scene in your presentation, bump this up a few seconds.

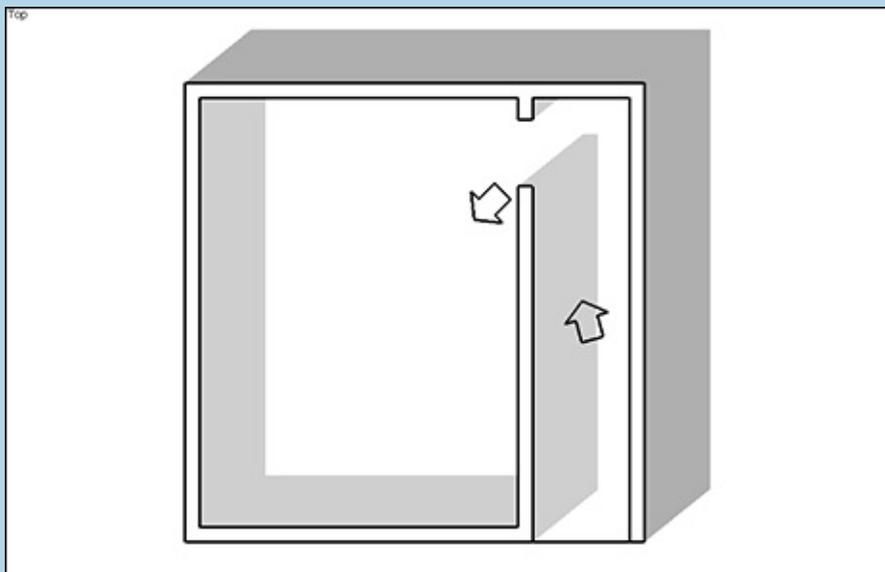


## Making walk-throughs

A really great way to use scenes is to pretend you're walking or flying through your model. By setting up your scenes sequentially, you can give a seamless tour without messing around with the navigation tools. This is especially handy when you need to walk and talk at the same time.

Here are some tips that can help you to simulate a person walking or flying through your model with scenes:

- ✓ **Adjust your field of view.** For interior animations, make your camera “see” a wider area by setting your field of view to 60 degrees. I like to set my field of view between 30 and 45 degrees for exterior views, but there's no hard-and-fast rule. I talk about how to do this in the section “[Setting your field of view](#),” earlier in this chapter.
- ✓ **Make sure that your scenes aren't too far apart.** Instead of racing through a room like it's on fire, don't be afraid to add more scenes. Your audience will thank you by not throwing up on your conference table.
- ✓ **Add scenes at equal distance intervals.** Because SketchUp only lets you control the scene transition timing for all your scenes at once, it's best to make sure that your scenes are set up about the same distance apart. If you don't, your walk-through animations will be jerky and strange, like my dancing.
- ✓ **Don't forget the animation settings in the Model Info dialog box.** Set the scene delay to 0 seconds so that your animation doesn't pause at every scene. For a normal walking speed, set your scene transitions so that you move about 5 feet per second. If your scenes are about 20 feet apart, set your scene transition time to 4 seconds. This gives your audience time to look around and notice things. For flying animations, pick a scene transition time that looks good.
- ✓ **Slide around corners.** When you set up a walking animation, you have an easy, reliable way to turn corners without seeming too robotic. The method is illustrated in the figure. Basically, the trick is to add a scene just short of where you want to turn — in this case, a few feet ahead of the doorway. The key is to angle your view *into* the turn slightly. Set up your next scene just past the turn, close to the inside and facing the new view. This technique makes it seem like you're turning corners naturally.



### *Modifying scenes after you make 'em*

After you create a whole bunch of scenes, you inevitably need to fiddle with them in some way. After all, modifying something is almost always easier than making it all over again, and the same thing holds true for scenes. Because your SketchUp model will change a million times, understanding how to make changes to your existing scenes can save you a lot of time in the long run.



Certain aspects of the scene-modification process can get a little tricky. This is kind of surprising, given how simple the rest of working with scenes can be. You deal with a lot of complexity when working in SketchUp, and this is just one of the places where that complexity rears its ugly head. The upshot: Pay special attention to the section on updating scenes and don't worry if you take a little while to figure things out. It happens to the best of us.

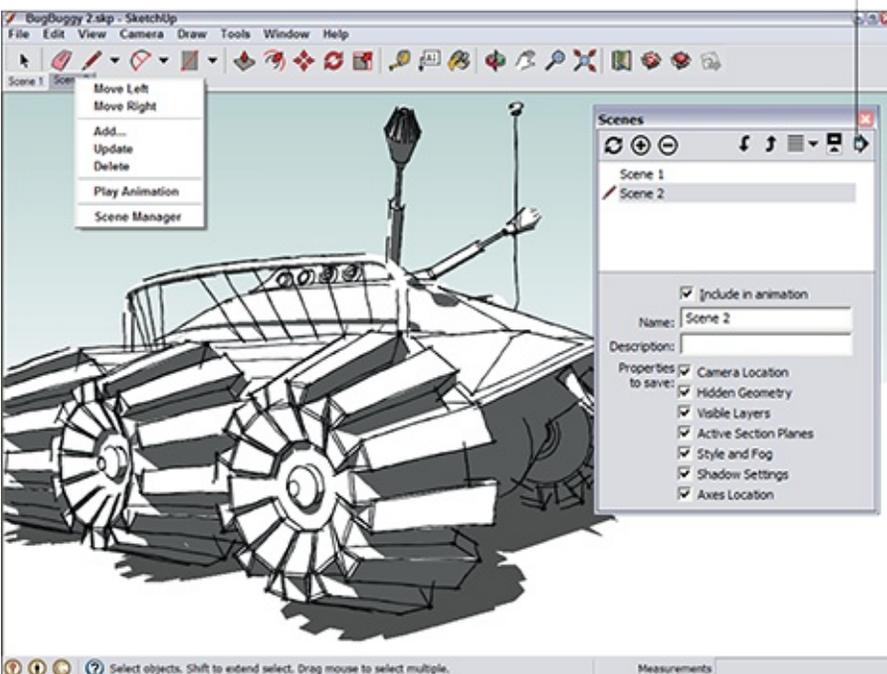
## Reordering, renaming, and removing scenes

Making simple modifications to scenes, such as reordering, renaming, and removing them, is easy. You can accomplish each of these in two ways: You either use the Scenes dialog box or you right-click the scene tabs at the top of your modeling window, shown in Figure 11-6.



To access the modification controls in the Scenes dialog box, click the arrow-shaped Show Options button in the upper-right corner.

Show Options



**Figure 11-6:** You can modify scenes by right-clicking scene tabs or by using the Scenes dialog box.

Here's how to reorder, rename, or remove scenes:

✓ **Reordering scenes:** You can change the order in which scenes play in a slide show. If you're using scenes, you need to do this often — trust me. Use one of the following methods:

- Right-click the tab of the scene you want to move (in the modeling window) and choose Move Right or Move Left.
- In the expanded Scenes dialog box, click the name (or thumbnail image) of the scene you want to move to select it. Then click the up or down arrows to the right of the list to change the scene's position in the scene order.



✓ **Renaming scenes:** It's a good idea to give your scenes meaningful names: Living Room, Top View, and Shadows at 5:00 P.M. are descriptive enough to be useful. Scene 14, I find, lacks a certain *je ne sais quoi*. Use one of the following methods:

- Right-click the scene tab and choose Rename (this works only on the Mac, for some reason).
- In the Scenes dialog box, select the scene you want to rename and type something into the Name field below the list. If you're feeling really organized, go ahead and give it a description, too — more information never hurts.

✓ **Removing scenes:** If you don't need a scene anymore, feel free to delete it. However, if you have a scene that you don't want to appear in slide shows, you don't have to get rid of it. Use one of the following methods to remove a scene:

- Right-click the scene tab and choose Delete to get rid of it permanently.
- In the Scenes dialog box, select the scene you want to ax and click the Delete button.

To exclude a scene from slide shows without getting rid of it, select its name (or thumbnail) and deselect the Include in Animation check box.

### *Working with scene properties*

Okay. Turn off the television. Send the kids outside to play. Do whatever you need to do to concentrate because wrapping your head around the concept of scene properties isn't altogether straightforward. I do my best to explain it.

Basically, a scene is just a collection of saved viewing *properties*. Each of these properties has something to do with how your model looks:

- ✓ **Camera Location:** Camera Location properties include the camera position, or *viewpoint*, and the field of view. I discuss field of view earlier in this chapter.
- ✓ **Hidden Geometry:** Hidden Geometry properties are really just one thing: what elements are hidden and what elements aren't. These properties keep track of the visibility of the lines, faces, groups, and components in your model.
- ✓ **Visible Layers:** Visible Layer Properties keep track of the visibility of layers in your model.
- ✓ **Active Section Planes:** Active Section Plane properties include the visibility of section planes and whether they're active. I talk about sections in the last part of this chapter.
- ✓ **Style and Fog:** Style and Fog properties are all the settings in the Styles and Fog dialog boxes, and there are a lot of them.
- ✓ **Shadow Settings:** Shadow Settings properties include whether shadows are turned on and the time and date for which the shadows are set. They also include all the other settings in the Shadow Settings dialog box.
- ✓ **Axes Locations:** Axes Location properties are very specific. They keep track of the visibility, location, and orientation of the main red, green, and blue axes in your modeling window. It's

sometimes useful to move the axes around when you're working, such as when you're working with a rotated street grid in an urban-scale model.



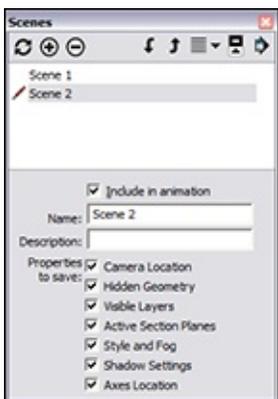
Here's the tricky part: Scenes can *save* (remember) any combination of the preceding properties — it's not an all-or-nothing proposition. After the full impact of this information soaks in, you'll realize that this means that scenes are *much* more powerful than they first appear.



By creating scenes that save only one or two properties (instead of all seven), you can use scenes to do some pretty nifty things. Here are three of my favorites:

- ✓ Create scenes that affect only your camera location, allowing you to return to any point of view without affecting anything else about the way your model looks (such as styles and hidden geometry).
- ✓ Create scenes that affect only styles and shadows, letting you quickly change between simple and complex (hard on your computer) display settings without affecting your camera location.
- ✓ Create scenes that have different combinations of Hidden Geometry to look at design alternatives without changing your model's style and camera location.

The key to working with scene properties is the expanded Scenes dialog box, visible in Figure 11-7. Although this dialog box is pretty simple, folks who understand it are few and far between. Prepare to join the informed minority.



**Figure 11-7:** Choose which scene properties to save in the expanded Scenes dialog box.

Follow these steps to set which properties a scene saves:

- 1. In the Scenes dialog box, select the scene whose properties you want to fiddle with.**

You don't have to view this scene when you edit it; you can edit properties for any scene at any time.

- 2. If not already expanded, click the Show Options button in the upper-right corner of the Scenes dialog box.**

### 3. **Select the check boxes next to the properties you want to save.**

That's it. You don't have to click Save anywhere to make your changes stick. A little anticlimactic, no?



One terrific use of scene properties is to create scenes that help you show off different *iterations* (versions) of your design. My favorite way to accomplish this is to make clever use of Layers. Take a look at Chapter [7](#) for more information.

### **Updating scenes**

If you want to *update* (make changes to) an existing scene, you have a couple options:

- ✓ Update all the scene's properties at once, which is a piece of cake.
- ✓ Update the scene's properties selectively, which isn't quite as simple. Read on for both sets of instructions.

### **Updating all the scene properties at once**

The simplest way to modify a scene is to not worry about individual properties.



After you update a scene, you can't use Undo to revert things back to the way they were. Save your SketchUp file right before you update a scene and choose File⇒Revert if you don't like the results.

If all you want to do is update a scene after you make an adjustment to the appearance of your model, you're in luck. Follow these steps:

#### **1. Click the tab of the scene you want to update.**

The tabs are at the top of the modeling window.

#### **2. Make whatever styles, shadows, camera, or other display changes you want to your model.**

#### **3. Right-click the current scene tab and choose Update.**



Be careful not to accidentally double-click the tab, or you'll reactivate the scene and lose all the changes you made. The old scene properties are replaced by the new ones, and you're home free.

### **Updating scene properties selectively**

Here's where things get complicated. At times in your SketchUp life, you'll want to update a scene without updating all its properties.



When you update scenes selectively, you make changes that you can't see immediately, which means disaster might strike. Copy your SketchUp file before you update more than one scene at a time, just in case something awful happens.

Maybe you've used scenes to create a tour of the sunroom you're designing for a client, and you want to change the shadow settings to make your model look brighter. You have 30 scenes in your presentation, and your meeting's in 5 minutes. You don't have time to change and update all 30 scenes one at a time. What to do? Follow these steps:

**1. Adjust the Shadow Settings properties to where you want them to be for all the scenes you want to update.**

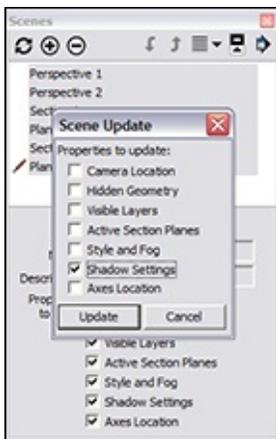
Although this example deals with shadows, this same method applies to any scene properties changes you want to make.

**2. In the Scenes dialog box, select all the scenes you want to update.**

Hold down the Shift key to select more than one scene at a time.

**3. Click the Update button in the Scenes dialog box.**

The Scenes Update dialog box appears, as shown in Figure [11-8](#).



**Figure 11-8:** Updating only certain scene properties is a little more involved.

**4. Select the Shadow Settings check box and click the Update button.**

If all you want to update are the Shadow Settings, make sure that only that check box is selected. More generally, you'd select the check box next to each of the properties you want to update. All the selected scenes are updated with those new properties, and all the properties left deselected remain unchanged.

## *Mastering the Sectional Approach*

Software like SketchUp has a funny way of providing moments of perfect simplicity, moments when you sit back, scratch your head, and think to yourself, “That’s it? That’s all there is to it?”

Sections in SketchUp offer one of those moments. To put it simply, *sections* are objects that let you cut away parts of your model to look inside. You place sections wherever you need them, use them to create views you couldn't otherwise get, and then delete them when you're done. When you move a section plane, you get instant feedback; the cut view of your model moves, too. If you want to get fancy, you can embed sections in scenes and even use them in animations. Sections are the icing on the SketchUp cake: easy to use, incredibly important, and impressive as all get-out.



If you're still not convinced, check out the videos that demonstrate how to cut sections, create sectional views, and animate sections. You find the videos via [www.dummies.com/extras/sketchup2014](http://www.dummies.com/extras/sketchup2014).

People use sections for all kinds of things:

- ✓ Creating standard orthographic views (such as plans and sections) of buildings and other objects
- ✓ Making cutaway views of complex models to make them easier to understand
- ✓ Working on the interiors of buildings without moving or hiding geometry
- ✓ Generating sectional animations with scenes

## Cutting plans and sections

The most common use for sections is to create straight-on, cut-through views of your model. These views often include dimensions and are typical of the drawings that architects make to design and explain space.

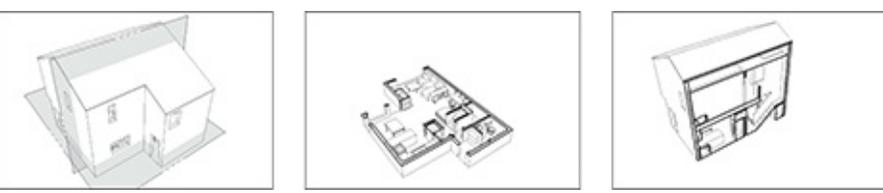
Straight-on, cut-through views are useful because

- ✓ They're easy to read.
- ✓ You can take measurements from them (if they're printed to scale).
- ✓ They provide information that no other drawing type can.



The following terms (which I illustrate in Figure [11-9](#)) can help you create different views of your model more easily:

- ✓ **Plan:** A *planimetric* view, or plan, is a top-down, two-dimensional, nonperspectival view of an object or space. Put simply, it's every drawing of a house floor plan you've ever seen. You generate a plan by cutting an imaginary *horizontal* slice through your model. Everything below the slice is visible, and everything above it isn't.
- ✓ **Section:** Not to be confused with sections (the SketchUp feature about which this part of the book is written), a *sectional* view, or *section*, is a from-the-side, two-dimensional, nonperspectival view of an object or space. You make a section by cutting an imaginary *vertical* slice through your model. Just like in a plan view, everything on one side of the slice is visible, and everything on the other side is hidden.



**Figure 11-9:** A plan is a horizontal cut, whereas a section is a vertical one.



## Cutting like an architect

In architecture, the convention is to *cut* plans at a height of 48 inches, meaning that the imaginary horizontal slice is made 4 feet above the floor surface. This ensures that doors and most windows are shown cut through by the slice, whereas counters, tables, and other furniture are below it, and thus are fully visible. You can see what I mean in Figure [11-9](#). These things are important when you try to explain a space to someone. After all, architectural drawings are two-dimensional abstractions of three-dimensional space, and every little bit of clarity helps.

When it comes to architectural sections (as opposed to sections, the SketchUp feature), there's no convention for where to cut them, but you should follow a couple rules:

- **Never cut through columns.** If you show a column in a section, it looks like a wall. This is bad because sections are supposed to show the degree to which a space is open or closed. You can walk around a column, but you can't walk through a wall (at least I can't).
- **Try your best to cut through stairs, elevators, and other vertical circulation.** Showing how people move up and down through your building makes your drawings a lot more readable, not to mention interesting. See Figure [11-9](#) for an example.

You cut plans and sections by adding section planes to your model. These are a little abstract because nothing like them exists in real life. In SketchUp, *section planes* are objects that affect the visibility of certain parts of your model. When a section plane is active, everything in front of it is visible and everything behind is hidden. Everywhere a section plane cuts your model, a slightly thicker section cut line appears.



If you're using Windows, open the Sections toolbar by choosing View⇒Toolbars⇒Sections. If you're on a Mac, the Section Plane tool is in the Large Tool Set, which you can activate by choosing View⇒Tool Palettes⇒Large Tool Set. On both platforms, Section Plane looks like a white circle with letters and numbers in it.

To add a section plane, follow these steps:

### 1. Choose Tools⇒Section Plane to activate the Section Plane tool.

You can also activate Section Plane by choosing its icon from the Large Tool Set (Mac) or the Sections toolbar (Windows), if you have it open.

### 2. Move the Section Plane tool around your model.

Notice how the orientation of the Section Plane cursor (which is quite large) changes to be

coplanar to whatever surface you hover over.

**3. After you figure out where you want to cut, click once to add a section plane.**

To create a plan view, add a horizontal section plane by clicking a horizontal plane like a floor. For a sectional view, add a vertical section plane by clicking a wall or other vertical surface. You can, of course, add section planes wherever you want; they don't have to be aligned to horizontal or vertical planes. Figure [11-10](#) shows a section plane being added to a model of a house.

**4. Choose the Move tool.**

**5. Move the section plane you just added by clicking it once to pick it up and again to drop it.**

You can only slide your section plane back and forth in two directions; SketchUp allows only section planes to move perpendicular to their cutting planes. When you're deciding where to locate your cut, the nearby sidebar, "[Cutting like an architect](#)," offers helpful pointers.

After you add a section plane and move it to the desired location, you can rotate and even copy it, just like any other object in your model. The section plane never affects your geometry — just the way you view it.

**6. If you need to rotate your section plane, select it and use the Rotate tool.**

Why rotate a section plane? In certain circumstances, rotating a section plane (instead of creating a brand-new one) can help explain a complex interior space. Showing a plan view *becoming* a sectional one is a powerful way to explain architectural drawings to an audience that doesn't understand them.

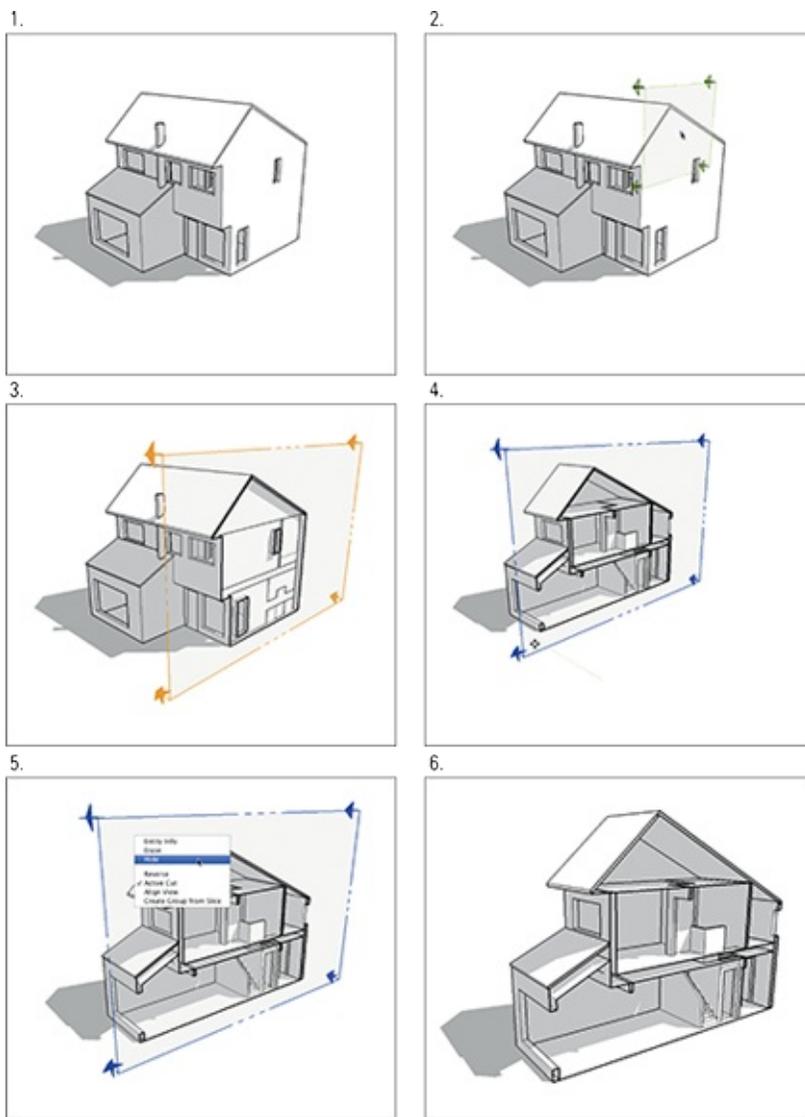
Read more about the Rotate tool in [Chapter 2](#).

**7. To make a new section plane by copying an existing one, use the Move or Rotate tool to do it the same way you'd make a copy of any other SketchUp object.**

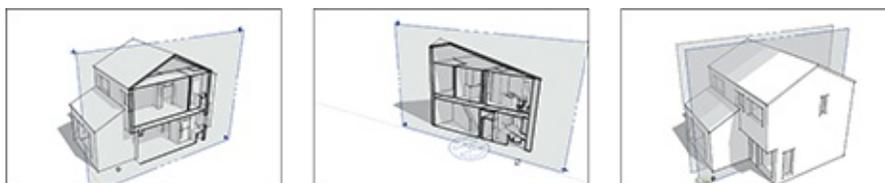
[Chapter 2](#) explains these basic actions in detail.

Copying section planes is a great way to space them a known distance apart; this can be trickier if you use the Section Plane tool to keep adding new ones, instead.

Figure [11-11](#) shows moving, rotating, and copying a section plane.



**Figure 11-10:** Add a section plane wherever you want one and then move it into position.

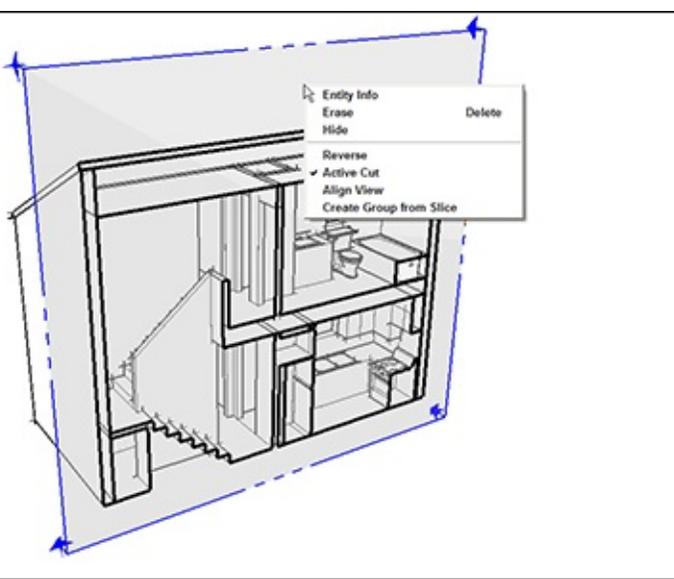


**Figure 11-11:** Moving, rotating, and copying a section plane.

When the section plane you've added is in position, you're ready to control how it affects visibility in a number of other ways. See the following sections for details.

### ***Controlling individual section planes***

You can control the way section planes behave by right-clicking them to bring up a context menu, as shown in Figure [11-12](#). I show examples of what the following options do in the same illustration:



**Figure 11-12:** Right-clicking a section plane gives you some options.

- ✓ **Reverse:** This option flips the direction of the section plane, hiding everything that was previously visible, and revealing everything that used to be behind the cut. Use this when you need to see inside the rest of your model.



- ✓ **Active Cut:** Although you can have multiple section planes in your model, only one plane can be active at a time. The *active cut* is the section plane that's actually cutting through your model; others are considered *inactive*. If you have more than one section plane, use Active Cut to tell SketchUp which one should be active.



You *can* have more than one active section plane in your model at a time, but doing so requires that you nest, or embed, each section plane in a separate group or component. You can achieve spiffy effects with this technique, but I'm afraid I don't have room to include more than this mention of it in this book. You can read all about groups and components in Chapter [5](#).

- ✓ **Align View:** When you choose Align View, your view changes so that you look straight on at the section plane. You can use this option to produce views like the ones that I describe in the section "[Getting different sectional views](#)," later in this chapter.
- ✓ **Create Group from Slice:** This option doesn't have much to do with the other choices in this context menu; it's really a modeling tool. You can use this to do exactly what it says: Create a group from the active slice, or section plane. I don't use this very often, but it comes in handy for creating filled-in section cuts for final presentations.

## Setting section-plane visibility



If you want to control the visibility of all your section planes at once, a couple menu options can help. Use both of these toggles in combination to control how section cuts appear in your model. These two options, shown on the View menu, are illustrated in Figure [11-13](#):

✓ **Section Planes:** This choice toggles the visibility of section-plane objects without affecting the section cuts they produce. More simply, deselecting Section Planes hides all the section planes in your model, but doesn't turn off the section cut effect, as shown in the middle image in Figure 11-13. This is how you probably want to show most of your sectional views, so this is a pretty important toggle.

✓ **Section Cuts:** This option toggles the section cut effect on and off without affecting the visibility of the section-plane objects in your model. This choice is sort of the opposite of Section Planes, in the previous point, but it's every bit as important.

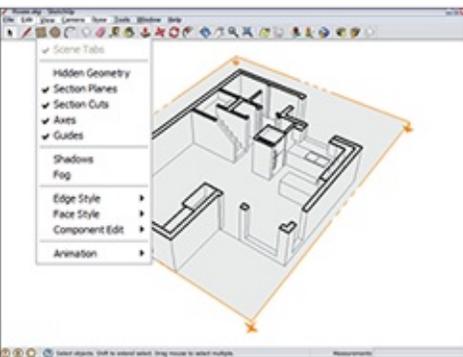
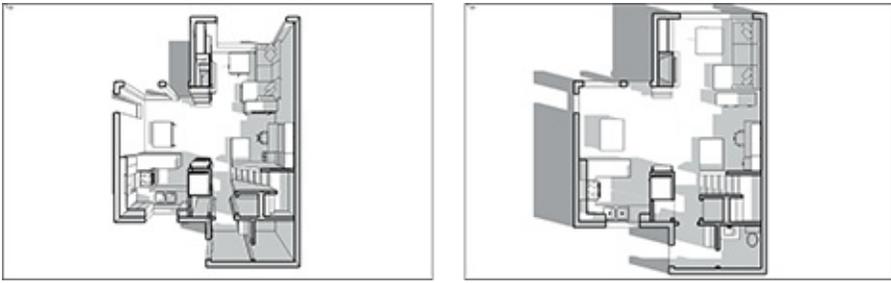


Figure 11-13: Control section plane visibility with Section Planes and Section Cut.

### Getting different sectional views

Using section planes, you can create a couple useful and impressive views of your model without much trouble. The second builds on the first, and both are shown in Figure 11-14. A section perspective (left) is a special view of a three-dimensional space. The second type, an orthographic view (right), is straight on and doesn't use perspective.



**Figure 11-14:** Turn on Perspective for a section perspective; choose Parallel Projection to produce an orthographic view.

### [Making a section perspective](#)

If you imagine cutting a building in half and then looking at the cut surface straight on while looking inside, you have a section perspective. The *section* part of the term means that the building has been cut away. The *perspective* part indicates that objects inside the space seem smaller as they get farther away.

Section perspectives are a great (not to mention incredibly cool) way of showing interior space in a way most people can understand. To create a section perspective using the Section Plane tool in SketchUp, follow these steps:

- 1. Select the section plane you want to use to make a section perspective by clicking it with the Select tool.**

When it's selected, your section plane turns blue, assuming that you haven't changed the default colors in the Styles dialog box.

- 2. If the selected section plane isn't active, right-click it and choose Active Cut.**

Active section planes cut through their surrounding geometry. If your section plane is visible but isn't cutting through anything, it's not active.

- 3. Right-click the selected section plane and choose Align View.**

This aligns your view so that it's straight on (perpendicular) to your section plane.

- 4. If you can't see your model properly, choose Camera⇒Zoom Extents.**

This zooms your view so that you can see your whole model in the modeling window.

### [Generating an orthographic section](#)

Ever seen a technical drawing that included top, front, rear, and side views of the same object? Chances are that was an *orthographic projection*, which is a common way for 3D objects to be drawn so that they can be built.

Producing an orthographic section of your model is pretty easy; it's only one extra step beyond making a section perspective. Here's how to do it:

- 1. Follow Steps 1 through 3 in the preceding section, as if you're making a section perspective.**
- 2. Choose Camera⇒Parallel Projection.**

This switches off Perspective, turning your view into a true orthographic representation of your model. If you printed it at a specific scale, you could take measurements from the printout.



To print a plan or section view of your model at a particular scale, have a look at Chapter [12](#), where I explain the whole process. If you have SketchUp Pro, see Chapter [14](#); printing to scale is what LayOut was created to do.

## *Creating section animations with scenes*

Combining section views with scenes to create an animation is both a useful and impressive way to show off your model. The basic idea is that you can use scenes to create animations where your section planes move inside your model. Here are a few reasons you may want to use this technique:

- ✓ If you have a building with several levels, you can create an animated presentation that shows a cutaway plan view of each level.
- ✓ Using an animated section plane to “get inside” your model is a much classier transition than simply hiding certain parts of it.
- ✓ When you need to show the relationship between the plan and section views for a project, using an animated section plane helps to explain the concept of different architectural views to 3D beginners.

Follow these steps to create a basic section animation; a simple example is illustrated in Figure [11-15](#):

### **1. Add a section plane to your model.**

I explain how to create section planes in the section “[Cutting plans and sections](#),” earlier in this chapter.

### **2. Add a scene to your model.**

Check out the section “[Creating scenes](#),” earlier in this chapter, for a complete rundown on adding scenes.

### **3. Add another section plane to your model.**

You can add another section plane in one of two ways:

- *Use the Section Plane tool to create a brand-new one.* This is probably the easiest option, and it’s the one I recommend if you’re just starting.
- *Use the Move tool to copy an existing section plane.* I talk about copying section planes in the section “[Cutting plans and sections](#),” earlier in this chapter.

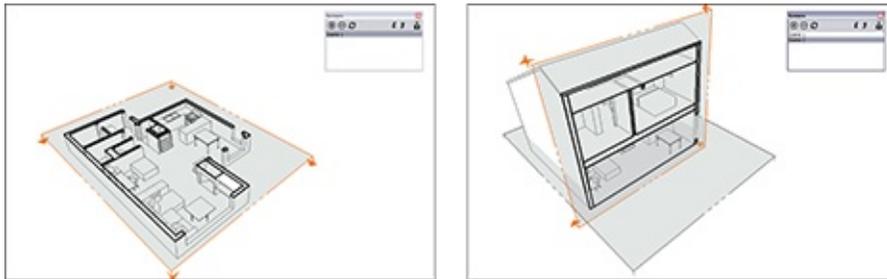
Make sure that your new section plane is active; if it is, it cuts through your model. If it's not active, right-click the section plane and choose Active Cut from the context menu.

#### 4. Add another scene to your model.

This new scene remembers which is the active section plane.

#### 5. Click through the scenes you added to view your animation.

You see an animated section cut as SketchUp transitions from one scene to the next. If you don't, make sure that you have scene transitions enabled: Choose Window⇒Model Info and then choose the Animation panel in the Model Info dialog box. Make sure the Scene Transitions check box is selected.



**Figure 11-15:** Making a section animation is a fairly straightforward process.



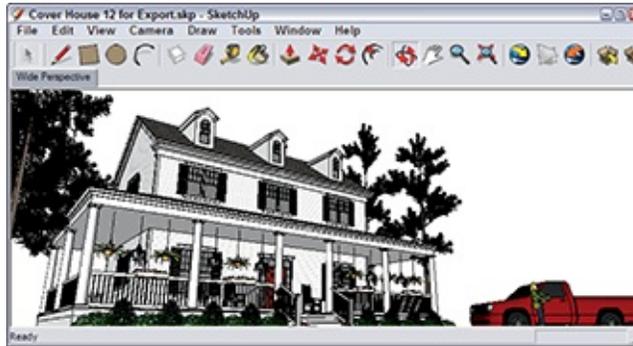
If you don't like seeing the section-plane objects (the boxy things with arrows on their corners) in your animation, switch them off by deselecting Section Planes on the View menu. Then you see the section cuts without any ugly gray rectangles flying around.



The hardest thing to remember about using scenes and section planes to make section animations is this: *You need a separate section plane for each scene that you create.* That is to say, SketchUp animates the transition from one active section plane to another active section plane. If all you do is move the same section plane to another spot and add a scene, this animation technique won't work. Believe it or not, it took me two years to figure this out, so don't feel dense if you need to come back and read this section a couple times.

## Part IV

# Sharing What You've Made



SketchUp modeling window



Exported image



Discover handy links and video demonstrations of the steps in this part. Just point your browser to [www.dummies.com/extras/sketchup2014](http://www.dummies.com/extras/sketchup2014).

## *In this part ...*

- ✓ Explore the all-new 3D Warehouse, an online repository of 3D models. Here, you can share your models, or browse models that other SketchUp users have shared.
- ✓ Print and export images and movies from your model files.
- ✓ If you're a SketchUp Pro user, find out how to use LayOut to create 2D presentation documents that automatically link to your 3D models.

## Chapter 12

# Paper or Cloud? Printing and Uploading Your Work

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### *In This Chapter*

- ▶ Printing views of your model
  - ▶ Figuring out the printing dialog boxes
  - ▶ Printing to scale
- 

You live at a time in history when it is often necessary to inscribe an image of your design onto dried and bleached wood pulp, and then, in a few seconds, send that same design, in the form of ones and zeros, thousands of miles to a series of data centers, where it's available in its entirety to anyone with an Internet connection.

Printing on paper and uploading to the cloud may seem like diametric opposites, but they're really just points on the same continuum of sharing.

In the first part of this chapter, I talk about how to print views of your SketchUp model. Because the Windows and Mac versions of this procedure are so different, I dedicate a whole section to each platform.

The second part of this chapter is dedicated to the SketchUp 3D Warehouse. It's a giant online repository of models made (mostly) by everyday SketchUp modelers like you and me. Uploading your own creations to the 3D Warehouse is useful for sharing and archiving your work.

## *Printing Your Work*

As much as everyone likes to pretend that we all live in an all-digital world, the ugly truth is that we don't. People use more paper now than they ever have; I have a stack of junk prints on the coffee table in front of me as I write this. It's not that I have anything against trees — it's just that printing is so *satisfying*. I love having something I can fold up and put in my pocket, or stick to the fridge, or mail to my Luddite relatives. Computer screens are nice, but in most people's minds, paper is *real*.



If you're using the Pro version of SketchUp, you can always use LayOut to print views of your models. Making both scaled and nonscaled prints is easier in LayOut than in SketchUp; take a look at Chapter [14](#) for all the juicy details.

### *Printing from a Windows Computer*

Printing from SketchUp is easy, as long as you're not trying to do anything too complicated. By

complicated, I mean printing to a particular scale, which can be a harrowing experience the first couple times you attempt it. Fortunately, printing to scale is something most people almost never have to do, so I've included instructions for how to do it at the end of this chapter.

### ***Making a basic print (Windows)***

Most of the time, all you need to do is print exactly what you see on your screen. Follow these steps to do that:

**1. Make sure that the view you want to print appears in your modeling window.**

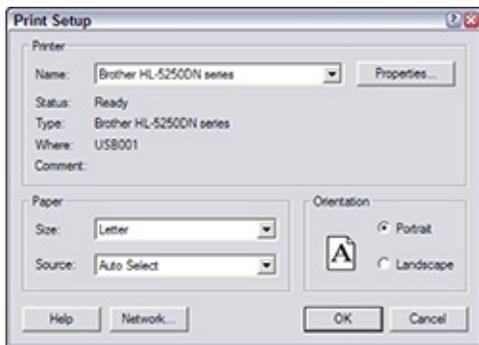
Unless you're printing to scale (which I cover in the last part of this chapter), SketchUp prints exactly what you see in your modeling window.

**2. Choose File⇒Print Setup.**

The Print Setup dialog box opens, which is where you choose what printer and paper you want to use.

**3. In the Print Setup dialog box shown in Figure 12-1, do the following:**

- a. *Choose the printer you want to use.*
- b. *Choose a paper size for your print.*
- c. *Choose an orientation for your print; most of the time, you want to use Landscape because your screen is usually wider than it is tall.*



**Figure 12-1:** The Print Setup dialog box in Windows.

**4. Click OK to close the Print Setup dialog box.**

**5. Choose File⇒Print Preview.**



The Print Preview dialog box opens. As an exact copy of the Print dialog box, Print Preview lets you see an image of what your print will look like before you send it to a printer. Lots of trees thank you for saving paper by using Print Preview every time you print.

**6. In the Print Preview dialog box, do the following:**

- a. *In the Tabbed Scene Print Range area, choose which scenes you want to print, if you have more than one.*

If you need to, you can read all about scenes in Chapter [11](#).

- b. *Tell SketchUp how many copies of each scene you need.*
- c. *Make sure that the Fit to Page check box is selected.*
- d. *Make sure that the Use Model Extents check box isn't selected.*
- e. *Choose a print quality for your printout.*

I recommend High Definition for most jobs.



For a complete description of all the knobs and doohickeys in the Print Preview and Print dialog boxes, have a look at the next section in this chapter.

## 7. **Click OK.**

The Print Preview dialog box closes, and you get an onscreen preview of what your print will look like.

## 8. **If you like what you see, click the Print button in the upper-left corner of the Print Preview window to open the Print dialog box.**

If you *don't* like what you're about to print, click the Close button (at the top of the screen) and go back to Step 1.

## 9. **In the Print dialog box (which should look exactly like the Print Preview dialog box), click OK.**

Your print job goes to the printer.

### ***Decoding the Print Preview and Windows Print dialog box***

Three cheers for simplicity! The Print Preview and Print dialog boxes in SketchUp are exactly the same. Figure [12-2](#) shows the former because that's the one I advocate using first every time, but the descriptions in this section apply to both.



**Figure 12-2:** The Print Preview dialog box in Windows. The Print dialog box looks exactly the same.

**Printer**

If you used the Print Setup dialog box first, you shouldn't need to change the settings in this section. If you want, from the drop-down list, you can choose which printer to use. If you know something about printers, you can even click the Properties button to make adjustments to your printer settings. (Because settings are different for every printer on Earth, that's between you and your printer's user manual — I'm afraid I can't be of much help.)

**Tabbed Scene Print Range**

Use this area to tell SketchUp which of your scenes you want to print, if you have more than one. This option is really handy for quickly printing all your scenes. Select the Current View option to print only whatever's currently in your modeling window.

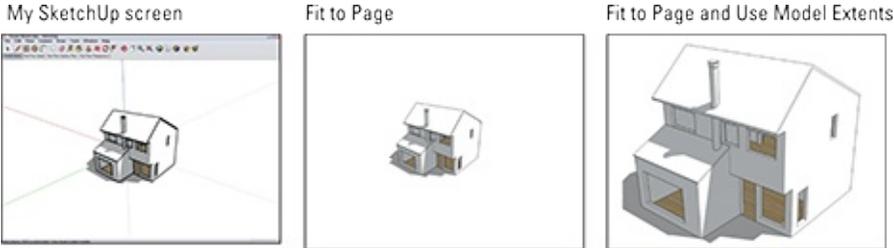
**Copies**

This one's pretty basic: Choose how many copies of each view you want to print. If you're printing multiple copies of multiple scenes, select the Collate check box to print *packets*, which can save you from assembling them yourself. Here's what happens when you print three copies of four scenes:

- ✓ Selecting the Collate check box prints the pages in the following order: 123412341234.
- ✓ Deselecting the Collate check box prints the pages like this: 111222333444.

**Print Size**

This is, by far, the most complicated part of this dialog box; Print Size controls how your model will look on the printed page. Figure 12-3 shows the effect of some of these settings on a final print.



**Figure 12-3:** Different Print Size settings applied to the same view in SketchUp.

The Print Size controls are as follows:

- ✓ **Fit to Page:** Selecting this check box tells SketchUp to make your printed page look like your modeling window. As long as the Use Model Extents check box isn't selected, you can see exactly what you see on your screen — no more, no less.
- ✓ **Use Model Extents:** I have to admit that I don't like this option; I almost never select it. All it does is tell SketchUp to zoom in to make your model (excluding your sky, ground, watermark, and whatever else may be visible on your screen) fit the printed page. If I want this effect, I just use choose Camera⇒Zoom Extents from the menu bar before I print my model; it's easier, and I know exactly what I'm getting.
- ✓ **Page Size:** As long as you don't have the Fit to Page check box selected, you can manually enter a page size using these controls. If you type a width or height, SketchUp figures out the other dimension and pretends it's printing on a different-sized piece of paper.



The Page Size option is especially useful if you want to make a big print by tiling together lots of smaller pages. See the next section in this chapter, “[Tiled Sheet Print Range](#),” for more details.



- ✓ **Scale:** Here's where printing gets a little complicated. To print to scale, you must do two things before you go anywhere near the Print or Print Preview dialog boxes:
  - Switch to Parallel Projection mode.
  - Make sure that you're using one of the Standard views.

Take a look at the section “[Printing to scale \(Windows and Mac\)](#),” later in this chapter, for a complete rundown on printing to scale in SketchUp.

## **Tiled Sheet Print Range**

Perhaps you're printing at a scale that won't fit on a single page, or you've entered a print size that's bigger than the paper size you chose in the Print Setup dialog box. The Tiled Sheet Print Range area lets you print your image on multiple sheets and then attach them together later. You can get posters from your small-format printer!

## **Print Quality**

To be honest, I think a little bit of voodoo is involved in selecting a print quality for your image. What you get with each setting depends a lot on your model, so try a couple different settings if you have time.

- ✓ Draft and Standard are really only useful for checking how your model appears on the printed page.
- ✓ I recommend using High Definition first and then bumping up to Ultra High Definition if your

computer/printer setup can handle it.

## Other settings

You can control the following odds-and-ends settings in the Print Preview dialog box, too:

- ✓ **2-D Section Slice Only:** If you have a visible section cut in your model view, selecting this check box tells SketchUp to print only the section cut edges. Figure 12-4 shows what the same model view would look like without (on the left) and with (right) this option selected. I use this to produce simple plan and section views that I can sketch on by hand.

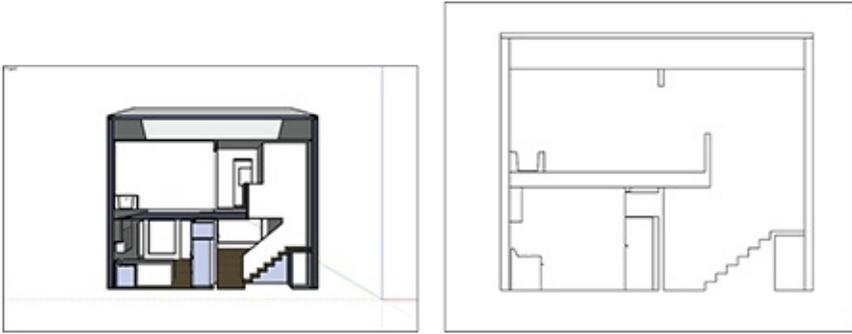


Figure 12-4: Printing only the 2D section slice yields a simple drawing that's easy to sketch over.

- ✓ **Use High Accuracy HLR:** The bad news is that I have no idea what HLR stands for. The good news is that it doesn't really matter. Selecting this check box tells SketchUp to send *vector* information to the printer instead of the usual *raster* data. (Check out Chapter 14 for a description of what these terms mean.) Why should you care? Vector lines look much smoother and cleaner when printed, so your whole model will look better — with one condition: *Gradients* (those nice, smooth shadows on rounded surfaces) don't print well as vectors. If you have a lot of rounded or curvy surfaces in your model view, you probably don't want to choose this option. Try to print both ways and choose the one that looks better. Thank goodness for Print Preview, huh?



If your model view includes a Sketchy Edges style, don't use high accuracy HLR; you won't see any of the nice, sketchy effects in your final print.

## Printing from a Mac

If you're using a Mac, the printing story is a little simpler than it is for folks who use Windows computers — but only by a little. The first part of the following sections lays out a procedure for generating a simple, straightforward print of what you see in your modeling window. The second part can be called “Gross anatomy of the Mac Document Setup dialog box”; this is where I go into some detail about what each and every setting does.

### Making a basic print (Mac)

Follow these steps to print exactly what you see in your modeling window on a Mac:

1. **Make sure that your modeling window contains whatever you want to print.**

SketchUp prints exactly what you see in your modeling window, unless of course you're printing to scale. This is considerably more complicated, so I gave it a whole section at the end of this chapter.

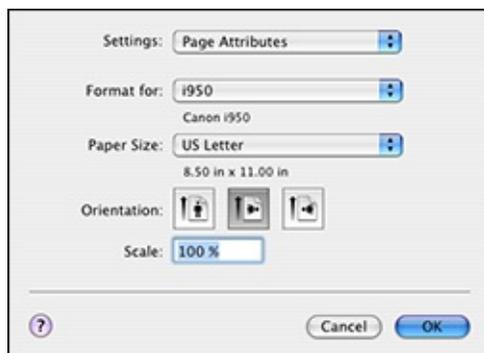
## 2. Choose File⇒Page Setup.

The Page Setup dialog box opens, where you decide what printer and paper size to use.

### 3. In the Page Setup dialog box shown in Figure 12-5, do the following:

- Choose the printer you want to use from the Format For drop-down list.
- Choose a paper size for your print.
- Choose an orientation for your print.

I usually end up using the second or third one (Landscape), because my modeling window is usually wider than it is tall.



**Figure 12-5:** The Page Setup dialog box on a Mac lets you select a printer, a paper size, and a page orientation.

### 4. Click OK to close the Page Setup dialog box.

## 5. Choose File⇒Document Setup.

The Document Setup dialog box opens.

### 6. In the Document Setup dialog box, make sure that the Fit View to Page check box is selected.

Check out the next section in this chapter for a full description of what everything does.

### 7. Click OK to close the Document Setup dialog box.

### 8. Choose File⇒Print to open the Print dialog box.

### 9. In the Print dialog box, click the Preview button.

This generates an onscreen preview of what your print will look like on paper.

### 10. If the preview suits you, click the Print button to send your print job to the printer.

If you're not happy with the preview, click the Cancel button and start again at Step 1. Isn't printing fun?

## Deciphering the Mac printing dialog boxes

Because printing from SketchUp on a Mac involves two separate dialog boxes, I describe both in the following sections.

### The Document Setup dialog box

You use the settings in the Document Setup dialog box shown in Figure 12-6 to control how big your model prints. Here's what everything does:

✓ **Print Size:** This one's pretty self-explanatory, but here are some details just in case:

- *Fit View to Page:* Select this check box to tell SketchUp to make your printed page look just like your modeling window onscreen. It's really that simple.



- *Width and Height:* If the Fit View to Page check box is deselected, you can type either a width or a height for your final print. This is the way to go if you want to print a tiled poster out of several sheets of paper; just enter a final size, and you'll have a poster in no time flat.

✓ **Print Scale:** Use these settings to control the scale of your printed drawing, if that's the kind of print you're trying to make. Because printing to scale is a bit of an ordeal, I devote the last section of this chapter to the topic. See that section for a description of what these settings do.

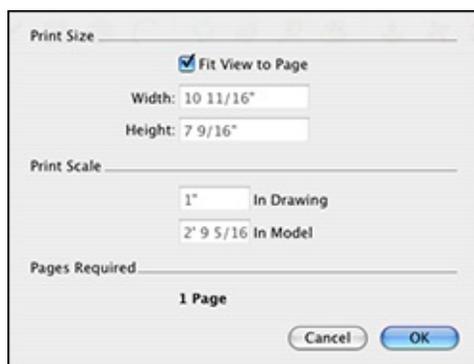


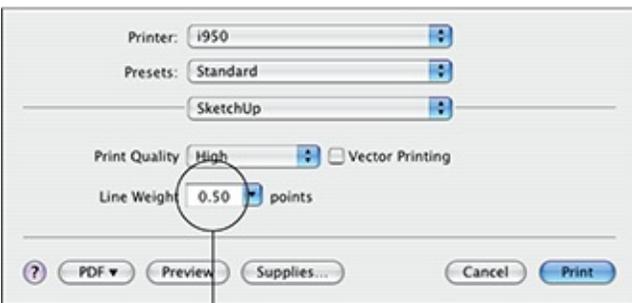
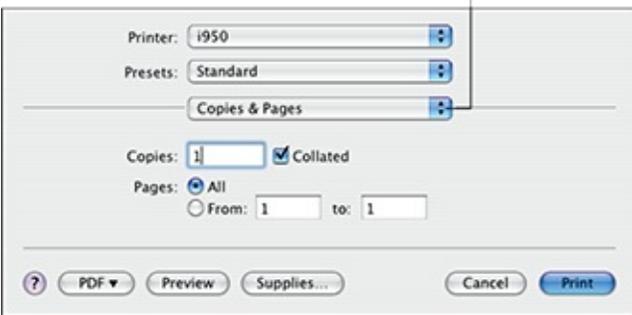
Figure 12-6: The Mac Document Setup dialog box.

✓ **Pages Required:** This is really just a readout of how many pages you need to print. If you have selected the Fit View to Page check box, this is 1. If your print doesn't fit on one sheet, it's tiled onto the number of sheets displayed in this section of the dialog box.

### The Print dialog box

The Print dialog box on the Mac is something of a many-headed beast; several more panels are hidden underneath the Copies & Pages drop-down list. Luckily, you only need to use two. Both are pictured in Figure 12-7 and described in the following list:

Choose another panel here



This doesn't matter unless you're using Vector Printing

**Figure 12-7:** The Copies & Pages and SketchUp panels of the Print dialog box.

- ✓ **Copies & Pages panel:** The controls in this part of the Print dialog box are pretty straightforward; use them to tell SketchUp how many copies and pages you want to print:
  - *Copies:* If you're printing more than one copy of a print that includes multiple pages, select the Collated check box to tell SketchUp to print *packets*, which can save you from having to collate them yourself.
  - *Pages:* If the Pages Required readout at the bottom of the Document Setup dialog box (refer to Figure 12-6) said that you need more than one sheet to print your image, you can choose to print all or some of those pages right here.
- ✓ **SketchUp panel:** You use the settings in this panel to control the final appearance of your print:
  - *Print Quality:* I usually set this to High, but the results you get depend a lot on your printer model. In general, I avoid Draft or Standard unless I'm just making sure my page will look the way I want it to. If you have time, try both High and Extra High and see which one looks the best.
  - *Vector Printing:* When you select this check box, SketchUp sends *vector* (instead of *raster*) information to the printer. Have a look at Chapter 13 for a description of these terms.



The upshot here is that vector printing makes edges look much smoother and cleaner but does a lousy job on *gradients* (the shadows on your curved surfaces). Use vector printing if your model view is made up of mostly flat faces, but try printing both ways (with vector printing on and off) to see which looks better.



If your model view includes a Sketchy Edges style, don't select Vector Printing; you won't see any of the nice, sketchy effects in your final print.

- **Line Weight:** This option works only if you've selected the Vector Printing check box. The number in this box represents the thickness of edges in your print; any edges that are 1-pixel thick in your model view will be drawn with a line as thick as what you choose for this option. The default is 0.50 points, but feel free to experiment to see what looks best for your model.

## Printing to a Particular Scale

Here's where printing gets interesting. Sometimes, instead of printing exactly what you see on your screen so that it fits on a sheet of paper, you may need to print a drawing *to scale*. See the nearby sidebar "[Wrapping your head around scale](#)" for more information about drawing to scale.



Keep in mind that if you have SketchUp Pro, you can use LayOut to generate scaled views of your model very easily. Take a look at Chapter [14](#) for more information.



## Wrapping your head around scale

When you print to scale, anyone with a special ruler (called a *scale*, confusingly enough) can take measurements from your drawing, as long as he knows the scale at which it was printed. You can use three kinds of drawing scales:

**Architectural:** In the United States, most people use feet and inches to measure objects. Most architectural scales substitute fractions of an inch for a foot. Three common examples of architectural scales follow:

- ✓ ½ inch = 1 foot (1 inch = 2 feet)
- ✓ ¼ inch = 1 foot (1 inch = 4 feet)
- ✓ 1/8 inch = 1 foot (1 inch = 8 feet)

**Engineering:** When measuring big things like parcels of land and college campuses, U.S. architects, engineers, and surveyors still use feet, but they use engineering scales instead of architectural ones. Three common engineering scales follow:

- ✓ 1 inch = 20 feet
- ✓ 1 inch = 50 feet
- ✓ 1 inch = 100 feet

**Metric:** Outside the U.S., virtually everyone uses the metric system. Because all measurement is based on the number 10, metric scales can be applied to everything from very small things (blood cells) to very big things (countries). Metric scales use ratios instead of units of measure. Here are three examples:

- ✓ 1:10 (The objects in the drawing are 10 times bigger in real life.)
- ✓ 1:100 (The objects in the drawing are 100 times bigger in real life.)
- ✓ 10:1 (The objects in the drawing are 10 times smaller in real life.)

## Preparing to print to scale

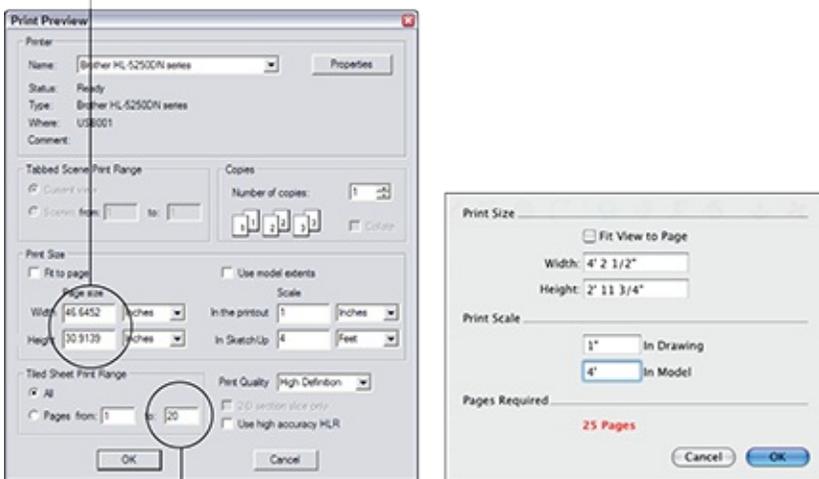
Before you can print a view of your model to a particular scale, you have to set up things properly. Keep the following points in mind:

- ✔ **Perspective views can't be printed to scale.** If you think about it, this makes sense. In perspectival views, all lines appear to “go back” into the distance, which means that they look shorter than they really are. Because the whole point of a scaled drawing is to be able to take accurate measurements directly off your printout, views with perspective don't work.
- ✔ **Switch to Parallel Projection if you want to print to scale.** I know, I know — this is the same as the last point. But it's important enough that I figure it's worth mentioning twice. To change your viewing mode from Perspective to Parallel Projection, choose Camera⇒Parallel Projection. That's all there is to it.
- ✔ **You have to use the Standard views.** SketchUp lets you quickly look at your model from the top, bottom, and sides by switching to one of the Standard views. Choose Camera⇒Standard and pick any of the views except Iso.

## Printing to scale (Windows and Mac)

The steps in this section allow you to produce a scaled print from SketchUp; I give Windows instructions first and then Mac. When the user-interface elements are different for the two platforms, the ones for Mac are shown in parentheses). Figure 12-8 shows the relevant dialog boxes for printing to scale in Windows and on a Mac.

When printing to scale, don't worry about these numbers



To print at 1 inch = 4 feet, you'll need 20 pages

**Figure 12-8:** Setting up to print at 1 inch = 4 foot (¼ inch = 1 foot) scale.



Before you begin, make sure that you've switched to Parallel Projection and that your view is lined up the right way. See the preceding section of this chapter for the lowdown on what you need to do to prepare your model view for scaled printing. Follow these steps to produce a scaled print:

1. **Choose File⇒Print Setup (Page Setup).**
2. **Select a printer, paper size, and paper orientation, and then click OK.**
3. **Choose File⇒Print Preview (Document Setup).**
4. **Deselect the Fit to Page (Fit View to Page) check box.**
5. **Windows: Make sure that the Use Model Extents check box is deselected.**

Mac users don't have this option.

6. **Enter the scale at which you want to print your model view.**

If you want to print a drawing at ¼-inch scale, enter the following:

- **1 Inches** into the In the Printout (In Drawing) box
- **4 Feet** into the In SketchUp (In Model) box

If you want to produce a print at 1:100 scale, enter the following:

- **1 m** into the In the Printout (In Drawing) box
- **100 m** into the In SketchUp (In Model) box

7. **Take note of how many pages you'll need to print your drawing.**

If you're using Windows, you can check this in the Tiled Sheet Print Range area of the dialog box. On a Mac, the number of pages you'll need appears in the Pages Required section of the Document Setup dialog box. If you want to print on a different-sized piece of paper, change the setting in the Print Setup (Page Setup) dialog box.

8. **If you want to print your drawing on a single sheet and it won't fit, use a smaller scale.**

Using the ¼ inch = 1 foot example, try shrinking the drawing to ⅜ inch = 1 foot scale. To do this, enter the following:

- **3 Inches** into the In the Printout (In Drawing) box
- **16 Feet** into the In SketchUp (In Model) box

9. **When you're happy with how your drawing will print, click OK.**

10. **Perform the step based on your computer:**

- *Windows:* If you like what you see in the Print Preview dialog box, click the Print button (in the upper-left corner) to open the Print dialog box.
- *Mac:* Choose File⇒Print.

11. **In the Print dialog box, click OK to send your print job to the printer.**

See this chapter's earlier "Making a basic print" section (for your operating system) for the whole story on basic printing from SketchUp.

# Working with the 3D Warehouse

The *3D Warehouse* is a huge online collection of 3D models that is searchable and, most importantly, free for everyone to use. To access the 3D Warehouse, all you need is an Internet connection. If you have a SketchUp model that you want to share with the world, share with just a few people, or store on SketchUp's servers for safekeeping, the 3D Warehouse is where you put it.

## Why Warehouse?



Before I go on, let me dispel a popular misconception right away: When you upload a model to SketchUp's 3D Warehouse, you aren't automatically donating your hard work to the world — you can make uploaded models and collections private.

With that understanding, here are my favorite reasons to use the 3D Warehouse:

- ✓ **Sharing is good for your self-esteem.** Don't get me wrong — I don't subscribe to the *nouveau tech* mind-set that all information wants to be free of charge. If you spent a lot of time on something and you don't want to give it away, you shouldn't have to. But if you're proud of what you made, and sharing it with others would make you feel good, the 3D Warehouse offers a great way to contribute to the 3D modeling community.
- ✓ **Create your own personal component library.** Because SketchUp can download models directly from the 3D Warehouse into the model you're working on, making your own online collections is incredibly handy. Everything you upload is accessible anywhere you happen to be working.

I maintain a collection of the furniture in my house; whenever I need a model of my sofa, I just download it — no matter what computer I'm using.



- ✓ **Explore uploaded models in 3D without having to download them.** Completely new for 2014, you can now orbit, pan, and zoom around any model you can see on the 3D Warehouse — *without* having to download it into SketchUp first. If you want to show someone your model in 3D, you can just send her its 3D Warehouse link. Better yet, you can embed a 3D viewer window on your web page; anyone who visits your page can poke around.
- ✓ **It's never a bad idea to have a backup.** If all you're looking to do is save a copy of your work in the cloud (where you can't spill your coffee all over it), services like Dropbox, Google Drive, and Microsoft OneDrive are great choices. None of these, however, give you direct access to your models inside of SketchUp. When you upload something to the 3D Warehouse, it's both safe *and* readily available.

## Getting to the 3D Warehouse

You can get to the 3D Warehouse in two ways:

- ✓ **From SketchUp:** Choose File⇒3D Warehouse⇒Get Models; when you do, a mini web

browser opens right in front of your modeling window.

✓ **From the Web:** Browse to <http://3dwarehouse.sketchup.com>.



This is a great way to hunt for 3D models without opening SketchUp first.

Go ahead and poke around the 3D Warehouse. It's amazing what you find; thousands of people add new content every day. Much of it isn't very useful, but you still find plenty of interesting things to download and look at.



Taking apart strangers' models is a great way to figure out how they're built.

Refer to Chapter 5 for plenty of information about grabbing what you need from the 3D Warehouse.

## ***Uploading a model***

Follow these steps to upload your model to the 3D Warehouse:

- 1. Open the model you want to upload in SketchUp and fiddle around with your view until you like what you see.**

When you upload a model to the 3D Warehouse, SketchUp automatically creates a preview image that's a snapshot of your modeling window.

Unfortunately, you can't upload just any old model to the 3D Warehouse. At the time I was working on this book, the maximum file size you could upload was 50MB, which is actually pretty big. You can check your model's file size in Windows Explorer (on a Windows machine) or in Finder (on a Mac).

- 2. Choose File⇒3D Warehouse⇒Share Model.**

A mini-browser window opens, and it shows the logon screen for the 3D Warehouse. If you want to upload models, you need a Google account. A Google account is free; you just need a valid e-mail address to get one. If you don't already have one, follow the onscreen instructions to sign up.

- 3. Enter your Google account information, click the Sign In button, and fill out the Upload to 3D Warehouse form as completely as you can:**

- *Privacy:* You can choose to make your model Public or Private. Checking the Public option gives anyone the right to find, download, and use your model however he likes. If you select Private, your model stays hidden (from everyone but you). Flip ahead to "Managing models online," in this chapter, for more about this topic.
- *Title:* Enter a title for your model. If it's a public building, you may enter its name. Something like Royal West Academy would do nicely.

- *Description*: Models with complete descriptions are very popular with people who hunt around the Warehouse. Try to use complete sentences here; the more you write, the better.
- *URL*: If you have a website address that you want people who view your model to visit, enter it here. For example, if your model is a historic building, you may include the website that provides more information about that building.
- *Tags*: Type a string of words that describe the thing you modeled. The 3D Warehouse search engine uses whatever you enter here to help people find your model. To increase the number of people who see what you made, add lots of tags. If I were uploading a modern coffee table, I'd enter the following tags: coffee table, table, coffee, modern, living room, furniture, glass, chrome, metal, and steel. You get the idea — be exhaustive.

#### 4. Click the Upload button to add your model to the 3D Warehouse.

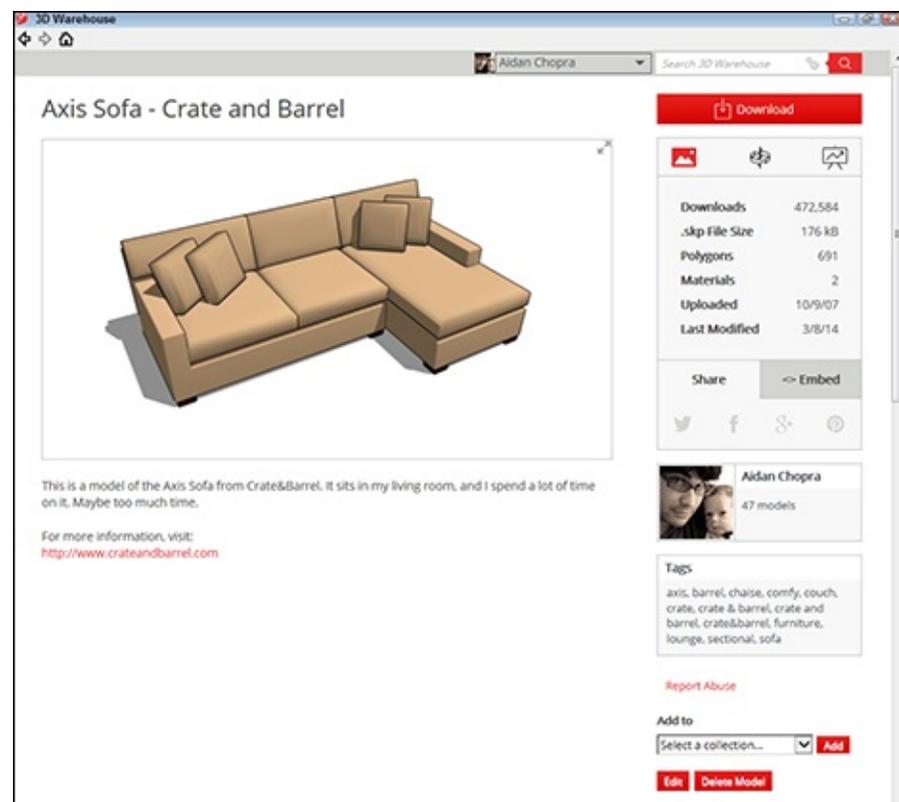
If everything works properly, you see a page with your model on it, along with all the information you just entered. Congratulations — you're now a full-fledged member of the SketchUp universe.



It takes awhile for the 3D Warehouse's robots (its *backend*, in geek parlance) to process your model after you upload it. You won't be able to search for it, see it in your collections, or even preview it in 3D for a few minutes. But that's okay — just sit back and reflect on what your great-grandfather would say if he heard you complaining. He *did* have to walk 50 miles to school, after all.

### *Managing models online*

The 3D Warehouse isn't a free-for-all of individual models floating around in cyberspace. It's actually a pretty organized place. Take a look at any model's individual details page to see what's possible. Figure [12-9](#) is a screenshot of my couch in the 3D Warehouse, taken in March 2014 (it may look slightly different by the time you read this).



**Figure 12-9:** My couch's details page on the 3D Warehouse, circa March 2014.

Here's a list of the less-obvious doodads and gadgets on the 3D Warehouse that I want you to know about:

- ✔ **Account drop-down menu:** With options for going to a page full of your own models, creating a new collection (more on that later), and signing out of your Google account, this is a critical part of the Warehouse interface.
- ✔ **Search bar:** Type in keywords to find models; there's nothing magical here — *except* if you click the little icon in the bar that looks like a couple of machine gears. This icon reveals options for searching for collections (instead of models), and a link to an advanced search page. This is your ticket to precision searching nirvana.
- ✔ **Viewer settings:** These three icons let you choose between static images, a 3D view, and a chart that shows the model's popularity (views and downloads) over time.



Of the three views, 3D view (the middle icon) is the most revolutionary. Being able to orbit around a model without having to download it first will save you tons of time and energy.

- ✔ **Statistics panel:** The numbers that appear on this section of the page are all interesting and useful, but the ones you should pay closest attention to are Polygons and Materials. These tell you the model's size in the two metrics that count most:
  - *Polygons* is 3D modeling shorthand for faces; the more you have, the harder SketchUp has to work to display your model. If you're thinking about downloading a tree with 350,000 polygons, consider taking a vacation to Tahiti while SketchUp opens it.
  - *Materials* are similarly taxing on your computer's performance, but they only come

into play for models that have been heavily photo-textured.

- ✔ **Share:** Shout out to Twitter, Facebook, Google Plus, and Pinterest here. Upload your model, and then tell your social networks about it.
- ✔ **Embed:** Click here and the 3D Warehouse serves up some HTML code that you can use to embed the model on a web page.

This feature is especially important for product manufacturers, designers, and anyone else who wants to let the public explore a model in 3D without leaving his or her website.

- ✔ **Add to Collection:** One of the most productive things you can do on the 3D Warehouse is collect models — your own *and* other people's. Make yourself empty collections for things like chairs, scale figures, trees, and star destroyers. Then fill them with the amazing models you find as you're exploring. Back in SketchUp, in the Components dialog box, choose My Collections from the Collections drop-down menu, and there they are, ready to use in your own work.
- ✔ **Edit:** Clicking the Edit button turns most of the text areas on the page into editable text fields; to change your model's title, just type a new one right where the old one was. Simple.

While I'm on the subject of collections, here's how to create your own:

- 1. Make sure you're logged in to the 3D Warehouse.**

If you're logged in, you'll see your username on the account drop-down menu at the top of every page in the Warehouse. If you're not logged in, click Sign In (also at the top of every page) and put in your Google Account credentials. To get a new Google Account, just follow the onscreen instructions.

- 2. Choose Create Collection from the Account drop-down menu at the top of any page.**

There are a couple of other ways to make a new collection, but this is the most universal one; it works no matter where you are in the Warehouse.

- 3. Choose a Privacy setting for your new collection.**

Public means everyone on the Warehouse can see it. Private means only you can see it, and only when you're logged in.

- 4. Give your new collection a title.**

- 5. Write a brief but meaningful description of what your collection will contain.**



Keep in mind that collections can contain both models and other collections; this is a new feature in 2014. Previously, individual collections could only contain one or the other.

- 6. Add a URL (web address), if it's relevant.**

7. **Type in tags that might help others find your collection.**



This is especially relevant for collections marked Public.

8. **Click Create Collection at the bottom of the page.**

## Chapter 13

# Exporting Images and Animations

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### *In This Chapter*

- ▶ Creating 2D views of your model as TIFFs, JPEGs, and PNGs
  - ▶ Reading about pixels and resolution
  - ▶ Making sure that you export the right kind of image
  - ▶ Exporting the kind of movie file you need
- 

Want to e-mail a JPEG of your newly modeled patio to your parents? How about a movie that shows what it's like to walk out onto that patio? If you need an image or a movie of your model, forget about viewing or printing within SketchUp. Exporting is the way to go.

SketchUp can export both still images and animations in most of the major graphics and movie formats. Here's the part that's a little bit confusing: Which file formats you can export depend on the version of SketchUp you have. If you have SketchUp Make (the free one), you can create *raster* image files and movies. If you've sprung for SketchUp Pro, you can also export *vector* files and a whole bunch of 3D formats; I talk about them all in online Bonus Chapter [1](#) for this book. (See the Introduction for details about what's online and where to find it.)

In this chapter, I talk about the export file formats that are common to both versions of SketchUp. Just in case you're not familiar with the terms *raster* and *vector*, I give brief definitions of each. Then I go into some detail about the 2D, raster image formats that you can create with SketchUp. I spend the last part of this chapter talking about exporting animations as movie files that anyone can open and view.

## *Exporting 2D Images of Your Model*

Even though the free version of SketchUp can export only 2D views of your model as *raster* images, it's helpful to know a little bit about graphics file formats in general. If you're already an aficionado about these sorts of things, or if you're in a big hurry, you can skip ahead to the section "[Exporting a raster image from SketchUp.](#)"



If you have SketchUp Pro, you have a much better way to get images out of SketchUp: LayOut. In fact, LayOut may even be able to replace whatever application is the reason you're trying to export an image in the first place. Take a look at Chapters [15](#) and [16](#) for the whole story.

Pictures on your computer are divided into two basic flavors: *raster* and *vector*. The difference between these two categories of file types has to do with how they store image information. Here's the one-minute version:

- ✓ **Raster:** Raster images are made up of dots. (Technically, these dots are *pixels*, just like the pixels that make up images you take with a digital camera.) Raster file formats consist of information about the location and color of each dot. When you export a raster, you decide how many dots (pixels) it should include, which directly affects how big it can be displayed. SketchUp exports TIFF, JPEG, and PNG raster images; the Windows version also exports BMPs, although that's nothing to get excited about. You can read more about raster images in the sidebar “[Understanding rasters: Lots and lots of dots](#),” later in this chapter.
- ✓ **Vector:** Vector images consist of instructions written in computer code. This code describes *how* to draw the image to whatever software tries to open it. The major advantage of using vector imagery (as opposed to raster) lies in its *scalability* — vectors can be resized larger or smaller without affecting their image quality, whereas rasters lose quality if you enlarge them too much. The free version of SketchUp can export only raster images, but SketchUp Pro can export vectors in both PDF and EPS file formats; you can read all about it in the online Bonus Chapter [1](#).

## Exporting a raster image from SketchUp

The process of exporting a view of your SketchUp model is fairly straightforward. Depending on which format you choose, the export options are slightly different, but I address them all in this section.

Follow these steps to export a raster image from SketchUp:

### 1. **Adjust your model view until you see exactly what you want to export as an image file.**

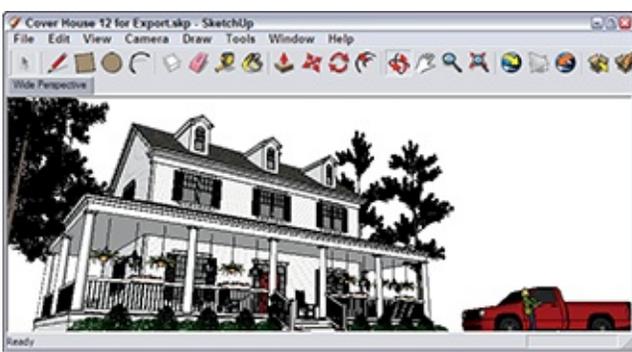
SketchUp's raster image export is *WYSIWYG* — What You See Is What You Get. Basically, your entire modeling window view is exported as an image, so use the navigation tools or click a scene to set up your view. Use styles, shadows, and fog to make your model look exactly the way you want it to. To change the proportions of your image, resize your SketchUp window. Follow these steps to do so:

- Windows only: If your SketchUp window is full screen, click the Minimize button in its upper-right corner.*
- Drag the Resize tab in the lower-right corner of your SketchUp window until the modeling window is the right proportion.*

In Figure [13-1](#), I want to export a wide view of a house I modeled, so I adjust the proportions of my modeling window until things look right.



You may be wondering whether *everything* in your modeling window shows up in an exported raster image. The red, green, and blue axes don't, which is good, but guides do, which is usually bad. If you don't want your guides to be visible in your exported image, deselect Guides on the View menu.



SketchUp modeling window



Exported image

**Figure 13-1:** Adjust your view and your modeling window until things look the way you want them to in your exported image.

**2. Choose File⇒Export⇒2D Graphic.**

The File Export dialog box opens.

**3. Select the file format you want to use from the Format drop-down list.**

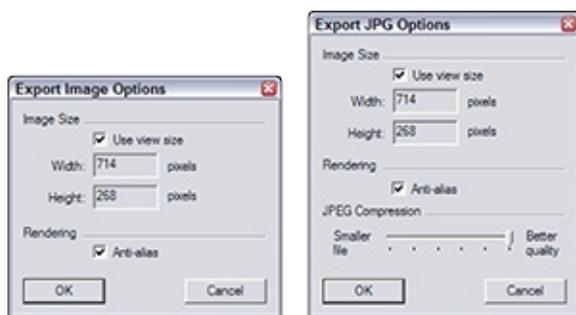


Before you choose JPEG by default, know that this file type isn't always the best choice. For a complete description of each format (as well as recommendations for when to choose each), see the section "[Looking at SketchUp's raster formats](#)," later in this chapter.

**4. Choose a name and a location on your computer for your exported image.**

**5. Click the Options button.**

The Export Options dialog box opens, where you can control how your image is exported. Figure 13-2 shows what this dialog box looks like for each of SketchUp's raster file formats.



Export Options for TIFFs, PNGs, and BMPs

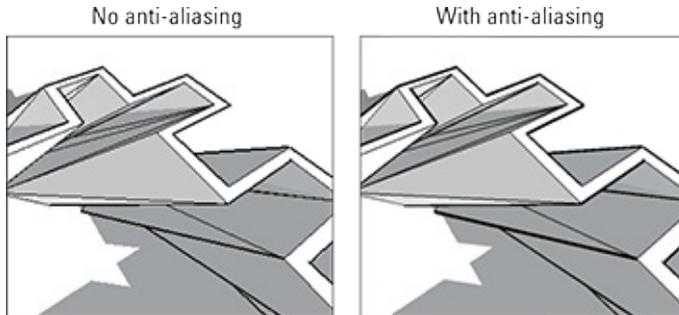
Export Options for JPEGs

**Figure 13-2:** The Export Options dialog boxes for TIFFs, PNGs, and BMPs (left) and JPEGs.

**6. Adjust the settings in the Export Options dialog box.**

Here's a description of what the settings do:

- *Use View Size*: Selecting this check box tells SketchUp to export an image file that contains the same number of pixels as are currently being used to display your model onscreen. If you're just planning to use your exported image in an e-mail or in an onscreen presentation (such as PowerPoint), select Use View Size, but it's still better to manually control the pixel size of your exported image. If you plan to print your exported image, don't select this check box — whatever you do.
- *Width and Height*: When you don't select the Use View Size check box, you can manually enter the size of your exported image. Because this process requires a fair amount of figuring, I've devoted a whole section to it; take a look at "[Making sure you export enough pixels](#)," later in this chapter, to find out what to type into the Width and Height boxes.
- *Anti-Alias*: Because raster images use grids of colored squares to draw pictures, diagonal lines and edges can sometimes look jagged and, well ... lousy. *Anti-aliasing* fills in the gaps around pixels with similar-colored pixels so that things look smooth. Figure 13-3 illustrates the concept. In general, you want to leave anti-aliasing on.
- *Resolution (Mac only)*: This is where you tell SketchUp how big each pixel should be, and therefore how big (in inches or centimeters) your exported image should be. Pixel size is expressed in terms of pixels per inch/centimeter. This option is available only when the Use View Size check box isn't selected. Just as with the Width and Height boxes, I go into a lot of detail about image resolution in "[Making sure you export enough pixels](#)," later in this chapter.



**Figure 13-3:** A view of the same image with anti-aliasing off (left) and on.

- *Transparent Background (Mac only, not for JPEGs)*: Mac users can choose to export TIFFs and PNGs with transparent backgrounds, which can make it easier to “cut out” your model in another piece of software. Exporting your image with a transparent background is also a nice way to use image-editing programs like Photoshop to drop in a sky and ground plane later. If you're a Windows user, the only way to produce images with transparent backgrounds is to use LayOut, which is part of SketchUp Pro. Chapter 14 has all the details.
- *JPEG Compression (JPEG only)*: This slider lets you decide two things at the same time: the file size of your exported image and how good the image will look. The two are, of course, inversely related; the farther to the left you move the slider, the smaller your file will be, but the worse it will look. I never set JPEG compression less than 8 — my models take too long to build for me to make them look terrible on export.

**7. Click OK to close the Export Options dialog box.**

## 8. Back in the File Export dialog box, click the Export button to export your raster image file.

You can find your exported file in whatever location on your computer you specified in Step 4. What you do with it is entirely up to you — you can e-mail it, print it, or use it in another software program to create a presentation.

Don't be alarmed if the export process takes longer than you think it should. If you export a pretty big image (one with lots and lots of pixels), the export takes a while. Take the opportunity to call your mother — she'll appreciate it.

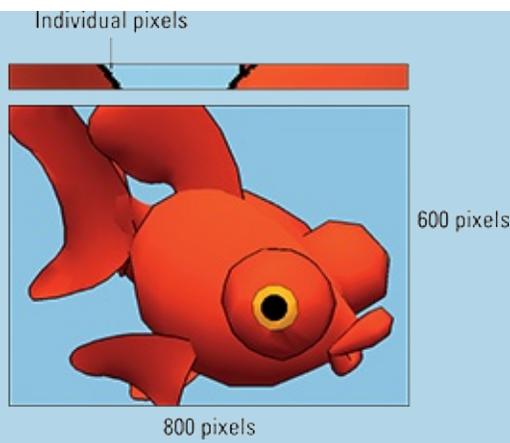
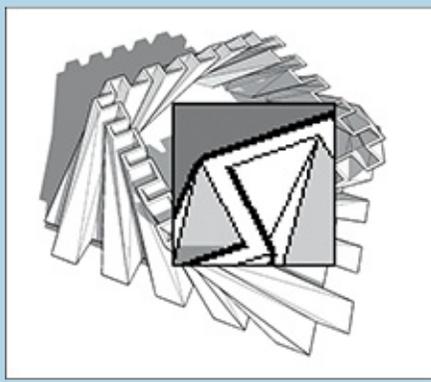


## Understanding rasters: Lots and lots of dots

When you look at a photograph on your computer, you're really looking at a whole bunch of tiny dots of color, or *pixels*. These are arranged in a rectangular grid called a *raster*. Digital images that are composed of pixels arranged in a raster grid are *raster images*, or *rasters* for short. Have a look at the first image in the figure below for a close-up view of a raster image. Here are some things to keep in mind about rasters:

- ✓ **Rasters are everywhere.** Almost every digital image you've ever seen is a raster. TIFF, JPEG, and PNG are three of the most common raster file formats, and SketchUp exports them all.
- ✓ **Rasters are flexible.** Every two-dimensional image can be displayed as a raster; a grid of colored squares is an incredibly effective way of saving and sharing picture information. As long as you have enough pixels, any image can look good as a raster.
- ✓ **Rasters take up a lot of space.** If you think about how raster images work, it takes a lot of information to describe a picture. Digital images are made up of anywhere from thousands to millions of pixels, and each pixel can be any one of millions of colors. To store a whole picture, a raster image file needs to include the location and color of *each* pixel; the bigger the picture is, the more pixels are needed to describe it, and the bigger the file size gets.
- ✓ **Rasters are measured in pixels.** Because every raster image is made up of a specific number of pixels, you use a raster's *pixel dimensions* to describe its size. If I told you that I'd e-mailed you a photograph that was 800 x 600, you could expect to receive a picture that is 800 pixels wide by 600 pixels tall. (See the following figure.) Pixels don't have a physical size on their own — they're just dots of color. You determine a picture's physical size by deciding how big its pixels should be; this is referred to as *resolution* and is generally expressed in terms of *pixels per inch (ppi)*. Check out the section "[Making sure you export enough pixels](#)," later in this chapter, for the whole scoop.

Why use pixels instead of inches or centimeters to describe the size of a digital image? It all has to do with how computer screens work. Because not all screens display things at the same size, it's impossible to predict how *big* an image will look when it shows up on someone's computer. Depending on the person's display settings, an 800-x-600-pixel image may be a few inches across, or it may take up the whole screen. Giving a digital image's dimensions in pixels is the only accurate way of describing how "big" it is.



## Looking at SketchUp's raster formats

So you know you need to export a raster image from SketchUp, but which one do you choose? You have four choices in Windows; three of them are available on the Mac. The following sections give you the details.



When you export a raster image, you're saving your current view in SketchUp to a separate file somewhere on your computer. As a raster image, that file consists of tiny, colored dots, or *pixels* — more pixels than you can shake a stick at. When you look at all the pixels together, they form an image.

### Tagged Image File (TIFF or TIF)

TIFFs are the stalwarts of the raster image file format world; everyone can read them and just about everyone can create them. *TIFF* stands for Tagged Image File Format, but that's hardly important. Here's everything you need to know about TIFFs:

- ✓ **When image quality is important, choose TIFF.** Unless file size is a concern (because, for example, you need to send an image by e-mail), always export a TIFF if you need a raster image. For everything from working in Photoshop to creating a layout in InDesign or QuarkXPress, a TIFF can provide the image quality you need.
- ✓ **TIFFs don't compress your image data.** That means they don't introduce any garbage like JPEGs do, but it also means that they're really big files.
- ✓ **Pay attention to your pixel count.** If you're exporting a TIFF, you're probably looking for the best image quality you can get. And if that's the case, you need to make sure that your TIFF is "big" enough — that it includes enough pixels — to display at the size you need. Have a look at "[Making sure you export enough pixels](#)," later in this chapter, for more information.

### Joint Photographic Experts Group (JPEG or JPG)

*JPEG* stands for Joint Photographic Experts Group, which makes it sound much fancier than it really is. Almost every digital image you've ever seen was a JPEG (pronounced *JAY-peg*); it's the standard file format for images on the web. Check out these JPEG details:

- ✓ **When file size is a concern, choose JPEG.** The whole point of the JPEG file format is to compress raster images to manageable file sizes so that they can be e-mailed and put on websites. A JPEG is a fraction of the size of a TIFF file with the same number of pixels, so JPEG is a great choice if file size is more important to you than image quality.
- ✓ **JPEGs compress file size by degrading image quality.** This is known as *lossy* compression; JPEG technology basically works by tossing out a lot of the pixels in your image. JPEGs also introduce a fair amount of pixel garbage; these smudges are *artifacts*, and they're awful.



- ✓ **JPEG + SketchUp = Danger.** Because of the way the JPEG file format works, JPEG exports from SketchUp are particularly susceptible to looking terrible. Images from SketchUp usually include straight lines and broad areas of color, both of which JPEG has a hard time handling. If you're going to export a JPEG from SketchUp, make sure that the JPEG Compression slider is *never* set less than 8. For more details, see the section "[Exporting a raster image from SketchUp](#)," earlier in this chapter.

## Portable Network Graphics (PNG)



- ✓ Hooray for PNG! Pronounced *ping*, this graphics file format is my hero. Unfortunately, it isn't as widely used as it should be. If I had my druthers (I keep leaving them on the subway), every raster export from SketchUp would be a PNG. Why? Because, at least as far as SketchUp is concerned, PNG combines all the best features of TIFF and JPEG. Why don't more people use PNGs? Because standards are hard to change, and right now, it's a JPEG world. PNG details are as follows:

- ✓ **PNGs compress image data *without* affecting image quality.** As a *lossless* compression technology, PNGs are smaller files than TIFFs (just like JPEGs), but they don't mess up any pixels (totally unlike JPEGs). Granted, PNGs aren't as small as JPEGs, but I think the difference in image quality is worth a few extra bits.
- ✓ **If you're exporting an image for someone who knows a thing or two about computers, choose PNG.** The truth is that some software doesn't know what to do with a PNG, so using it involves a risk. If you plan to send your exported image to someone who knows what he's doing, go ahead and send a PNG — he'll be impressed that you're "in the know." If the recipient of your export is less technologically sophisticated, stick with a JPEG or TIFF file; it's the safe choice.



- ✓ The PNG file format wasn't developed to replace JPEG or TIFF; it was supposed to stand in for *GIF* (Graphics Interchange Format), which is a file type that SketchUp doesn't export. Without going into too much detail, folks use JPEG for images like photographs and GIF for things like logos. Because exported SketchUp views usually have more in common with the latter, PNG (the replacement for GIF) is the better choice. So why can't PNG replace JPEG and TIFF? For most photographs (which are the majority of images on the web), JPEG is

better than PNG because it produces smaller files, which in turn yields faster load times when you're surfing the Internet. TIFF is more versatile than PNG because it supports different *color spaces*, which are important to people in the printing industry. For reasons that are beyond the scope of this book, that isn't relevant to exports from SketchUp; PNG is still (in my opinion) the best — if not the safest — choice.

## Windows Bitmap (BMP)

Windows Bitmap, or BMP, files are old school; they can be used only on Windows, and they're big. If a BMP were a car, it would be the old, rusty van in your parents' garage. As you can probably guess, I don't recommend using BMPs for anything, with two exceptions:

- ✓ **To send your exported file to someone with a very old Windows computer:** If the person to whom you're sending an exported image has a Windows computer that's more than about eight years old, I suppose I'd send him a BMP.
- ✓ **To place an image in an old Windows version of layout software:** If your layout person is using an old, old copy of Word or PageMaker, he may need a BMP file.

## Making sure you export enough pixels

With raster images, it's all about pixels. The more pixels your image has, the more detailed it is, and the bigger it can be displayed or printed. Figure 13-4 shows the same image three times. The first image is 150 x 50, meaning that it's 150 pixels wide by 50 pixels high. The second image is 300 x 100, and the third is 900 x 300. Notice how the image with more pixels looks a lot better? That's the whole point of this section.



Why not always export a truckload of pixels, just in case you need them? There are two reasons:

- ✓ Image exports with lots of pixels take a long time to process.
- ✓ Raster images are very big files.



150 x 50 pixels



300 x 100 pixels



900 x 300 pixels

**Figure 13-4:** More pixels yield a much more detailed image.

How many pixels you need to export depends on what you're going to use the image *for*. Very broadly, you can do two things with your image:

- ✓ Display or project it on a screen, digitally.
- ✓ Print it.

In the next two sections, I talk about each of these possibilities in detail.

### **Exporting enough pixels for a digital presentation**

If you plan to use your exported image as part of an onscreen presentation, it's helpful to know what computer monitors and digital projectors can display:

- ✓ The smallest, oldest devices currently in use have images that are 800 pixels wide by 600 pixels high.
- ✓ At the other end of the spectrum, high-end, 30-inch LCD monitors display 2560 x 1600 pixels.

So it stands to reason that if you're exporting an image that will be viewed only onscreen, you need to create an image that's somewhere between 800 and 2500 pixels wide. Table 13-1 provides some guidelines on image sizes for different digital applications.

**Table 13-1 Suggested Image Sizes for Onscreen Use**

| <i>How the Image Will Be Used</i>        | <i>Image Width (Pixels)</i>        |
|--|------------------------------------|
| E-mail                                   | 400 to 800                         |
| Website, large image                     | 600                                |
| Website, small image                     | 200                                |
| PowerPoint presentation (full screen)    | 800 or 1024 (depends on projector) |
| PowerPoint presentation (floating image) | 400                                |

### **Understanding resolution: Exporting images for print**



Images that you want to print need to have lots more pixels than ones that are going to display only onscreen. That's because printers — photo, inkjet, laser, and offset — all operate very differently than computer monitors and digital projectors. When you print something, the pixels in your image turn into microscopic specks of ink or toner, and these specks are smaller than the pixels on your computer screen. To make a decent-sized print of your exported image, it needs to contain enough *pixels per inch* of image. An image's pixel density, expressed in pixels per inch (ppi), is its *resolution*. What kind of resolution you need depends on three things:

- ✓ **The kind of device you print to:** For home inkjet printers, you can get away with a resolution of as little as 150 ppi. If your image will be appearing in a commercially produced book, you need a resolution of at least 300 ppi.
- ✓ **How far away the image will be from the audience:** There's a big difference between a magazine page and a trade-show banner. For close-up applications, a resolution of 200 to 300 ppi is appropriate. Large graphics that will be viewed from several feet away can be as low as 60 ppi.

✓ **The subject matter of the image:** Photographic images tend to consist of areas of color that blur together a bit; these kinds of images can tolerate being printed at lower resolutions than drawings with lots of intricate detail. For images with lots of lines like SketchUp models, it's best to work with very high resolutions — 300 to 600 ppi — especially if the image will be viewed close-up.

Table [13-2](#) provides some guidelines for exporting images that will be printed.

**Table 13-2 Recommended Resolutions for Prints**

| <i>How the Image Will Be Used</i>         | <i>Image Resolution (Pixels/Inch)</i> | <i>Image Resolution (Pixels/Centimeter)</i> |
|---|---------------------------------------|---|
| 8.5-x-11 or 11-x-17 inkjet or laser print | 200 to 300                            | 80 to 120                                   |
| Color brochure or pamphlet                | 300                                   | 120   |
| Magazine or book (color and shadows)      | 300                                   | 120   |
| Magazine or book (linework only)          | 450 to 600                            | 180 to 240                                  |
| Presentation board                        | 150 to 200                            | 60 to 80                                    |
| Banner                                    | 60 to 100                             | 24 to 40                                    |



Keep in mind that the biggest raster image that SketchUp can export is 10,000 pixels wide or tall (whichever is greater). This means that the largest banner image, printed at 100 ppi, that SketchUp can create is about 100 inches wide. To make larger images, you need to export a *vector* file; check out the details on exporting to vector formats with SketchUp Pro in Bonus Chapter [1](#), online.

Follow these steps to make sure that you export enough pixels to print your image properly:

- 1. In the Export Options dialog box, make sure that the Use View Size check box is deselected.**

To get to the Export Options dialog box, follow Steps 1–6 in the section “[Exporting a raster image from SketchUp](#),” earlier in this chapter.

- 2. Decide on the resolution that you need for your exported image. (Refer to Table [13-2](#).)**

Keep the resolution in your head or scribble it on a piece of paper.

- 3. Decide how big your exported image will be printed, in inches or centimeters.**

Note your desired physical image size, just like you did with the resolution in the preceding step.

- 4. Multiply your resolution from Step 2 by your image size from Step 3 to get the number of pixels you need to export:**



Resolution (pixels/in or cm) × Size (in or cm) = Number of pixels

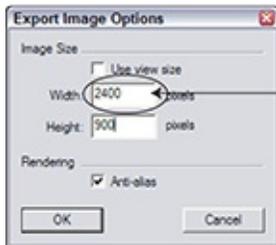
In other words, if you know what resolution you need to export, and you know how big your image will be printed, you can multiply the two numbers to get the number of pixels you need. Here's an example: 300 pixels/inch × 8 inches wide = 2400 pixels wide.

To export an image that can be printed 8 inches wide at 300 ppi, you need to export an image that's 2400 pixels wide. Figure 13-5 gives an illustration of this example.



SketchUp's default setting is to make your exported image match the proportions of your modeling window; that is, you can type only a width *or* a height, but not both. If you're on a Mac, you can manually enter both dimensions by clicking Unlink (which looks like a chain). You can always click it again to relink the width and height dimensions later.

8 inches wide x 300 ppi = 2400 pixels



Enter 2400 here

**Figure 13-5:** To figure out how many pixels you need to export, multiply the resolution by the physical size.

## 5. Type the width *or* height of the image you want to export, in pixels.

It's usually pretty hard to know *exactly* how big your image will be when it's printed, and even if you do, you probably want to leave some room for cropping. For these reasons, I always add 15–25 percent to the number of pixels I figure I'll need. If my image calls for 2400 pixels, I export 3000 pixels, just to be safe.



If you're on a Mac, things are a little easier because SketchUp's designers built a pixel calculator into the Export Options dialog box. Just enter your desired resolution in the appropriate spot, change the Width and Height units from pixels to inches or centimeters, and type your desired image size. SketchUp does the arithmetic for you.

6. Click OK to close the Export Options dialog box.

## *Making Movies with Animation Export*

When it comes to having nerdy fun, I think exporting movie animations of your SketchUp models is right up there with iPods and store-bought fireworks. Like both these things, what's so great about animation export is how *easy* it is to do. That's not to say that animation and digital video are simple topics — they're not. It'd take a freight elevator to move the books that have been written about working with video on the computer, but I'm going to keep it simple. Because you and I are primarily interested in 3D modeling, what you find in the following sections are instructions for doing what you need to do.

### *Getting ready for prime time*

The key to exporting animations of your SketchUp models is using scenes; if you haven't read it already, now's the time to check out Chapter [11](#). *Scenes* are saved views of your model that you can arrange in any order you want. When you export an animation, SketchUp strings together the scenes in your model to create a movie file that can be played on just about any computer made in the last several years.

Follow these steps to get your model ready to export as an animation:

1. **Create scenes (as described in Chapter [11](#)) to build the “skeleton” of your animation.**
2. **To adjust the animation settings in the Model Info dialog box, choose Window⇒Model Info and then select the Animation panel.**

I explain all the controls in the section about moving from scene to scene in Chapter [11](#).

3. **Select the Enable Scene Transitions check box to tell SketchUp to move smoothly from one scene to the next.**
4. **Enter a transition time to tell SketchUp how long to spend moving between scenes.**

If your Scene Delay is 0 (below), you can multiply your transition time by your number of scenes to figure out how long your exported animation will be.

5. **Enter a scene delay time to pause at each scene before moving on to the next one.**



If you plan to talk about each scene, use the scene delay time to pause before each one. If your animation is supposed to be a smooth walk-through or flyover, set this to 0.

6. **Adjust the proportions of your modeling window to approximate the proportions of your movie.**

Unlike SketchUp's 2D export formats, the proportions of your exported movie don't depend on those of your modeling window; that is to say, making your modeling window long and

skinny won't result in a long and skinny movie. You choose how many pixels wide and tall you want your movie to be, so to get an idea of how much you'll be able to see, make your modeling window match the proportions of your exported file. (The 16:9 aspect ratio is common for video formats.) Have a look at Step 1 in the section "[Exporting a raster image from SketchUp](#)," earlier in this chapter, for guidance on adjusting your modeling window.

## 7. When your project is ready to go, move on to the next section to export your animation.

### *Exporting a movie*

SketchUp offers a veritable alphabet soup of video export formats: You can choose from seven on Windows and six on Mac. The list can seem daunting, so here's a cheat sheet that should save you some mental anguish:

- ✓ **H.264 (.mp4):** This video format is as close to an industry standard as it gets. Everyone with a Mac and anyone with Quicktime on her Windows computer can readily view H.264 movies without any hassle. It's also the upload format of choice for popular video sharing websites like YouTube and Vimeo. SketchUp's exported H.264 files are nicely compressed, which keeps them smallish and good-looking.
- ✓ **AVI (.avi):** All Windows machines and Macs with a special plugin can play AVI movies. Popular video sharing websites like YouTube and Vimeo let you upload AVI files, but they tend to prefer H.264. SketchUp's exported AVI animations are *uncompressed*, meaning that they look nice and clean but the files can get huge quickly. If you're planning to send someone your movie file, AVI might not be your best choice.
- ✓ **VP8 (.webm):** Not too many years ago, the tech world started getting nervous about H.264's dominance as a file format used to display video on websites. H.264 is *proprietary*, meaning that big companies have to pay licensing fees to its owner (Apple) if they want to use it. WebM is a free alternative, backed by Google, and made for use on websites that use HTML5. Translation: You don't need to worry about WebM unless you're planning to embed your movie on a modern website *without* first uploading it to YouTube or Vimeo.
- ✓ **Theora (.ogv):** Theora is another free, open source format meant for videos that will be embedded on websites. Unlike WebM, Theora is managed by an independent foundation that tries to keep important multimedia file formats out of the hands of big, private corporations like Apple (H.264) and Google (WebM). Note that only the Windows version of SketchUp can export Theora video files.
- ✓ **JPEG, PNG and TIFF:** Choosing to export in any of these formats won't give you a movie file that you can watch — they aren't video file formats. Instead, you'll get a pile of image files that each represent one frame in your animation; for a three-second video at 30 frames per second, SketchUp would export 90 individual images. These options are useful for serious video editors who need lots of control, but most folks shouldn't need to use them.

Although exporting animations in SketchUp is a pretty simple operation, figuring out how to set all the animation export controls can seem like landing the space shuttle.

Follow these steps to export a movie file from SketchUp:

## 1. Prepare your model for export as an animation.

See the section “[Getting ready for prime time](#),” earlier in this chapter, for a list of things you need to do before you export an animation.

## 2. Choose File⇒Export⇒Animation⇒Video.

Choosing Video provides you with file formats that yield video files. If you pick Image Set instead, you’ll see options for creating sets of still images. I get into the difference between these a little later on in this section. If you’re on a Mac, there’s no bifurcation of the Animation submenu; just choose File⇒Export⇒Animation, and you see all of your format choices.

## 3. Give your movie file a name and then choose where it should be saved on your computer system.

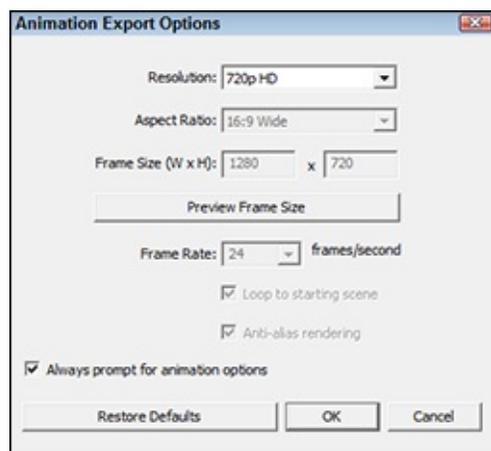
## 4. Make sure that the correct file format is selected.

From the Format drop-down list, select the file format you want SketchUp to export. In most cases, this is either H.264 or AVI, but take a look at the descriptions earlier in this section for more detailed info.

## 5. Click the Options button to open the Animation Export Options dialog box.

## 6. Adjust the settings for the type of animation you want to export. (See [Figure 13-6](#).)

How you set up everything in this dialog box depends on how you plan to use the animation you create. Check out the next section in this chapter for a list of settings and their implications.



**Figure 13-6:** The Animation Export Options dialog box.

## 7. Click OK in the Export Options dialog box.

You return to the Animation Export dialog box.

## 8. Check to make sure that everything looks right and then click the Export button.

Because exporting an animation takes a while, it pays to double-check your settings before you click the Export button. When the export is complete, you can find your animation file in the location you specified in Step 3. Double-clicking it causes it to open in whatever movie-

playing software you have that can read it.

## ***Figuring out the Animation Export options settings***

As I say earlier, digital video can be complicated. Lucky for you, you don't really have to know exactly what everything means to export the right kind of movie; you just have to know how to set up everything. The Animation Export Options dialog box (shown in Figure [13-6](#)) is the same for each of the video file formats that SketchUp offers; here's a brief guide to the settings:

- ✓ **Resolution:** This use of the word *resolution* refers to the pixel dimensions — the physical size — of your video. SketchUp Make (the free version) lets you choose from three standard sizes, whereas SketchUp Pro provides a Custom option for more flexibility. Here's what the terms mean:
  - *1080p Full HD* yields a video that is 1920 pixels wide and 1080 pixels high. This is the highest resolution that most newer televisions can display, and it's even higher than a lot of laptops can handle natively. Choose this option only if you know you'll need it; exporting this many pixels takes a long time.
  - *720p HD*, which is 1280 pixels wide by 720 pixels high, is the most common resolution for high-quality exported video. This size looks good on computer screens and televisions, and it's the recommended upload resolution for YouTube and Vimeo. Chances are good that this is the resolution for you.
  - *480p SD*, at only 854 pixels wide by 480 pixels high, will probably look small on most computer screens. This is the resolution used for DVDs, which every 16-year-old knows are weird artifacts from the distant past. (I have a huge collection, unfortunately.) Use 480p if file size is a concern.
  - *Custom* is available only if you're using the Pro version of SketchUp. Choosing this option “unlocks” settings for Aspect Ratio and Frame Size, which I describe later in this list.
- ✓ **Aspect Ratio:** This refers to the proportions of your video frame; the first name refers to the width and the second to the height. Common aspect ratios for film and video are 16:9 (which is wide) and 4:3 (which is more square). If you're using SketchUp Pro, you can choose Custom and put whatever you want into the Frame Size fields below this setting.
- ✓ **Frame Size:** Pro users can pick their own video frame dimensions. Go nuts, big spender.
- ✓ **Preview Frame Size:** This is actually an incredibly handy button. Click it to see a green box preview of how big your video will look on your screen. Click the preview to make it go away when you're done.
- ✓ **Frame Rate:** Different video technologies use different frame rates. Using more frames/second (fps) results in smoother motion but bigger files and longer processing times. Generally speaking, 30 fps is a good sweet spot. If you're worried about big files, try 15 fps and see how that looks.
- ✓ **Restore Defaults:** Replaces your hard drive's contents with a looping, 8-second video montage of Keanu Reeves's greatest cinematic moments. Just making sure you're still paying attention — this button puts everything in Export Options back the way it was before you

started messing around.

- ✓ **Loop to Starting Scene:** Automatically ends your video on the scene you started with, rather than the last scene in the sequence. This option is handy if you want your movie to end exactly how it started.
- ✓ **Anti-alias Rendering:** Choosing this doubles the amount of time it takes for your animation to export, but it makes your edges look much smoother in the final movie. You'll almost certainly want to select this option.
- ✓ **Transparent Background (Mac only):** If you're planning to use your exported movie with advanced video editing software, this is something that might interest you. Otherwise, you should probably leave this option deselected.
- ✓ **Always Prompt for Animation Options (Windows only):** Select this to force SketchUp to show you the Animation Export Options dialog box every time you export a movie.

## Chapter 14

# Creating Presentations with LayOut

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### *In This Chapter*

- ▶ Discovering LayOut's purpose
  - ▶ Figuring out the tools and panels
  - ▶ Building a simple presentation document from scratch
  - ▶ Printing and exporting your work
- 

People who design things in 3D have to present their ideas to other people, and most of the time they have to present in a 2D format. Creating these presentations almost always involves the use of layout or illustration software like InDesign or Illustrator — great programs but expensive and tricky to figure out, especially if you're not a graphic designer. If you're lucky enough to have the Pro version of SketchUp, you have access to a separate piece of software — LayOut.

*LayOut* enables you to create documents for presenting your 3D SketchUp models, both on paper and onscreen. LayOut was designed to be easy to use, quick to learn, and tightly integrated with SketchUp. The people who built it want you to use LayOut to create all your design presentations; here are examples of what you can make:

- ✓ Design packs, presentation boards, and posters
- ✓ Simple construction drawings with scaled views and dimensions
- ✓ Vector illustrations and diagrams
- ✓ Storyboards for planning camera shots

LayOut gives you the tools to create cover pages, title blocks, callouts, and symbols — whatever needs to accompany views of your model. You can create presentations that are just about any physical size and export them as PDFs or images to send to other people. Best of all, when your design changes in SketchUp, you can easily update your model views in LayOut to reflect the changes. If you make your living designing and presenting ideas in 3D, LayOut can save you boatloads of time.

In this chapter, I give a high-level overview of what you can do with LayOut. I start with a quick tour of the LayOut user interface, explaining where everything is and what it's supposed to do. Next, I take you through the process of creating a simple presentation drawing set from one of your SketchUp models — not exhaustively by any means, but it should be enough to see you through a tight deadline. Chapter [15](#) is dedicated to exploring LayOut in more detail — jump ahead if you're dying to know something specific.

## *Getting Your Bearings*

Even though LayOut comes with SketchUp Pro, it's not just a SketchUp feature — LayOut is a full-fledged, gets-its-own-icon program. As such, LayOut has its own menus, tools, dialog boxes, and drawing window. A couple of versions from now, LayOut will probably have its own *For Dummies* book. (Maybe I'll even get to write it!)

Even though the LayOut user interface is pretty standard, I want to give you a quick overview of the different elements. Knowing that it's a lot like other software you've used (including SketchUp) should help you get up to speed quickly. Figure 14-1 shows the LayOut user interface. The following sections explain the various parts in more detail.

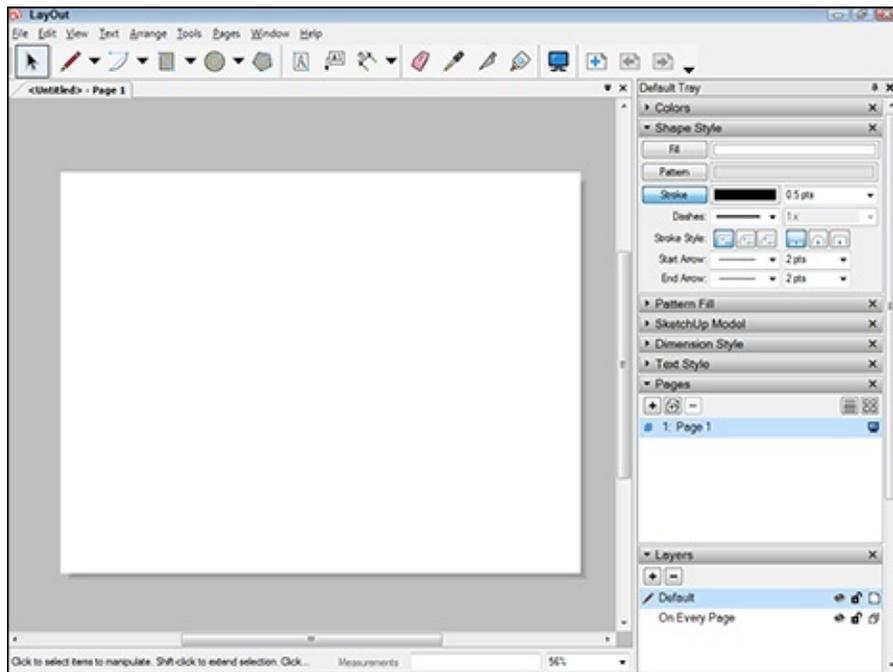


Figure 14-1: The LayOut user interface.

## Some menu bar minutiae

Just like almost every other piece of software in the universe, LayOut has a menu bar. And just like SketchUp, you can use LayOut's menu bar to access the vast majority of its tools, commands, settings, and dialog boxes. Instead of boring you with a bunch of stuff you almost certainly already know, I skip ahead to the especially useful items:

- ✓ **Preferences:** You find LayOut's application-wide Preferences dialog box on the Edit menu on Windows computers and on the LayOut menu on Macs. Preferences is where you do things like assign custom keyboard shortcuts and create new drawing scales. (Personally, I'm a big fan of  $\frac{3}{16}$ .)
- ✓ **Document Setup:** Located on the File menu, this is LayOut's version of SketchUp's Model Info dialog box; it's jam-packed with settings you use all the time:



- **Auto-Text:** In a multipage document set, you'll often want to let LayOut automatically fill in a text box according to your instructions. One great example is page numbering; instead of manually keeping every page number in your file up-to-date, you can insert a special tag to tell LayOut to do this for you.

- *Grid*: Not only can LayOut display a helpful grid on your pages, but it also lets you control the size and color of the gridlines or points. You can also choose to display the grid *above* your drawing elements, which some people really appreciate.
- *Paper*: Right below the boring settings for paper size and margin width lies one of the most important controls in LayOut: Rendering Resolution. Both Edit Quality and Output Quality are set to Medium by default, but you want to adjust them for almost every file you work on. Curiosity piqued? Head on over to Chapter [15](#).
- *References*: When you insert a SketchUp model or an image in your LayOut document, LayOut creates a file reference that keeps track of where it came from.



If you edit the original file (which you probably will), this panel lets you know whether LayOut shows the most currently saved version. For people who go back and forth between design and presentation documents a lot (sound familiar?), the References panel is a gift from the heavens.

✓ **Snap settings**: These help you position elements on your page by making it easier to line them up with a grid (Grid Snap) or with other elements (Object Snap). Depending on what you want to do, you may choose to work with both kinds of snap settings, just one, or neither. I switch between Object Snap and Grid Snap while I work; I rarely use both at the same time. The snap settings are at the bottom of the Arrange menu.



In both the Windows and Mac versions of LayOut, you can have more than one document open at a time. On the Mac, separate files look just like they do for other programs; they're all in different windows. LayOut on Windows is a little different, though: Your open files display as tabs across the top of your drawing window, a little bit like scenes in SketchUp. The tabbed files confuse some people who think that the tabs represent pages. Now you know — they don't.

## Perusing LayOut's panels

You can find most of LayOut's knobs and switches in its ten panels. In Windows, most of these are contained in a "tray" that appears on the right side of your screen by default.



On the Mac, your panels float around willy-nilly, but you can snap them together if you want. Choosing Window⇒Arrange Panels tidies up things when everything's everywhere and you can't find anything. Don't you wish your house had something similar?

Here are brief descriptions of each panel:

✓ **Colors**: Just about all your LayOut documents use color in some way, so you need this dialog box most of the time. The nice thing about the Colors panel is that clicking any color selector well in LayOut (like the ones for Fill and Stroke in the Shape Style panel) pops the Colors

panel open (if it wasn't open already).



To hide a dialog box without closing it, click its title bar once to minimize it. Click again to see the whole thing.

- ✓ **Shape Style:** A lot of the graphic elements in your presentation can have solid color fills, pattern fills, and strokes (outlines). The Shape Style panel is where you control the appearance of those fills and strokes. Check out the options in the Start and End drop-down lists — you won't find callout styles like these in most other layout programs.
- ✓ **Pattern Fill:** After you draw shapes in LayOut, you can fill them with solid colors, patterns, or both at the same time. This panel lets you choose, rotate, and scale those pattern fills. You can even import your own image tiles to use as patterns.
- ✓ **SketchUp Model:** The greatest thing about LayOut (at least with respect to other software like it) is its capability to include 2D views of your SketchUp models. In the SketchUp Model panel, you can control all sorts of things about the way your placed SketchUp model looks, including camera views, scenes, styles, shadows, scale, and fog. For folks who spend a lot of time laying out presentation drawings that include SketchUp models, the SketchUp Model panel is a godsend.
- ✓ **Dimension Style:** LayOut lets you draw both linear and angular dimensions. This panel is where you control what they look like. For more information, take a look at Chapter [15](#).
- ✓ **Text Style:** You should be pretty familiar with what the Text Style panel lets you do; you use it to control the font, size, style, color, and alignment of text in your document.
- ✓ **Pages:** You can add, delete, duplicate, and rearrange the pages in your document to your heart's content. The List and Icon buttons at the top let you toggle between views of your pages; I prefer to use the former and give my pages meaningful names as I work. The little icons on the right control visibility for full-screen presentations. The # icon on the left tells you where automatic page numbering is set to begin (in the Auto-Text settings panel in Document Setup).
- ✓ **Layers:** You can have multiple layers of content in every LayOut document you create.

Use the Layers panel to add, delete, and rearrange layers in your document. The icons on the right let you hide (and show), lock, and share individual layers.



*Shared layers* let you automatically place elements on more than one page. For more detail, see Chapter [15](#).

- ✓ **Scrapbooks:** This one's a little trickier to explain; scrapbooks are unique to LayOut, so you probably haven't worked with anything like them before. *Scrapbooks* are LayOut files that live in a special folder on your computer system. They contain colors, text styles, and graphic elements (such as scale cars, trees, and people) that you may use in more than one LayOut document. To use something in a scrapbook, just click it with the Select tool and then click

again in your drawing window. You can also sample things like colors, line weights, and text styles by clicking with any other tool.

- ✔ **Instructor:** The Instructor panel shows information on whichever tool you happen to be using. If you're just starting with LayOut, make sure that this panel is open.

## Building a Quick LayOut Document

Pretend you have a major deadline looming, and you've flipped to this page because you need to turn your SketchUp model into a set of drawings. There's no time for the nitty-gritty — you need model views, page titles, basic dimensions, some annotations, and maybe a logo. You've come to the right place. In the following sections, I walk you through putting together a bare-bones LayOut document. Take a deep breath, put a fresh battery in your mouse, and follow me... .

### Starting with a template

In my experience, templates are the quickest way to get up and running with a new LayOut project. Follow these steps to load a LayOut template and customize it for your own purposes:

#### 1. Launch LayOut.

Keep in mind that LayOut and SketchUp are separate software programs, so you need to launch them individually. If you've already launched LayOut, choose File⇒New to open the Getting Started dialog box. (See Figure 14-2.) If you don't see it, you can switch it on in the Startup panel of the Preferences dialog box.

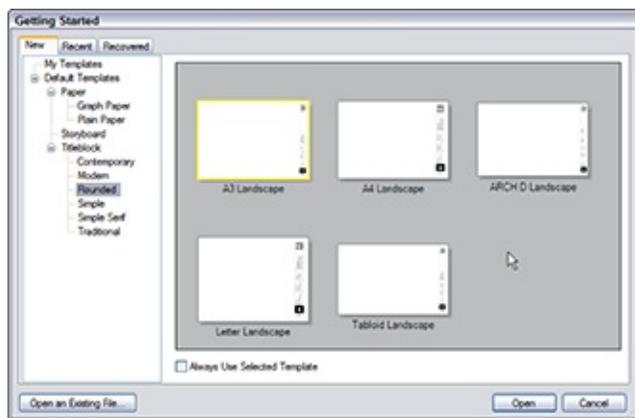


Figure 14-2: The Getting Started dialog box.

#### 2. In the Getting Started dialog box, click the New tab.

This shows a list of available templates on the left, with thumbnail previews of each template on the right. Nothing about these templates is special — they're just ready-made LayOut files you can use as a starting point for your document.

#### 3. Choose a template to use.

Expand the items in the list on the left to see the available templates by category. Browse the list, select one you want to use, and click the Open button (Choose on a Mac) to work with that template.

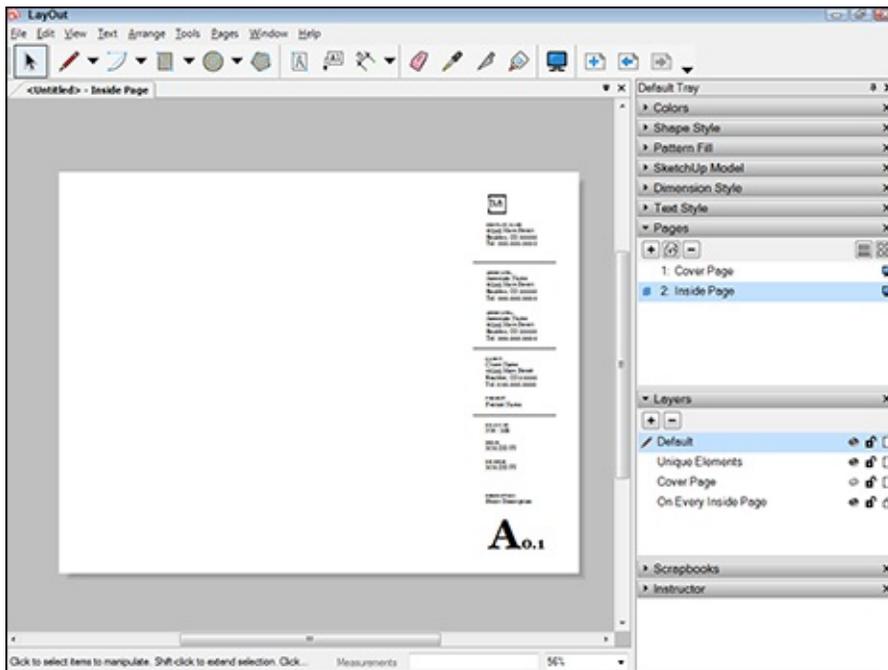


If you change your mind about the template you picked, close the file you just created and choose File⇒New to pick another one.

#### 4. **Unlock all your new document’s layers.**

Many templates that come with LayOut have multiple layers, and some layers are locked by default so that you can’t accidentally move things. In this case, you want to unlock them all so you can customize the template with your own information.

In the Layers panel, unlock all the locked layers by clicking their little lock icons one at a time. Figure 14-3 shows the Layers panel, among other things.



**Figure 14-3:** One of LayOut’s fancier prebuilt templates.

#### 5. **Edit the default text on the page.**

With the Select tool, double-click text to edit it. Click somewhere else on the page to stop editing.



Roll your scroll wheel to zoom in and out on the page, just like in SketchUp. Hold down the scroll wheel button to pan around. To fill your drawing window with the page you’re viewing, choose Scale to Fit (Zoom to Fit on the Mac) from the Zoom drop-down list in your window’s lower-right corner.

#### 6. **Edit the default text on all your other pages.**

Most of the more interesting templates include at least two pages; many templates open on the second page. Use the Pages panel to switch between pages in your document. Repeat Step 5 for

any default text that needs to change.

## 7. (Optional) Change colors, pattern fills, and line styles.

You can edit lines and other graphic entities you select in the Shape Style panel. Clicking a color well opens the Colors panel. To change the color of text, select it and click the color well in the Text Style panel (Fonts panel on a Mac).



Sometimes the entity you're trying to edit is buried inside a group. Double-click a group to edit it. Sound familiar? SketchUp and LayOut are, after all, siblings.

## 8. Swap out the generic logo for your own.

Delete the generic logo wherever it appears in your document by selecting it and pressing the Delete key. Follow these steps to bring in a logo of your own:

- a. *Make sure you're not on your document's cover page.*
- b. *In the Layers panel, click the On Every Inside Page layer to make it the active one and then choose File⇒Insert.*
- c. *Find the logo image you want to use and click the Open button.*
- d. *Activate the Select tool; then resize your logo by dragging its blue corner grips and pressing down the Shift key to keep from stretching your logo while you resize it.*
- e. *Click and drag your logo to put it where you want on the page and then choose Edit⇒Copy to copy your logo to the clipboard.*
- f. *Switch to your document's cover page and make the Cover Page layer active by clicking its name in the Layers panel.*
- g. *Choose Edit⇒Paste to paste your logo on the page.*
- h. *Repeat Steps d and e to place your logo where you want it, and then make the Default layer the active one before you forget.*

## Inserting SketchUp model views

With every other page-layout program in the universe, the only way to include a view of a SketchUp model is to export that view from SketchUp as an image file and then place it in the layout program. Changing the SketchUp file means going through the whole export-and-place process again, and if your presentation includes lots of SketchUp model views, it can take hours.



This brings me to LayOut's *raison d'être*: Instead of exporting views from SketchUp to get them into LayOut, all you do is insert a SketchUp file. From within LayOut, you can pick the view you like best. You can also use as many views of the same model as you want. When your SketchUp file is modified, LayOut knows about it and (using the References panel in the

Document Setup dialog box) lets you update all your views at once by clicking a single button.

Follow these steps to insert a SketchUp *viewport* (model view) into your document:

**1. In SketchUp, create a scene for each view of your model that you want to show in your LayOut document. (See Figure 14-4.)**

Take a look at Chapter 11 for a refresher on using scenes. Be sure to give them meaningful names and remember to save your SketchUp file when you're done.



**Figure 14-4:** To save time, save a scene in SketchUp for every view you want to include in your LayOut document.

**2. In LayOut, navigate to the page where you want to insert a viewport.**

Use the Pages panel to move between existing pages. The quickest way to add a new page is to duplicate an existing one: Just click the Duplicate Selected Page button (between Add and Delete) in the Pages panel.

**3. Insert a SketchUp model viewport:**

- a. Choose *File⇒Insert* to open the *Insert* dialog box.
- b. Find the SketchUp file on your computer that you want to insert and click the *Open* button.

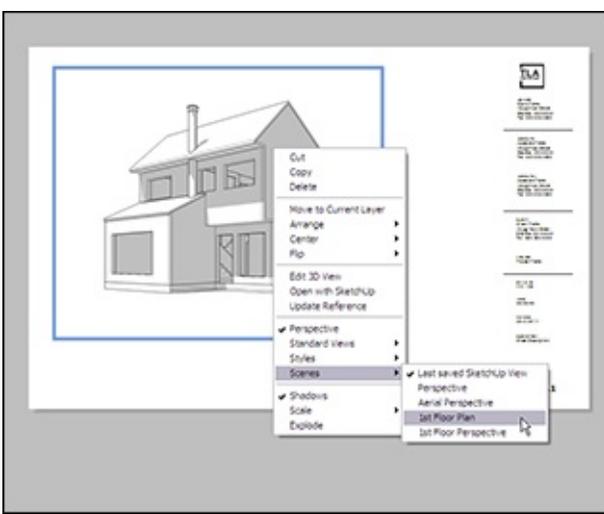
The Insert dialog box closes, and your SketchUp model is placed on your current LayOut document page.

**4. Associate a scene with your model viewport. (See Figure 14-5.)**

With the Select tool, right-click your viewport, choose Scenes, and then choose the name of the scene you want to associate.



If you don't see a list of scenes, you probably forgot to save your SketchUp file in Step 1. Save your SketchUp file; then right-click your viewport (in LayOut) and choose Update Reference.



**Figure 14-5:** Associate a scene from your model with a viewport in LayOut.

**5. Assign a drawing scale to your model view if that’s appropriate. (See Figure 14-6.)**

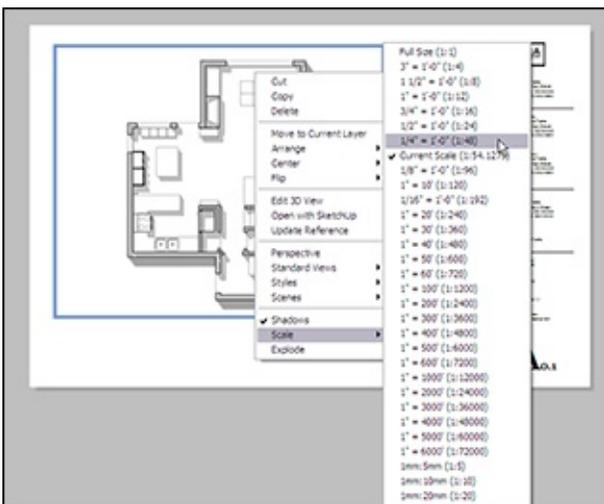
If the scene you picked in Step 4 is an *orthographic* view (top, front, side) where perspective is turned off, it’s very likely that you want to show your model at a particular drawing scale. With the Select tool, right-click your viewport, choose Scale, and then choose one from the list that appears.



LayOut doesn’t prevent you from assigning a scale to any old view, but that doesn’t matter. Drawing scales apply only to nonperspectival, straight-on views of your model. If your view isn’t orthographic, it isn’t at scale.



If a bright yellow exclamation mark icon appears in the lower-right corner of a viewport, you need to tell LayOut to render that viewport in order for it to reflect whatever changes you’ve made to it. Right-click the viewport and choose Render Model from the context menu, and you’re good to go. See Chapter 15 for a complete discussion of viewport rendering methods and options.



**Figure 14-6:** Assign a precise drawing scale to any orthographic viewport.

## 6. Use the Select tool to position, rotate, or resize your model view.

Click and drag to move any element in your document on the page. Use the Rotation Grip (the little blue stick in the center of your image when it's selected) to rotate. You can resize anything by clicking and dragging any corner.

Go ahead and repeat the preceding steps for all the additional viewports you want to add to your document. Check out Chapter [15](#) for lots more information about viewports.

## *Adding images and other graphics*

Inserting images into your LayOut document is a straightforward affair. Just choose File⇒Insert and take it from there. A few more things to know about images you insert:

- ✓ **LayOut can insert raster images.** This means TIFFs, JPEGs, GIFs, BMPs, and PNGs — these are all graphics file formats that save pictures as lots of tiny dots.
- ✓ **The Mac version of LayOut can also insert PDFs.** This is indisputably the best way to bring in vector art, such as logos. You can use a program like Adobe Illustrator to save any AI (Illustrator) or EPS file as a PDF.
- ✓ **Images are a lot like viewports.** The techniques for moving, resizing, and rotating images work just like they do for SketchUp model views; use the Select tool to do everything. Remember to hold down the Shift key when you resize to keep your images from stretching.

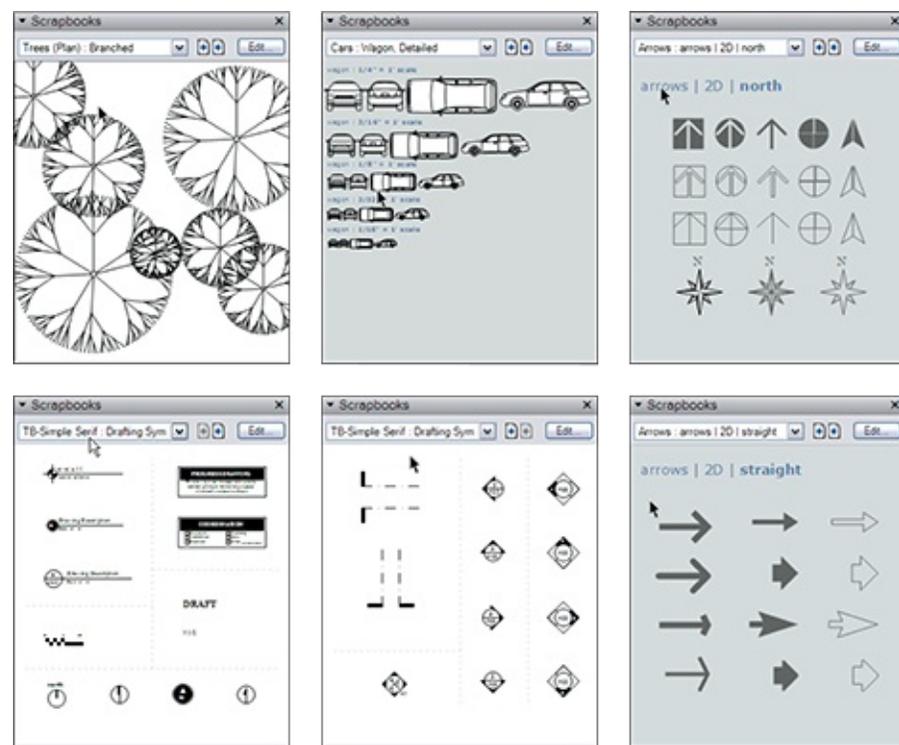
Unfortunately, LayOut offers no easy way to import editable vector (such as AI, EPS, and SVG) graphics. If you want to use vector graphics in your LayOut document, you have two choices:

- ✓ **Make your own.** LayOut is a fantastic vector illustration tool — I actually prefer it to Illustrator for most things I draw. Take a gander at Chapter [15](#) to discover all the nuances of LayOut's illustration toolset.
- ✓ **Borrow shamelessly from the Scrapbooks panel.** One of the best things about LayOut is the hundreds — maybe thousands — of predrawn graphical elements you can find in the Scrapbooks panel (shown in Figure [14-7](#)). You find things like
  - *Symbols:* Arrows, section markers, north indicators, graphic scales, and column grids
  - *Entourage elements:* Trees, cars, and people at various scales and levels of detail
  - *Color palettes:* To help with producing attractive documents quickly

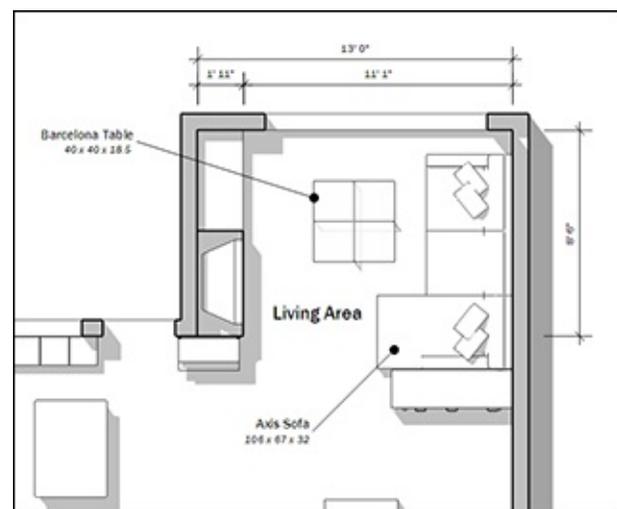
To use something you see in the Scrapbooks, just click it with the Select tool to sample it and then click again to stamp it onto your page. You can keep clicking to stamp more copies. Press the Esc key when you're ready to exit stamping mode.

## *Annotating with text and dimensions*

LayOut has a few tools you can use to add blocks of text, titles, callouts, labels, and dimensions to your drawings. Luckily, none is terribly complicated to use. Following are mini-sections about each text tool. Figure [14-8](#) is a sampler of drawing annotations.



**Figure 14-7:** LayOut's Scrapbooks are the fastest way to add professional-looking graphics to your drawings.



**Figure 14-8:** Text, callouts, and dimensions are all different forms of annotation.

## The Text tool

Text boxes in LayOut are classified into two broad types, depending on how you create them:

- ✔ **Bounded:** If you click and drag with the Text tool, the text box you create is *bounded*. Any text you enter into it that doesn't fit isn't visible, and you get a little red arrow at the bottom. That arrow tells you that there's more in your text box; you need to use the Select tool to make the box bigger to show everything that's inside. Use a bounded text box whenever your text needs to fit into a precise space in your design.
- ✔ **Unbounded:** If, instead of creating a text box with the Text tool, you simply click to place your cursor somewhere on your page, the text you create is *unbounded*. It stays inside a text box, but that text box automatically resizes to accommodate whatever text you put inside it. To turn an unbounded text box into a bounded one, just resize it with the Select tool or choose Text⇒Make Unbounded.

Naturally, you control things like text size, color, alignment, and font using the Text Style panel (Fonts panel on a Mac).



This tip applies only to Mac folks: Choosing Text⇒Show Rulers does more than just display ruled increments at the top of your drawing window. It also enables extra controls for paragraph spacing and lists — bulleted and numbered. Just select text in your document to see them appear above the ruler.

## The Label tool

Use the Label tool to add *callouts* (notes with leader lines) wherever you need them. Here are six important points about (what I consider to be) the most useful tool in LayOut:

- ✓ **Activate, click, click, type, and click.** Activate the Label tool, click once to pin the end of the leader line to an element in your drawing, click again to place your text cursor, type something, and click somewhere else to finish your label.

If you want, you can create *curved* leader lines. They often do a better job of standing out when most of the shapes in your drawings have straight edges. In LayOut, you curve a leader line the same way you do a regular line: by *click-drag-releasing* your mouse when you're placing its endpoints. Try it and see.



- ✓ **Save time with auto-filled text.** When you label certain kinds of entities in a model viewport, LayOut automatically fills in the text part for you. This feature works just like the Text tool in SketchUp. Labeling a component gives you its name. Labeling a face gives you its area. If you don't want LayOut's suggestion, just type something else.
- ✓ **Leader lines stick to drawing elements.** When you move the thing your leader line is pinned to, the line moves with it.
- ✓ **Use the Shape Style panel to edit the look of your leader lines.** You can change the color, thickness, and endpoints (arrowheads, slashes, and dots) of any leader line very easily after you create it.
- ✓ **Save time by sampling.** After you edit a label you've made, it's easy to arrange for every subsequent label you make to look the same:

- Activate the Label tool and then press the S key.*

Your cursor changes into an eyedropper.

- Click the text part of the label you sample and then click S again.*
- Click the leader line of the label you sample.*

Now every label you create looks just like the one you sampled.

- ✓ **Use the Style tool to copy styles between labels you've created already.** If you have a bunch

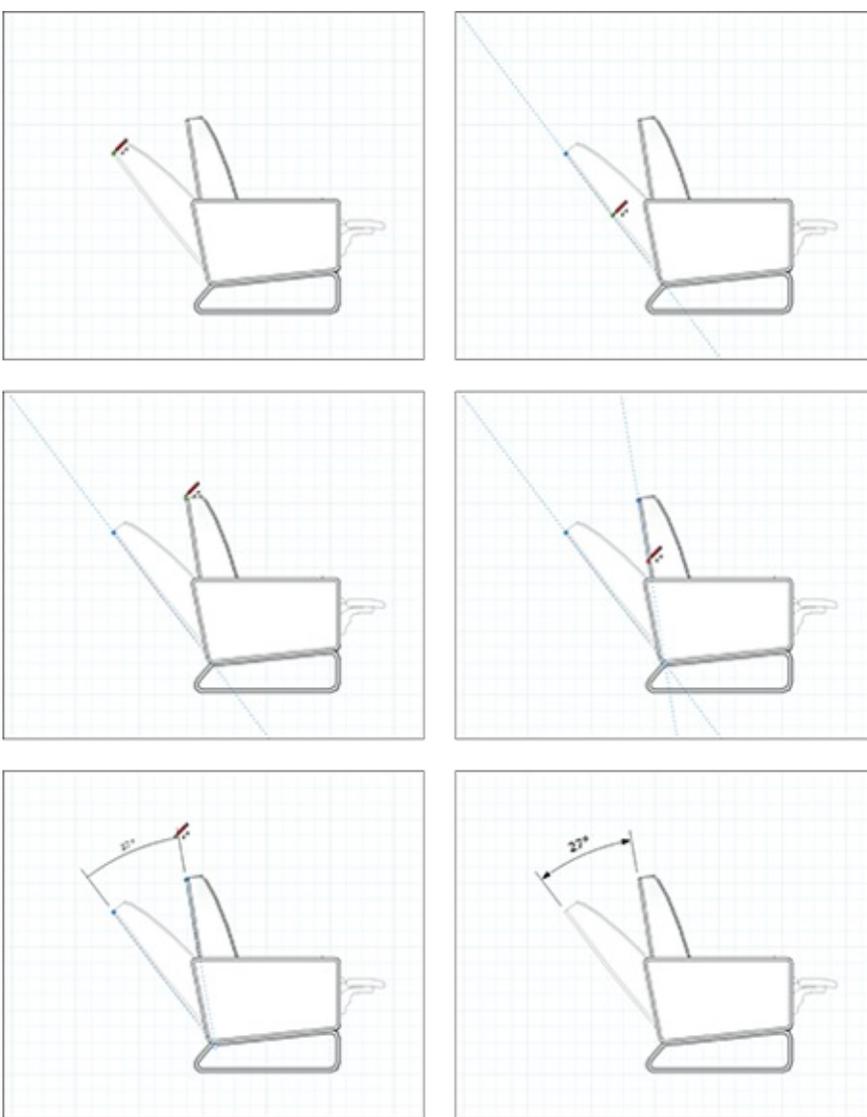
of labels and you want to make them all look the same, follow these steps:

- a. *Activate the Style tool (it looks like an eyedropper) and then click the text part of the label whose style you want to copy.*
- b. *Apply (by clicking) that style to the text of every other label you want to change.*
- c. *Repeat Steps a and b, sampling the leader lines of your labels instead of the text.*

## **The dimension tools**

Both dimensioning tools (Linear Dimension and Angular Dimension) work very similarly to the Label tool; all three are made of lines and text. Here's a stripped-down version of what you find in Chapter [15](#):

- ✓ **Turn on Object Snap before you start.** Choose Arrange⇒Object Snap to make sure your dimension leader lines can “see” the points they’re supposed to be attached to.
- ✓ **Creating a new linear dimension is very simple.** Activate the Linear Dimension tool, click a start point, click an end point, click to define an offset, and you’re done.
- ✓ **Double-click to create a string of linear dimensions.** After you create your first dimension and while the tool is still active, double-click the next point you want to dimension. The offset you set for the first is duplicated.
- ✓ **Angular dimensions are a little trickier.** Using the Angular Dimension tool is a five-click operation. Follow these steps to make it work (see Figure [14-9](#)):
  - a. *Activate the Angular Dimension tool and then click once to establish the first “pin point” for your new dimension.*
  - b. *Click again, somewhere along the same line as the point you clicked in Step a.*
  - c. *Click once to establish the second pin point.*
  - d. *Click again along the same line as your second point.*
  - e. *Click one last time to position the text of your angular dimension.*



**Figure 14-9:** Creating an angular dimension takes some getting used to.

- ✓ **Use the Shape Style panel to edit your leader lines.** Thickness, color, endpoints — it’s all here.
- ✓ **Use the Dimension Style panel to change formatting.** By *formatting*, I mean metric or imperial, decimal places, text position, and visibility.
- ✓ **Use the Style tool to copy formatting and other settings between dimensions.** Activate Style, click your “source” dimension, and then click each dimension you want to change.



Creating separate layers for text, labels, and dimensions saves time in the long run. In the Layers panel, click the Add Layer button to make a new one. The layer with the little red pencil next to it is your active layer.

## Getting Your Document Out the Door

After you create a LayOut document, you can do the following five things to show it to someone else:

- ✓ Print it.

- ✓ Export it as a PDF.
- ✓ Export it as an image file.
- ✓ Export it as a DWG or DXF (CAD) file.
- ✓ View it as a full-screen presentation.

Simple, huh? The next five sections provide more detail on each of these options.

## *Printing your work*

Chapter [12](#) is about printing from SketchUp; notice that it's more than ten pages long. The instructions for printing from LayOut, on the other hand, would easily fit on a business card:

### **1. Choose File⇒Print.**

In the Print dialog box, choose which pages to print and how many copies you want.

### **2. Click OK to send your document to the printer.**

And that, my dear reader, is why you should always insert your SketchUp models into a LayOut document if you need to print them.



That said, I almost never print directly from LayOut. Ninety percent of the time, I export a PDF and use Adobe Acrobat (or Reader) to send the actual job to the printer. The settings in Adobe's Print dialog box give you more control over the finished product.

## *Exporting a PDF*

Anyone with Adobe Reader software (which is free and is already loaded on millions of computers) can look at a PDF document you create; all you have to do is e-mail it to your recipient. Follow these steps to export your LayOut document as a PDF file:

### **1. Choose File⇒Export⇒PDF.**

If you're on a Mac, choose File⇒Export and then make sure PDF is selected in the Export dialog box. The Export PDF dialog box opens.

### **2. Give your file a name and figure out where to save it on your computer.**

### **3. Click the Save button (in Windows) to open the PDF Export Options dialog box; click the Options (Mac).**

### **4. Set the PDF options the way you want them.**

Here's what everything means:

- *Page*: Choose which pages you want to export.
- *Quality*: See Chapter [15](#) for a brief discussion about Output Quality. Here's a good guideline: For documents that are small enough to be hand-held, I recommend a setting

of High. For anything bigger, go with Medium.

- *Layers*: PDFs can have layers, just like LayOut documents do. If it makes sense to do so, you can export a layered PDF so that people who view it can turn the layers on and off.
- *Finish*: Select this check box to view your PDF after it's exported.

5. **Mac only: Click OK to close the PDF Export Options dialog box.**

6. **Click the Export button (Save button on a Mac) to export your document as a PDF.**

## *Exporting an image file*

You can export the pages of your file as individual raster images in either JPEG or PNG format. Take a look at Chapter [13](#) for more information on the differences between JPEG and PNG if you need to. Follow these steps to export your LayOut document as one or more image files:

1. **Choose File⇒Export⇒Images.**

If you're on a Mac, choose File⇒Export and make sure PNG or JPEG is selected in the Export dialog box.

The Export Image dialog box opens.

2. **Name your file and tell LayOut where to save it on your computer.**

3. **Click the Save button (Options on a Mac).**

The Image Export Options dialog box opens.

4. **Set the Image Export options.**

Here's what each option means:

- *Pages*: Choose which pages you want to export. Each page in your LayOut document exports as a separate image file.
- *Size*: See Chapter [13](#) for a complete rundown on pixel size and image resolution.
- *Finish*: Select this check box to view your image after it's exported.

5. **Mac only: Click OK to close the Image Export Options dialog box.**

6. **Click the Export button (Save button on a Mac) to export your document as one or more image files.**

## *Exporting a DWG or DXF file*

You'd be hard-pressed to find a piece of professional computer-aided drawing (CAD) software that can't read the DWG and DXF formats, which are the industry standard for exchanging CAD files with people who use apps like AutoCAD and Vectorworks. Here's how to turn your LayOut document into a CAD file:

1. **Set all your SketchUp viewports to vector rendering mode.**

Here's the short version: LayOut treats your SketchUp models' edges as either *raster* (dots) or *vector* (math) information. Viewports that are rendered as rasters export to DWG/DXF as raster images. That's usually not what you want to happen — especially if you're exporting a CAD file. Follow these steps to make sure your viewports are vector images:

- a. *Select a model viewport and then click the View tab of the SketchUp Model panel. (Choose Window⇒SketchUp Model to open this panel.)*
- b. *Change the Rendering style drop-down list from Raster to Vector.*

Depending on the complexity of your model, LayOut may take a while to think.

- c. *Repeat the preceding two steps for each viewport.*



If a viewport contains a view whose edges you don't want to manipulate in CAD (such as a glitzy rendering), leave it as a raster.

## 2. **Choose File⇒Export⇒DWG/DXF.**

On a Mac, choose File⇒Export and make sure DWG/DXF is selected in the Export dialog box.

## 3. **Name your file, tell LayOut where to save it on your computer, and click the Save button (Options on a Mac).**

The DWG/DXF Export dialog box opens.

## 4. **Set the DWG/DXF Export options.**

Here's what all the knobs and switches do:

- *Format:* Unless you know you need a DXF, export a DWG file. As for which version, stick with the most recent one in the list.
- *Pages:* Choose which pages you want to export. Keep in mind that each page in your LayOut document exports as a separate file.
- *Output Space:* When you choose Paper Space, the lines in your resulting document file, when measured in the CAD program you use next, are exactly as long as they'd be on a piece of paper printed from LayOut. Choosing Model Space tells CAD to draw the lines at a particular scale. Here's an example:

You have a viewport that shows a plan view of your building at  $\frac{1}{8}$  scale. Your building is 80 feet wide, so it looks 10 inches wide in the drawing in LayOut.

If you export to Paper Space, open your drawing in AutoCAD, and measure your building, it'll be 10 inches wide — probably not what you wanted.

If you export to Model Space, choose  $\frac{1}{8}'' = 1'-0''$  as a scale, and then measure your building in AutoCAD, it'll be 80 feet wide. Most of the time, you want to choose Model Space.

- **Scale:** This setting is relevant only if you choose to export to Model Space. Pick the drawing scale that matches the scale of the viewports on the pages you're exporting.



If your pages have viewports at different scales, you have to export them separately to make sure all the scaling is accurate. Have two viewports at different scales on the same page? Only one of them will be correct in your exported file.

- **Layers:** Compared to the preceding two settings, this one's mercifully clear. Decide which layers will appear in your exported files.
- **Ignore Fills:** *Fills* are shapes that are drawn in LayOut and filled with a color or pattern.

5. **Mac only: Click OK to close the DWG/DXF Export dialog box.**

6. **Click the Export button (Save button on a Mac) to export your document as one or more DWG/DXF files.**

If your LayOut file included any inserted raster images (such as JPEGs or PNGs) you also end up with a folder that contains copies of those. They're necessary for the DWG/DXF files you produce.

## Going full-screen



Many times, design presentations for clients go beyond printed boards and booklets; they include a digital slide show that usually involves a few hours of work in a program like PowerPoint or Keynote. LayOut helps you skip the PowerPoint step by letting you display your presentation in a full-screen view. You can move back and forth between pages with the arrow keys on your computer, and you can even double-click SketchUp model views to orbit them. Follow these tips:

- ✓ **Switching to Presentation mode takes less than a second.** Choose View⇒Start Presentation to view your presentation full-screen. Press the Esc key to exit Presentation mode.
- ✓ **Specify where you want your presentation to appear.** Use the Presentation panel in the Preferences dialog box to tell SketchUp which monitor (or projector) you want to use to show your presentation.
- ✓ **Move from page to page.** Use the left- and right-arrow keys.
- ✓ **Choose which pages to show full-screen.** You can decide not to show certain pages in full-screen mode by toggling the Show Page in Presentations icon to the right of those page names in the Pages dialog box. (You have to be in List view to be able to do this.)
- ✓ **Double-click to change your view of a SketchUp model.** When you're in full-screen mode,

you can double-click any SketchUp model view to orbit and zoom around inside it. Just use your scroll wheel the same way you do in SketchUp. Click anywhere outside the view to exit.

- ✓ **Draw while you're in full-screen mode.** Try clicking and dragging while you're in full-screen mode; doing so lets you make red annotations right on your presentation. If a client doesn't like the porch you designed, scrawl a big, red *X* over it to let her know you understand. When you press Esc to exit Presentation mode, you can choose to save your annotations as a separate layer.
- ✓ **Play scene animations in full-screen mode.** You can double-click and then right-click a model view with scenes that you've set up in SketchUp; then choose Play Animation. LayOut transitions from scene to scene. You can read more about scenes in [Chapter 11](#).

# Chapter 15

## Diving Deeper into LayOut

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### *In This Chapter*

- ▶ Using layers and pages to streamline your work
  - ▶ Mastering inserted SketchUp model views
  - ▶ Letting LayOut handle the details with Auto-Text
  - ▶ Getting precise about dimensions
  - ▶ Drawing vector graphics and illustrations
  - ▶ Creating your own templates and scrapbooks
- 

Chapter [14](#) lays out the basics of LayOut: what it's for, where everything is, and how to use it to when you just need to get something done. This chapter is filled with hints, recommended techniques, and minutiae about the more powerful — but less obvious — aspects of SketchUp's sister app.

I start by discussing the way LayOut wants you to organize your documents. After that, you explore the intricacies of inserting SketchUp models and getting them to look exactly the way you want. You dig in to dimensions and discover how to create your own templates and scrapbooks. Customizing LayOut for yourself (or the rest of your team) shaves hours off your next project.

## *Staying Organized with Layers and Pages*

Here's something you already know: When you build a sophisticated document, cutting corners at the beginning of the process comes back to bite you when you need to make a last-minute change. Knowing *exactly* how LayOut's layers work gives you the confidence to use them all the time. The frustration you avoid late in the schedule (when it really counts) is easily worth the extra few minutes it takes to “work clean.”

### *Using layers to maintain your sanity*

LayOut has *layers* that (unlike SketchUp's layers) act just like layers in InDesign, Illustrator, Photoshop, and every other graphics program you've ever used. Layers let you

- ✓ Keep collections of similar elements separate and organized.
- ✓ Easily show or hide large numbers of elements at once.
- ✓ Lock elements so you can't accidentally change them.
- ✓ Stack one group of elements on top of another.
- ✓ Create design iterations by tweaking copies of the same elements.



Figure 15-1 shows a simple, one-page document with three layers. Different elements on the page are assigned to different layers. When you work with layers, keep these points in mind:

- ✓ **To know which is the active layer,** look for the little red pencil icon; anything you insert, draw, or paste is assigned to the active layer.
- ✓ **To make another layer the active layer,** click its name in the Layers panel.
- ✓ **To show or hide a layer,** click the eye icon next to that layer's name.
- ✓ **To change the stacking order of layers,** drag them around in the Layers panel.

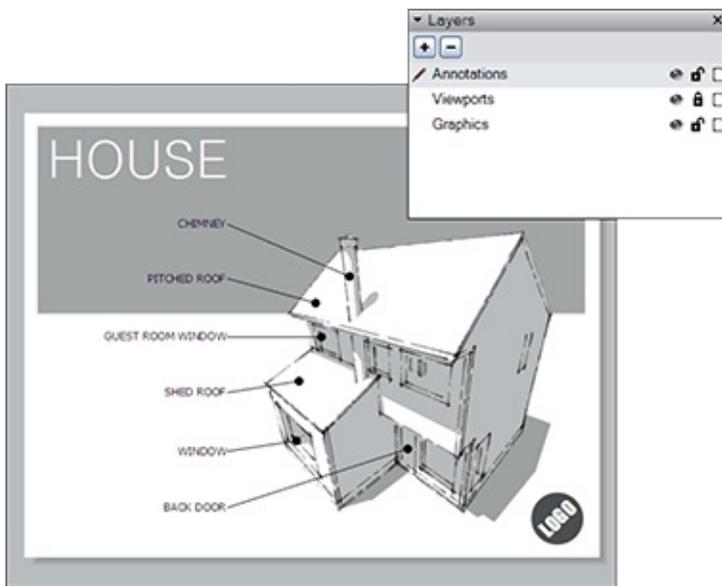


Figure 15-1: Layers let you organize the elements on your page.

- ✓ **To see what layer an element is on currently,** select the element and look for the tiny blue dot in the Layers panel. If you select two elements on two different layers, you see two blue dots.
- ✓ **To change which layer something's on,** select the destination layer in the Layers panel. Then right-click the element you want to move and choose Move to Current Layer. Selecting multiple elements, right-clicking one of them, and choosing Move to Current Layer moves them all.



I can hardly say this enough: Using layers is the absolute best way to work efficiently in LayOut. Check out the following tips for working with layers:

- ✓ **Give your layers meaningful names.** When you (or other people) open your file next year, you want to know what the heck is going on.
- ✓ **Lock layers you're not using.** I know it's annoying to have to unlock a layer before you can modify its contents, but it's even more annoying to accidentally move the wrong things or even delete them. Lock a layer by clicking the lock icon next to its name in the Layers panel.
- ✓ **Improve performance by hiding layers.** Make liberal use of the hide icon next to the name of

each layer; hiding layers can really improve LayOut's performance, especially on slower computers. Hide any layers you're not working with, and you'll notice the difference.

- ✓ **Move several elements from multiple layers to a single layer with Copy and Paste.** Copying elements from multiple layers and pasting them pastes them all on the same layer — the active one.
- ✓ **Group elements from different layers to create a group on the active layer.** This one bothers me sometimes, like when I'm trying to group a viewport and its dimensions. They start on separate layers and end up on the same one. Oh well.

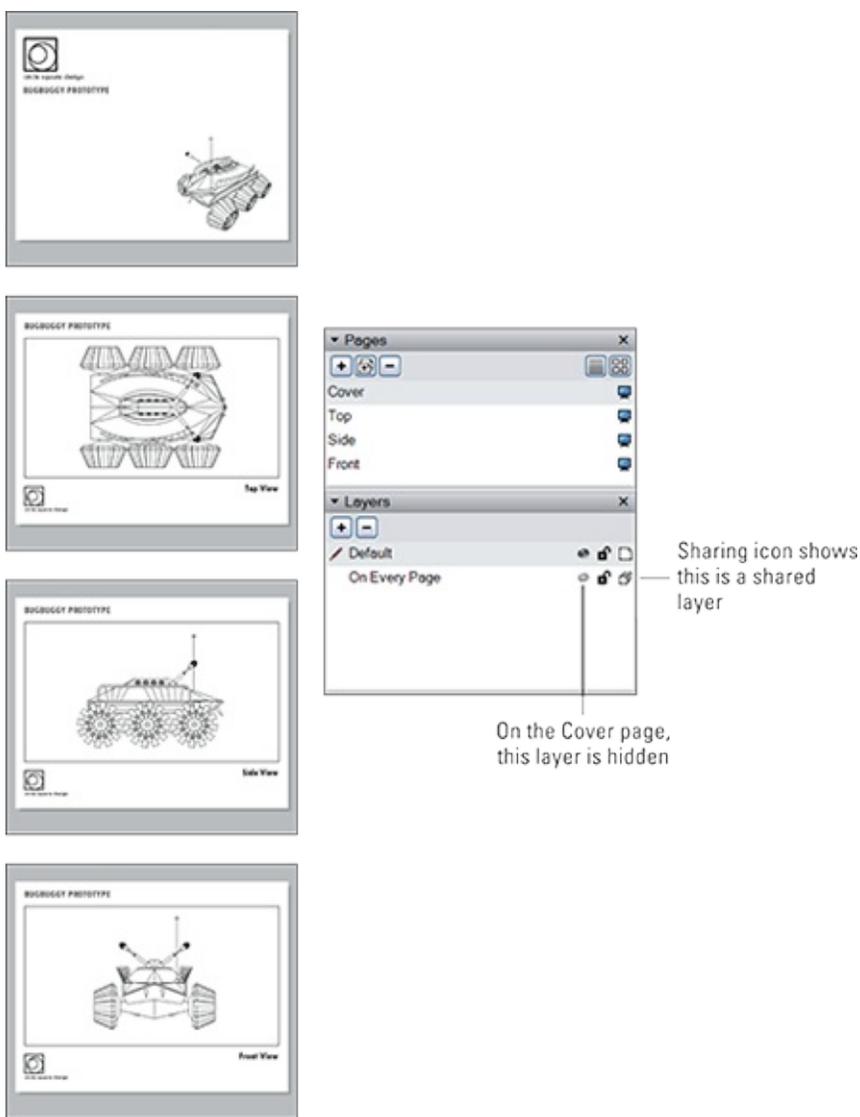
## *Making layers and pages work together*

You can use layers to make certain elements appear on more than one page in your document. LayOut has two kinds of layers:

- ✓ **Unshared:** Any element (text, graphic, or otherwise) that you put on an unshared layer exists only on one page: the page you're on when you put the element on the layer.
- ✓ **Shared:** LayOut introduces the notion of *shared layers*; anything you put on a shared layer appears on every page of your document, as long as those pages are set up to show that layer. Think logos, title blocks, page numbers, page titles, important dates, and other elements that need to be exactly the same on most pages.

Shared layers can confuse new LayOut users, so here are a few quick tips about how you organize content on layers — including shared layers — as you create presentations in LayOut:

- ✓ **You can make any layer a shared layer by clicking the sharing icon to the right of its name in the Layers panel. (See Figure [15-2](#).)**



**Figure 15-2:** A simple document with two layers: one that's shared and one that isn't.

- ✓ **You can make an element (such as a logo) appear in the same spot on more than one page by putting it on a shared layer.** For example, the logo and the project title need to appear in the same spot on every page; I put these two elements on the shared On Every Page layer. In Figure 15-2, note how the logo and project title appear in exactly the same place on the second, third, and fourth pages.



- ✓ **With the addition of Auto-Text in the latest version, shared layers are more important than ever.** Put placeholders for elements such as page numbers and page titles in the same place on every page and let LayOut take care of inserting the correct information. Read all about Auto-Text later on in this chapter.
- ✓ **Put content that appears on only one page on an unshared layer.** Again, on the last three pages of the document shown in Figure 15-2, the image boxes are different on each page, so I put them on the unshared Default layer.
- ✓ **You decide which pages should show which layers.** For example, I don't want the logo and the project title to be on the cover (first) page. I toggle the show/hide icon beside the On Every Page layer to hide it on that page.



I like to work with at least four layers, organizing content on each as follows:

- ✓ Elements that should appear in the same place on almost every page, such as logos and project titles
- ✓ Things that appear in the same place on most pages, but that change from page to page, such as numbers and page titles
- ✓ Content (such as images and SketchUp model views) that appears only on a single page
- ✓ Unused stuff that I'm not sure I want but that I don't want to delete

## Working with Inserted Model Views

Being able to choose views of your SketchUp models and put together documents to present them is what LayOut is all about. Text, vector drawing, raster images, and everything else aside, LayOut is a tool for presenting SketchUp models.

This section is about two things: managing the model views that you've inserted into your LayOut document and controlling how they look. You accomplish both by fiddling with the controls in the SketchUp Model panel, which you can open by choosing Window⇒SketchUp Model from the menu bar.



To insert a view of a SketchUp model into your LayOut document, all you have to do is choose File⇒Insert and pick the model you want to work with. Creating the look you want, on the other hand, is a whole lot trickier — and that's where the following sections come into play.

### Framing exactly the right view



A SketchUp model view that lives in your LayOut document is a *viewport*. You can have multiple viewports that show the same model. For example, you may have different viewports for a top view, a perspective, and a section through a building you're designing. They're all linked to the same model but show it in different ways.

The next few sections provide specific advice on setting up different model views in your documents' viewports.



Of course, your LayOut document can also have viewports that correspond to more than one SketchUp model. Some folks don't realize that, so I thought I'd point it out.

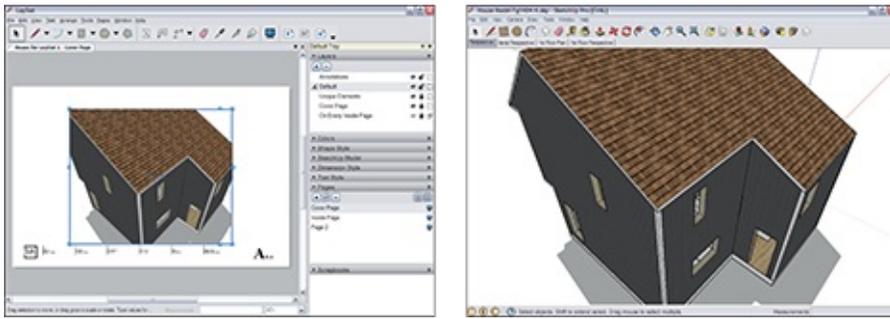
### Seeing precisely what you want to see

When you insert a SketchUp model into a LayOut document, it shows up in a new viewport. Not only that — it shows up looking exactly the way it did in SketchUp when you saved it. (See Figure

## 15-3.)

Saving while on this view in SketchUp...

...yields this view when you insert the model into LayOut



**Figure 15-3:** Newly inserted SketchUp models look just like they did when you saved them.

You can do a couple of things to change your viewport's point of view: Use the Camera tools or edit scenes with the Model panel.

### Using the Camera tools directly

Double-clicking a viewport with the Select tool is a little bit like activating SketchUp from inside LayOut. The model looks different (worse, usually) than it did — that's because you're looking at the model itself instead of the rendered image of it that LayOut made when you inserted it. To change your point of view, you can

- ✓ Orbit, zoom, and pan around using your mouse, exactly the way you do in SketchUp.
- ✓ Right-click the viewport and choose a specific Camera tool from the context menu.

When you're done repositioning your model, click somewhere else to stop editing the viewport. LayOut re-renders the view, and your model goes back to looking nice and crisp.

### Using scenes and the SketchUp Model panel

Using the SketchUp Model panel is by far my preferred method for controlling what's visible in viewports. Instead of messing around with the Camera tools, choose a scene to display from the Scenes drop-down list in the panel's View tab; see [Figure 15-4](#).



**Figure 15-4:** Use the View tab of the SketchUp Model panel to control your viewport's point of view.



Of course, working this way requires that you first set up scenes in your SketchUp model, but that's not hard at all; [Chapter 11](#) describes the simple process of creating and working with scenes.

Setting up the views you want to use in LayOut by saving scenes in SketchUp makes things easier

for four main reasons:

- ✓ **You can see more.** Your SketchUp modeling window is bigger than your viewport in LayOut, so it's easier to see what you're doing.
- ✓ **You can go back to a previous view.** Repositioning your model in a LayOut viewport is kind of a temporary measure; if you change things, there's no way to come back to the view you set up previously. SketchUp scenes, on the other hand, are views that you can always return to.
- ✓ **You can show section cuts.** Scenes are the *only* way to save views of your model with different section planes active.
- ✓ **You have more control over shadows, fog, and styles.** LayOut provides basic tools for fiddling with other aspects of your viewports' appearance, but they're nowhere near as easy to use as the ones in SketchUp.



If the scenes you created in SketchUp aren't visible in the SketchUp Model panel, you probably forgot to save your model before you switched applications. You also need to make sure your viewport is current; right-click it and choose Update Reference to make sure everything's up-to-date.

Figure [15-5](#) shows a LayOut page with three viewports on it. All three show the same model. Before I laid out this page, I created three scenes in SketchUp:

- ✓ **Large plan view:** To get this point of view, lop off the top of the model (temporarily, of course) by adding a section plane about 48 inches from the floor. Turn off Perspective view (Camera⇒Parallel Projection) and choose a top view (Camera⇒Standard Views⇒Top). Apply a Hidden Line style to make it black and white and then choose View⇒Section Planes to hide the section plane. Update the style and turn on Shadows to help the model read better on the page.
- ✓ **Smaller perspective views:** To create these two scenes, use a little trick: Create two section planes a couple inches apart. Point one down and the other up; right-clicking a section plane lets you reverse it (Edit⇒Section Plane⇒Reverse) — whatever was hidden becomes visible and vice versa.

## Cropping with clipping masks

*Cropping* an image means reframing it so that you can see only part of it; every page-layout program on the planet allows you to crop images, and each one insists that you do it a little differently. LayOut is no exception.

In LayOut, use *clipping masks* to hide the parts of images — and viewports — that you don't want to see. Follow these steps to use a shape as a clipping mask:

1. **Draw the shape you want to use as a clipping mask and make sure that it's positioned properly over the image you want to crop.**
2. **Use the Select tool to select both the clipping mask object and the image you want to crop.**
3. **Right-click the selected elements and choose Create Clipping Mask from the context menu.**

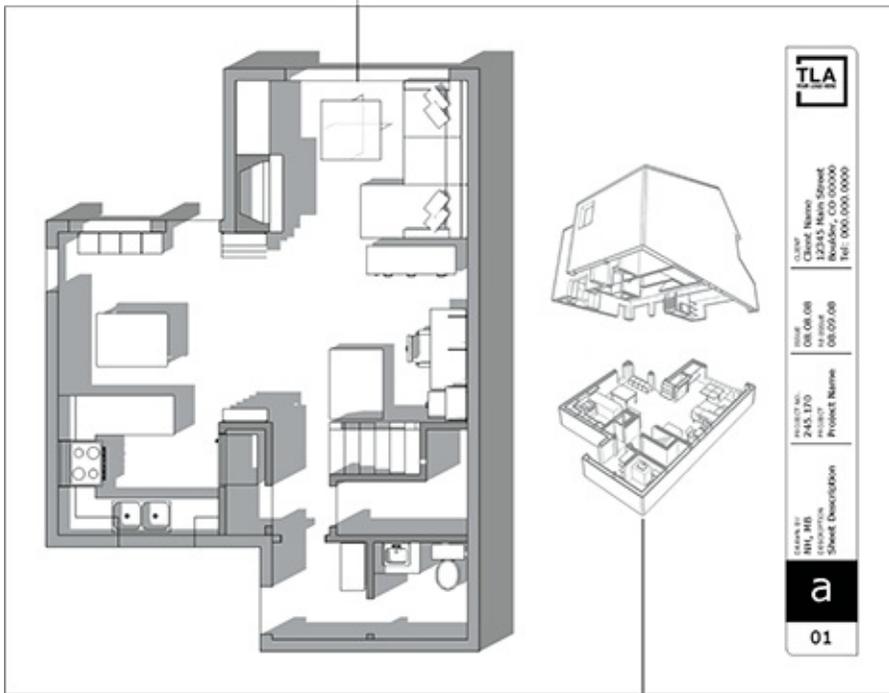
Here are some fun facts about clipping masks in LayOut:

- **Clipping masks work on inserted images.** This includes both raster images and SketchUp model viewports.
- **Deleting clipping masks is easy.** To see a whole image again, select the image and choose Edit⇒Release Clipping Mask.
- **Edit clipping masks by double-clicking them.** When you double-click a clipping mask, you can see the whole image and the shape you used to create the mask. Then you can modify the shape, the image, or both. Clicking somewhere else on your page exits the edit mode.

## Creating scaled orthographic views

With the addition of honest-to-goodness dimensions (both linear and angular) to LayOut in SketchUp Pro 8, people have started to push the limits of what LayOut was intended to do. LayOut was never supposed to be a 2D drafting tool; its toolset has always been closer to Illustrator than to AutoCAD. That said, you absolutely can put together scaled drawing sets, complete with title blocks, symbols, dimensions, and other forms of annotation.

SketchUp model with Section Plane and shadows turned on



Model with Perspective turned on

**Figure 15-5:** Three viewports inserted in a LayOut document.

The first step in creating a dimensioned drawing is to turn your viewport into a 2D orthographic view of your model. (See Chapter [11](#) for an introduction to orthographic views.) Although you can use the controls in the SketchUp Model panel to accomplish this, my favorite way is to go back to the model and create a scene.

Follow these steps to save an orthographic scene in your SketchUp model and assign it to a viewport in LayOut:

1. **In LayOut, right-click (with the Select tool) the viewport that contains your model and choose Open with SketchUp.**

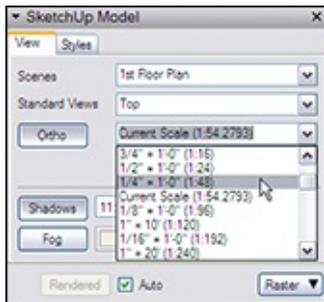
2. **If you plan to have an active section cut in your view, add it to your model (if you haven't already).**

Chapter [11](#) explains how to make section cuts.

3. **In SketchUp, choose Camera⇒Parallel Projection; then choose Camera⇒Standard Views⇒Top (or any other option from this list except Iso).**
4. **Zoom and pan (but don't orbit) until you have the view you want and then choose View⇒Animation⇒Add Scene.**
5. **Save your model and close it.**
6. **In LayOut, right-click the viewport and choose Update Reference.**
7. **In the View tab of the SketchUp Model panel, choose your new scene to associate it with the viewport.**

Now that you have an orthographic view of your model, you can assign a scale to it. Here's everything you need to know about that:

- ✓ **Assign a scale using the scale drop-down list in the SketchUp Model panel. (See [Figure 15-6](#).)** Don't forget to select the viewport you're working on first.



**Figure 15-6:** Use the SketchUp Model panel to assign a scale to your viewport.



- ✓ **Create your own scales if you want.** Need a scale that doesn't appear in the default list? Choose Edit⇒Preferences (LayOut⇒Preferences on a Mac) to open the Preferences dialog box; then click Scales on the left. Click the plus sign to add a new scale to the list. Scales you add are available for any LayOut file you're working on.
- ✓ **Make sure Preserve Scale on Resize is selected.** After you assign a scale to a viewport, you probably want to manually resize its boundaries with the Select tool. Before you do, make sure the Preserve Scale on Resize check box (in the SketchUp Model panel) is selected. If it's not, you change the scale of your model view when you try to resize its viewport.

## Filling shapes with hatching and patterns

A recent addition to LayOut's bag of tricks is the ability to fill shapes with patterns. This is no small thing — when pros such as architects and engineers create drawings, they often need to represent different materials using standardized patterns called *hatches*. LayOut comes with a collection of some of the most common hatches (which it calls Material Symbols),

as well as ones for Geometric Tiles, Site Patterns, and Tonal Patterns (which include dots and lines of various sizes). Using pattern fills is pretty straightforward, and you find them under Pattern Fill in the default tray.

## Making your models look their best

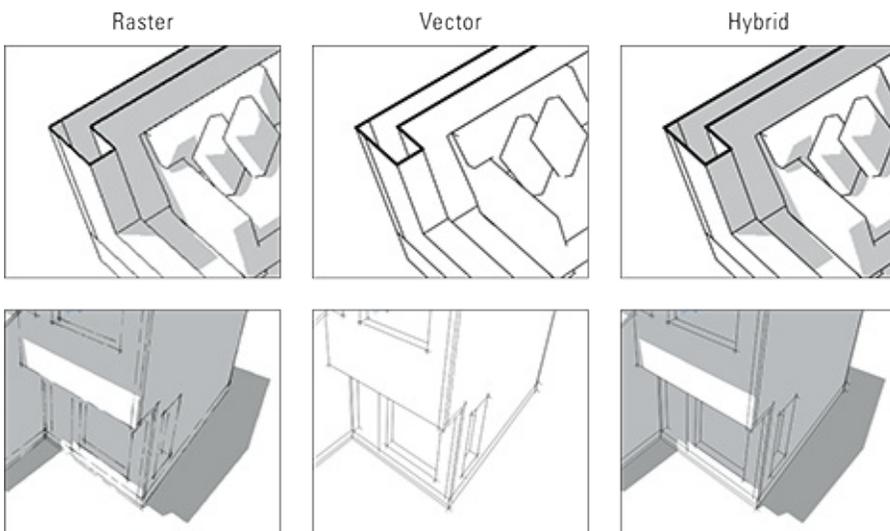
Getting your models posed correctly on the page is only half the battle; they also need to look readable and compelling. That's what this section is about. You discover how LayOut renders, or draws, your models on the page and how adjusting line weights can make your drawings look their best.

### Choosing raster, vector, or hybrid

Every time you insert or edit a SketchUp model view, LayOut renders an image of your model to display in the viewport. This rendering process is just like exporting an image from SketchUp; it can produce either a raster or a vector, depending on the settings. Take a look at Chapter 13 for more information about raster and vector images.

You control how your models look by choosing which method LayOut uses to render each viewport. Simply select an option from the rendering method drop-down list in the lower-right corner of the SketchUp Model panel. You have three choices, which I illustrate in Figure 15-7:

- ✓ **Raster:** Renders your viewport as an image comprising many, many little dots. If your model is rendered as a raster, it can display sketchy styles, shadows, and other effects that make it look like it does in SketchUp. On the other hand, printing or exporting a raster image at large sizes involves truckloads of pixels, and that can make LayOut choke. See the nearby section “[Balancing performance and quality](#)” to find out more.
- ✓ **Vector:** Renders your selected model view as a vector image. Lines appear smooth and crisp, but things like shadows, textures, and sketchy styles don't appear. Also, choosing vector rendering for really complex models can take a long time to process.
- ✓ **Hybrid:** Combines clean vector lines with rich raster faces, shadows, and other goodies. Behind the scenes, LayOut actually renders twice — once as a vector and once as a raster. Hybrid rendering takes even longer than vector rendering, but it produces very nice results. If you have time, try hybrid rendering to see how it looks.



**Figure 15-7:** Choose a rendering method for each viewport in your LayOut document.



I tend to use raster rendering for views of my models that involve Sketchy Edges styles and for any model with a lot of geometry. I prefer hybrid or vector rendering for any plans, sections, or other views that feature a lot of line work.

### ***Balancing performance and quality***

LayOut places rendered images of your SketchUp models into viewports on the page; that's why your models look so much better in LayOut than they do in SketchUp's modeling window. But that's also why LayOut can feel so slow at times — rendering is a very time-intensive activity. Luckily, you have a couple of ways to manage LayOut's speed:

#### **Manage your rendering resolution**

At the bottom of the Paper pane (File⇒Document Settings), you find two settings: Edit Quality and Output Quality. They both control the pixel resolution of raster-rendered viewports in your document. Low correlates to a resolution of 72 ppi (pixels per inch), Medium to 150 ppi, and High to 300 ppi. The higher the resolution, the more pixels LayOut has to figure out — and the longer it takes to render. By default, both settings are set to Medium for every new document you create.

When I work with big raster- or hybrid-rendered viewports, I dial down my Edit Quality to Low. Doing so doesn't adversely affect the quality of my exports and prints; both of those are controlled by Output Quality. What it does is ask LayOut to draw far fewer pixels every time I fiddle with a viewport. It makes a big difference — believe me.

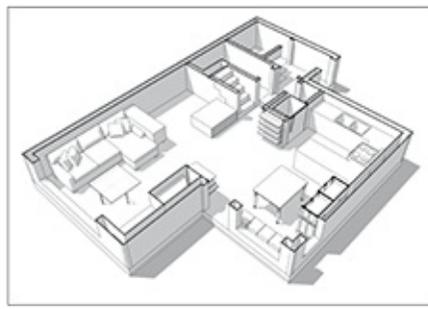
#### **Switch off auto rendering**

Notice the controls in the lower-left corner of the SketchUp Model panel? (Refer to Figure [15-6](#).) When the Auto check box is selected, LayOut automatically re-renders a viewport every time you edit it. If your model is big and heavy, you have to wait while LayOut works, and that can get old, fast. Deselecting the Auto check box lets *you* decide when LayOut should render your viewports. Just select a viewport and click the Render button (also in the SketchUp Model panel) to tell LayOut to start cranking.

#### ***Line Weight***

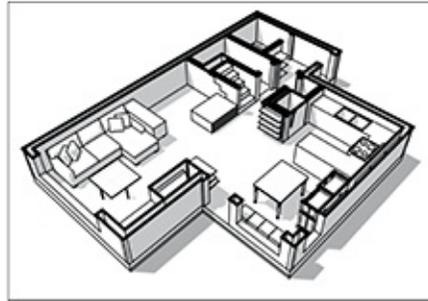
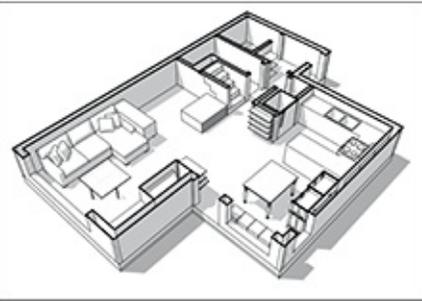
The SketchUp Model panel's second tab — Styles — contains what one of the most important settings in all of LayOut. In the lower-left corner, the Line Weight field lets you control how bold your models look. Take a look at Figure [15-8](#) to see what I mean.

0.25 point



0.5 point

1 point



**Figure 15-8:** Use the Line Weight field to make your models look their very best.

The number you put into the Line Weight field tells LayOut how thick to draw the thinnest lines in your viewport. Entering **2** yields edges that are 2 points wide. Typing **0.25** makes your edges a quarter point wide — much thinner and (in many cases) much nicer.



Changing the Line Weight number is the single best thing you can do for your models in LayOut. The line weights you use depend entirely on the size of your viewports and the complexity of your drawings. Try to avoid making anything look too wispy or too chunky — the key here is *readability*.



If the style that's applied to your viewport has Profiles enabled, some edges look thicker. To change the thickness of Profiles in a LayOut viewport, you need to edit the style that defines them in the SketchUp model. Profile thickness is always a multiple: A setting of **4** produces Profiles that are four times as thick as regular edges. Check out Chapter [10](#) for more about styles and how to edit them.

## *Simplifying Your Life with Auto-Text*



For years, the number one LayOut feature request was Automatic Page Numbering. In a long document, it's a pain to have to manually number your pages — especially when you add or remove a page in the middle. Aren't computers smart enough to figure out this kind of stuff on their own?

For LayOut 2014, the folks on the SketchUp team decided to add something even more useful: Auto-Text is a new feature that provides page numbering, but it also lets you add placeholders for lots of other kinds of text information. Like cellphones and Google, Auto-Text is one those things

that will make you wonder how you ever got along without it. It saves hours of mind-numbing, repetitive drudgery, which is exactly what good tools (and summer interns) are supposed to do.

## Using Auto-Text tags

When you want LayOut to automatically fill in some text in your document, all you have to do is insert a *tag*. Tags are preset words that act as placeholders in your text boxes. Here are two things you should know about them:

- ✓ **You can add an Auto-Text tag to a text box in two ways.** You'll probably start by using the first method and graduate to using the second as you gain experience:
  - *Choose from a list.* To see a list of tags that you can use in your document, place your text cursor in any text box and choose Text⇒Insert Auto-Text from the menu bar.
  - *Type it in yourself.* If there's a tag called <PageNumber> you know you want to use, just type exactly <**PageNumber**> into the text box. When LayOut sees a word enclosed in <angle brackets>, it knows to look for an Auto-Text tag.
- ✓ **Format Auto-Text tags however you like.** Just like you do with any ol' piece of text, assign any font, size, and color to text that happens to be a tag.

Follow these simple steps to see how it's done:

**1. In the Layers panel, click the + button to create a new layer called Page Numbers.**

Page numbers don't need to be on their own layer, but I find it easiest to keep everything in my documents separate.

**2. Make your new layer shared by clicking the sharing icon next to its name.**

Putting your page number on a shared layer gives you the flexibility to move it around on the page without messing up your document; any changes you make to it will automatically be reflected on every other page.

**3. Use the Text tool to add a text box to the page you're on.**

Don't worry about formatting right now — save that for after you've inserted an Auto-Text tag.

**4. Choose Text⇒Insert Auto-Text⇒<PageNumber> to add the relevant tag to your text box.**

Make sure you're editing the text box before you do this; the menu selection won't be available unless you are.

**5. Format the new text any way you want.**

You can change the font, point size, and alignment, for example.

**6. Flip through your other pages to make sure everything's working.**

Your page numbers should be styled the same way on every page.



Want to ask LayOut to automatically insert page titles for you? Just follow the preceding steps but choose the tag `<PageName>` in Step 4. Whatever you've titled your pages in the Pages panel will automatically appear wherever you use that tag.

## Customizing Auto-Text tags

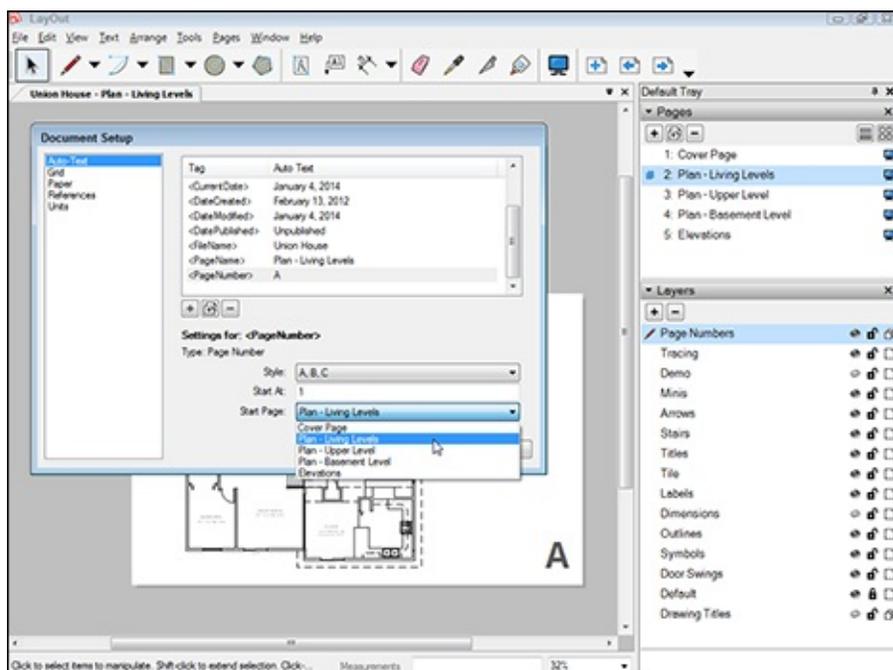
By no means are you limited to using the tags that come with LayOut — that's part of what makes this feature so powerful. You can edit existing tags and even make your own from scratch. The key to managing Auto-Text tags is the new Auto-Text section of the Document Setup dialog box.

### Editing existing tags

Editing an existing tag is just a matter of choosing it from the list and changing its settings. Which settings are available depends on what type of tag it is. You can see a complete list of tag types in the next section.

For the sake of consistency, suppose you want to change the settings for the tag `<PageNumber>`. You want to use uppercase letters instead of numbers, and you don't want your page numbering to start until the page called Plan - Living Levels (which isn't the first page in your document). Follow these steps to make the changes and look at Figure 15-9 for a visual reference:

1. **Choose Text⇒Customize Auto-Text to open the Document Setup dialog box.**
2. **Click the `<PageNumber>` tag. It's near the bottom of the list.**
3. **Choose A, B, C from the Style drop-down menu.**
4. **Leave the value next to Start At set to 1 to start numbering at the letter A.**
5. **Choose Plan - Living Levels from the Start Page drop-down menu.**



**Figure 15-9:** Editing the `<PageNumber>` tag to use letters instead of numbers.

## Making your own Auto-Text tags

To add a new tag to the list of options, you can either create one from scratch or duplicate an existing one. Use the Add (+), Duplicate, and Delete (–) buttons below the list to manage the tags in your document.

If you decide to make a new tag from scratch, the first thing LayOut asks you to do is pick a *type* from the following list:

- ✓ **File Name:** Inserts the current file name, with or without its *full path* (location on your hard drive) and file extension (.layout).
- ✓ **Page Name:** Inserts the page name you've typed into the Pages dialog box.
- ✓ **Page Number:** Inserts the current page number as numbers, letters, or roman numerals. You can choose where to start numbering.
- ✓ **Custom Text:** Inserts whatever text you type into the field. Use this option for names, addresses, and other static information.
- ✓ **Current Date:** Always updates to show the current date.
- ✓ **Date Created:** Inserts the date you first created the document. Choosing File⇒Save As resets this date, so be careful with this tag.
- ✓ **Date Modified:** Inserts the date you last saved changes to the document.
- ✓ **Date Published:** LayOut considers your document published whenever you print or export it.

After you pick one of the preceding types for your new tag, you give it a name (make it descriptive) and fiddle with the rest of the settings in the Auto-Text pane.

## Getting fancy: Page numbering for multiple sections

A common thing to do in longer, more complicated document sets is to have sections dedicated to each drawing type, where the page numbering actually tells you something about what's on the page. In architectural sets, it's common to put plan views on page numbers that begin with 101. After that, you have elevations, which start on page 201. The 300s are reserved for sections, 400s for larger-scale views, 500s for details, and so on. If that isn't complicated enough, it's also typical to use a different letter prefix (*A* for architectural, *S* for structural, *M* for mechanical) to indicate which discipline is associated with each drawing set.

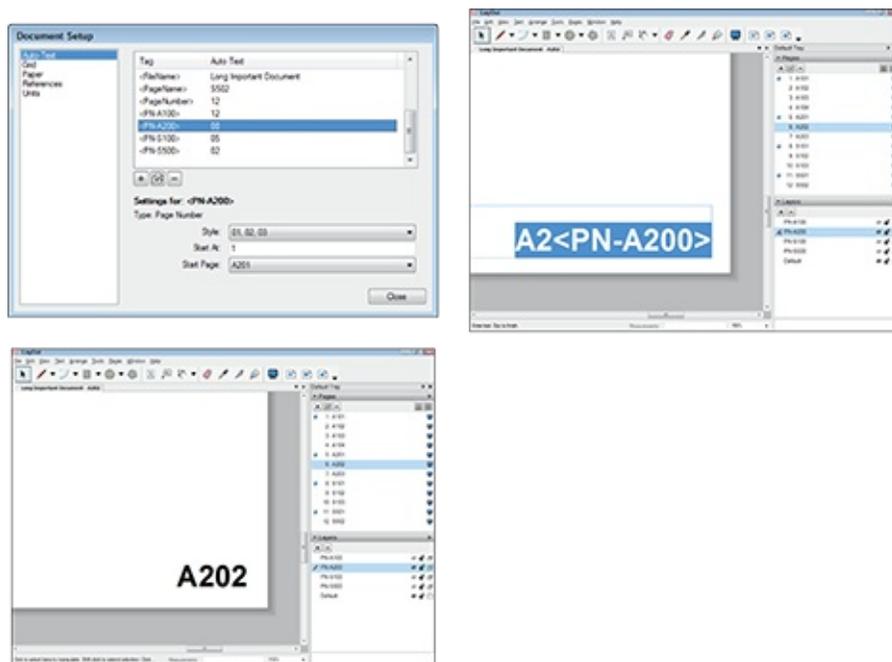
No problem. Just create a unique tag, shared layer, and text box for each section in your document. Follow these steps, and you'll do just fine:

### 1. Create a new Page Number tag for each section you want to number separately.

Suppose you have a document that includes architectural plans (A100s) and elevations (A200s), as well as structural plans (S100s) and details (S500s). That's four sections, so you need four Page Number tags: <PN-A100>, <PN-A200>, <PN-S100>, and <PN-S500>. You set each tag's Style to 01, 02, 03 and tell it to start at the first page of its section in your document. The first part of Figure [15-10](#) shows what the Auto-Text pane in Document Setup would look like for the <PN-A200> tag.

## 2. Add a new shared layer for each section's page number.

In this case, you need four shared layers — one for each section. Keep in mind that each shared layer should be visible only on its section's pages. The second part of Figure [15-10](#) shows the Layers panel configuration for this scenario.



**Figure 15-10:** Setting up a page numbering system for a document with multiple sections.



To turn a regular layer into a shared layer, click its sharing icon in the Layers panel. If you want to make it invisible on certain pages, click its visibility icon wherever you don't want it to show up.

## 3. Make a new text box on each section's shared Page Number layer.

To make the page numbers on your pages look the way they're supposed to, you combine regular text with an Auto-Text tag in the same text box. For the section which includes architectural elevation views, you type `A2<PN-A200>`, which translates to `A202` for the second page in that section. Copy, paste, and modify for each of the other three sections, and you're done. The last part of Figure [15-10](#) provides a much-needed picture.



Auto-Text tags and LayOut templates go together like peanut butter and chocolate. Unfortunately, the tags you set up are specific to the file you're working on, and you have no way to import or otherwise load a set of tags into an existing file. As a result, the only efficient way to work in an environment where you're always creating the same kind of document is to make a template that includes your custom tags (and shared layers) and to start with that template every time. Read all about templates at the end of this chapter.

# Discovering More about Dimensions

When dimensions were added to LayOut in SketchUp 7.1, designers, architects, engineers, woodworkers, and all kinds of other people jumped for joy. With the addition of *angular* dimensions in SketchUp Pro 8, LayOut became a full-fledged tool for creating scaled, annotated drawings from your models.

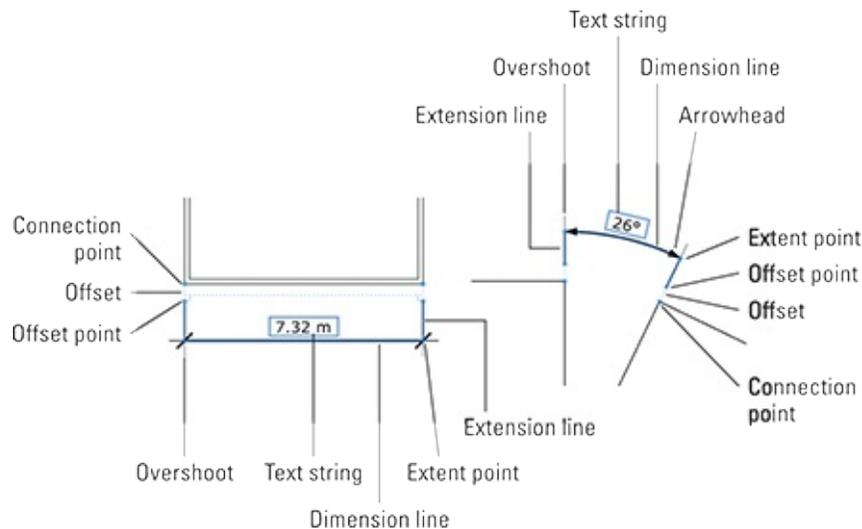
I provide a decent-sized set of instructions for using both of LayOut's dimension tools in Chapter [14](#); flip to there if that's the extent of the help you need right now. In the interest of not making this book longer than it needs to be, I don't repeat that information here.



If you have trouble getting your dimension tool to see any of the points in a model viewport, chances are good that you don't have Object Snaps (Arrange⇒Object Snaps) turned on.

## Editing your dimensions

After you actually draw a dimension — linear or angular — on your page, you can do an awful lot to change what the dimension looks like. To begin with, take a look at the anatomy of a dimension. Figure [15-11](#) shows an example of each kind.



**Figure 15-11:** The anatomy of a LayOut dimension. Linear on the left, angular on the right.

Now that you're clear on nomenclature, here's some advice on making the kinds of changes you may want to make:

- ✔ **Use the Shape Style panel** to change colors, line styles, line weights, and arrow styles (the things at the ends of dimension lines). Basically, the Shape Style panel is for controlling everything about your dimensions except their text strings.
- ✔ **Use the Dimension Style panel** to change the format of text strings and their level of precision. Skip ahead a page or two for a more in-depth look at the Dimension Style panel.
- ✔ **Double-click a dimension to get access to all its internals.** After you've double-clicked to start editing a dimension, you can move its connections points, offset points, or extent points all you like.

- ✓ **Click and drag to move a text string.** Need to reposition a text string to make it more legible? Just drag it someplace else after you've double-clicked the dimension to edit it, of course.
- ✓ **Double-click twice more to edit a text string.** That's three double-clicks in total; this clearly isn't something the folks on the LayOut development team thought you'd do very often.
- ✓ **Select individual lines to edit them individually.** After you double-click a dimension, you can select its constituent lines one at a time. I like to draw my dimension lines slightly thicker than my extension lines; selecting the former individually lets me do that.
- ✓ **Overshoots can be tricky.** The *overshoot* (as shown in Figure [15-11](#)) is the part of an extension line that extends beyond the dimension line. You can adjust your overshoot's length if you like. Here's how:
  - a. *Double-click a dimension to edit it.*
  - b. *Click to select the extension line whose overshoot you want to adjust.*
  - c. *Change the number beside the End Arrow setting in the Shape Style panel.*

Unfortunately, there's no way to alter both extension lines' overshoots simultaneously. What I recommend is to change one and choose Edit⇒Copy Style; then select the other and choose Edit⇒Paste Style.



Copying a dimension's style and applying it to your other dimensions is pretty easy. Just use the Style tool to transfer formatting from one dimension to the other. To sample a dimension's style so that every new dimension you draw matches it, activate the tool, tap the S key, and click your source dimension before you draw the next one.

Take a gander at the Dimension Style panel, as shown in Figure [15-12](#). Most of the controls here are obvious, but some definitely aren't. Diving right in:

- ✓ **Text position:** Choose to display a text string above, below, or right smack dab in the middle of its corresponding dimension line.
- ✓ **Text alignment:** Force a text string to always be horizontal or vertical on the page, or aligned (parallel) or perpendicular to its dimension line.
- ✓ **Display units:** People who use the Imperial system of measurement tend to show the units on their dimensions. Metric folks tend not to. You have the choice.
- ✓ **Auto Scale button:** Here's where dimensions start to get a bit complicated. For a full discussion of what the heck this button does, see the next section.
- ✓ **Scale drop-down list:** This is available only when Auto Scale is deselected. Skip ahead to read all about model space and paper space. Getting your head around this topic takes time.
- ✓ **Length:** Different professions have different conventions for the dimensions they put on their drawings. Choose the one that suits you best.
- ✓ **Precision:** If you dimension the overall length of an airport runway, you probably don't need

to be accurate to the 1000th of an inch. If you design an artificial heart valve, on the other hand

...

- ✔ **Angle:** Degrees or radians — you decide. Sometimes it's easy to forget that software is made by math nerds.

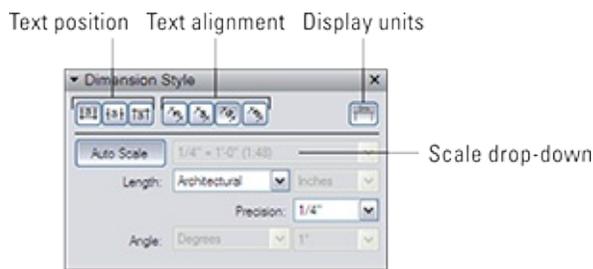


Figure 15-12: The Dimension Style panel.

## Keeping track of model space and paper space

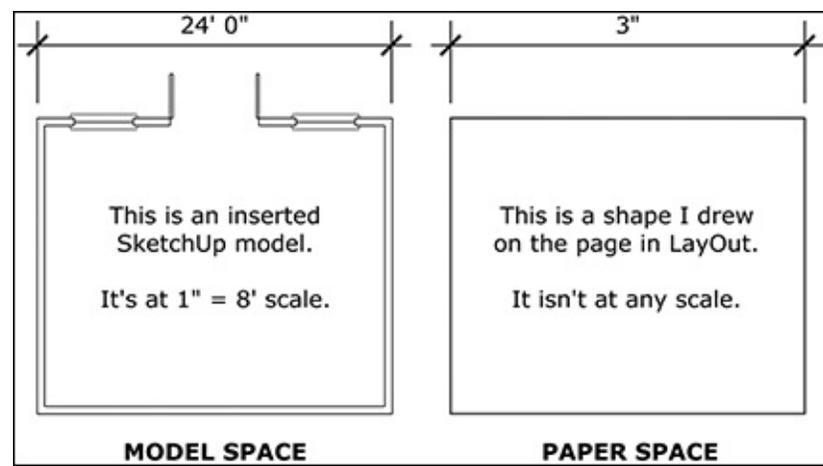
When you place a SketchUp model viewport on your page, you end up with two types of space in your LayOut document:

- ✔ **Paper space:** Distances that pertain to the physical sheet of paper you're working on are said to be in *paper space*. A 4-x-4-inch blue square in paper space is 4 inches long.
- ✔ **Model space:** Distances within a model viewport have nothing to do with the size of the sheet of paper the viewport is on. An 80-x-80-foot building shown at 1 inch = 8 feet scale is 80 feet long in model space. In paper space, it's 10 inches long.

A dimension you draw in LayOut is either in paper space or in model space. Which one the dimension is in by default depends on what the dimension is connected to:

- ✔ **Viewports:** When you draw a dimension between two points in a model viewport, LayOut is smart enough to presume that you want to display the length between the points *in the model* (in model space).
- ✔ **Everything else:** When you create a dimension between two points that have nothing to do with a viewport, LayOut assumes that you want to see the *actual length on the page* (in paper space).

Figure [15-13](#) shows what I mean. Both dimensions are exactly the same physical length on the page: 3 inches. The difference is that the dimension on the left is attached to two points on a SketchUp model that's shown at 1 inch = 8 feet scale. It displays the *model space* length of 24 feet (3 x 8), whereas the dimension on the right just shows its *paper space* length of 3 inches.



**Figure 15-13:** Dimensions can either show model space or paper space.



The Auto Scale button in the Dimension Style panel is automatically selected whenever you create a new dimension. If your dimension touches a point in a model viewport, the text string displays the length in model space. If it doesn't touch any model viewport at all, you get a length in paper space.

Turning off Auto Scale lets you assign a scale to the dimension you select. Choosing 1 inch = 60 feet for a dimension that's physically 4 inches long makes its text string read 240 feet — no matter what it's attached to.

## Drawing with LayOut's Vector Tools

LayOut includes a full slate of drawing tools that you can use to create logos, title bars, north arrows, graphic scales — anything you want. The drawings you create are *vectors*, meaning that you can do the following:

- ✓ Scale the drawings without losing quality.
- ✓ Change the fill and stroke (outline) colors.
- ✓ Split lines and then rejoin them to make new shapes.

Because I don't know what you want to draw, a step list would be pretty pointless here. Instead, here are a few pointers to get you started:

- ✓ **Use the right kind of snaps.** You can snap to objects or to a grid via the Arrange menu.
- ✓ **Type measurements and angles.** LayOut has a Measurements box (in the lower-right corner of your screen), just like the one in SketchUp. Take a look at [Chapter 2](#) for tips on working accurately with this box.
- ✓ **Build complex shapes out of simpler ones.** For example, you can combine a triangle and a rectangle to create a thick, blocky arrow.
- ✓ **Open the Shape Style dialog box.** Use the Shape Style dialog box to change the fill and stroke characteristics of elements in your document. In plain English, this is where you pick colors and patterns for the things you draw. The controls are straightforward, so you don't need much

help from me; just experiment and see what happens.

# Customizing LayOut with Templates and Scrapbooks

When you've made your own templates and scrapbooks in LayOut, you know you've arrived. Every time you need to put together a drawing set, all you have to do is open your template (which already includes your logo, title block, layout, Auto-Text tags, and text styles) and insert your model.

Need to add your firm's custom symbols? Just open one of your scrapbooks and drag the symbols onto your pages. Having a collection of your own templates and scrapbooks means never starting all over again at the last minute — which is when most LayOut files are made.

## Creating your own templates



Most of the design presentations that you (or your firm) put together probably look alike — after all, they're part of your brand identity. If the presentation documents you make are all variations on a couple themes, why not build your own templates and use them every time you need to start a new project? You can set up LayOut so that your templates appear in the Getting Started dialog box, making it easier to build consistent presentations, quicker.

Follow these steps to turn any LayOut file into a template:

### 1. **Build a LayOut file that includes all the elements you want.**

These elements may include a title block, a logo, page numbering, and a cover page. You probably also want to set up things you can't see, such as Auto-Text tags, a layering system, and even premade, empty pages for content. I suggest stripping all the content out of a document set you've already made and then saving the resulting shell as a template.



Before you move to Step 2, make sure you're viewing the page that you want to use as the thumbnail preview in the template list.

### 2. **Choose File⇒Save as Template.**

The Save as Template dialog box opens.

### 3. **Type a name for your template and then choose a location for your new template.**

In the list at the bottom of the dialog box, click the folder (they're all folders) in which you want to include the template you're adding.

### 4. **Click OK (Save on a Mac).**

The next time the Getting Started dialog box appears, your new template will be in it.

## ***Putting together your own scrapbooks***

Most hardcore LayOut users make their own scrapbooks of scale figures, cars, trees, drafting symbols, typography — anything they need to use again and again.

Like templates, *scrapbooks* are just LayOut files that have been saved in a special folder on your system. When you open the program, it checks that folder and displays the files it finds in the Scrapbooks panel.

Follow these steps to build your own LayOut scrapbook, as shown in Figure [15-14](#):

1. **Build a LayOut file with the elements you want to include in your scrapbook.**
2. **Choose File⇒Save as Scrapbook.**
3. **Type a name for your scrapbook.**

The Scrapbook Folder list in the Save as Scrapbook dialog box shows the location of the folder on your system where your new scrapbook will be saved. If you prefer to use another folder, you can add one using the Folder panel of the Preferences dialog box.

4. **Click OK (Save on a Mac).**

The next time you restart LayOut, your scrapbook appears at the top of the Scrapbooks panel.

A few notes about making your own scrapbooks:

- ✓ **A good size is 6 x 6 inches.** You can choose any paper size for the file you plan to save as a scrapbook, but smaller sheets work better. The scrapbooks that come with LayOut are 6 inches square.
- ✓ **Scrapbooks can have multiple pages.** In fact, just about all the default scrapbooks in LayOut do. The first page in your document becomes the cover page for the scrapbook; all subsequent pages appear below it in the list. Pay attention to your page names, which appear in the Scrapbooks panel, too.
- ✓ **Use locked layers.** Anything you put on a locked layer can't be dragged out of the scrapbook. Take a look at the People scrapbook that comes with LayOut — the word *People* and the information next to it are on a locked layer. Notice how you can't drag them into your drawing?
- ✓ **You can put model viewports into scrapbooks.** Open the Arrows⇒3D⇒Curved scrapbook. Drag one of the arrows onto your page. Now double-click it — it's a model! I created that scrapbook specifically to provide story boarders with orbitable arrows that they could pose however they liked. The moral of this story is that you can put *anything* into a scrapbook: graphics, images, viewports, and text.

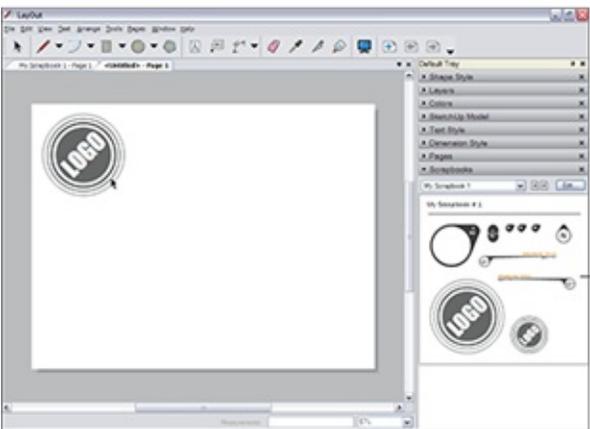
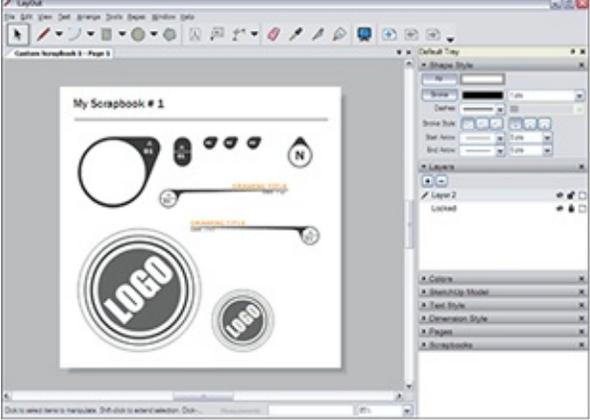


Figure 15-14: Making your own scrapbooks is easy and ultra-rewarding.

## Part V



My favorite thing about books in the *For Dummies* series is the way they embrace people's love of lists. Visit [www.dummies.com/extras/sketchup2014](http://www.dummies.com/extras/sketchup2014) for an extra Part of Tens article.

## *In this part ...*

- ✓ Discover expert tips and tricks for handling ten things that you'll definitely struggle with when you're first using SketchUp.
- ✓ Find out where to turn when the information you need isn't in this book. There are some really great books and online resources out there, and I've made a list that should get you started.

## Chapter 16

# Ten SketchUp Traps and Their Workarounds

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### *In This Chapter*

- ▶ Knowing why faces, colors, and edges aren't behaving right
  - ▶ Coping with a slow or crashing SketchUp
  - ▶ Viewing your model the way you want
  - ▶ Persuading components to budge
  - ▶ Recovering from Eraser disasters
- 

The bad news is that every new SketchUp user encounters certain problems, usually in the first couple hours using the software. I guess you can call these problems growing pains. The good news is that such predictability means that I can write a chapter that anticipates a lot of the bad stuff you'll go through. I can't prevent it from happening, but I *can* help you make sense of what's going on so you can get on with your life as quickly as possible.

## *SketchUp Won't Create a Face Where You Want It To*

You've dutifully traced all around where you want SketchUp to create a face, but nothing's happening. Try checking whether your edges aren't all on the same plane.



Ninety percent of the time, when SketchUp doesn't create a face where you think it should, an edge isn't on the plane you think it's on. To check whether your edges are coplanar, draw an edge that cuts diagonally across the area where you want a face to appear. If a face appears now, your edges aren't all on the same plane. To fix the problem, you have to figure out which edge is the culprit.

I call my favorite method for doing this the Color by Axis method; Color Plate 21 shows images of the steps that I describe:

### **1. In the Styles dialog box, change your edge color from All Same to By Axis.**

See Chapter [10](#) for details. SketchUp draws the edges in your model the color of the axis to which they're parallel; edges parallel to the red axis are red, and so on.

### **2. Look carefully at the edges that you wanted to define your desired face.**

Are all the edges the color they're supposed to be? If they're not all supposed to be parallel to the drawing axes, this technique doesn't do much good. But if they are, and one (or more) of them is black (instead of red or green or blue), that edge (or edges) is your problem child. Fix it and switch back to All Same when you're done.

If the plane isn't the problem with your edges, then check whether one edge is part of a separate group or component. To check whether you have a component problem, try hiding groups or components and checking the edges to make sure that they're all in the group or component you think they're in. See Chapter [5](#) for details.

## *Your Faces Are Two Different Colors*



In SketchUp, faces have two sides: a front and a back. By default, these two sides are different colors.

When you do certain things like use Push/Pull or Follow Me on a face, sometimes the faces on the resulting geometry are “inside out.” If it bothers you to have a two-tone model (it bothers me), right-click the faces you want to flip over and choose Reverse Faces from the context menu. If you have lots of them, you can select them all and then choose Reverse Faces to do them all at once.

Too laborious? You can always change your style's default front and back colors to be the same. Here's how:

1. **Choose Window⇒Styles to open the Styles dialog box.**
2. **Click the Edit tab.**
3. **Click the Face panel icon (it's the second one from the left).**
4. **Set your Front and Back colors to be the same.**
5. **Update the style or create a new one.**

See Chapter [10](#) for detailed instructions.

## *Edges on a Face Won't Sink In*

This tends to happen when you're trying to draw a rectangle (or another geometric figure) on a face with one of SketchUp's shape-drawing tools. Ordinarily, the Rectangle tool creates a new face on top of any face you use it on; after that, you can use Push/Pull to create a hole, if you want.

When the edges you just drew don't seem to cut through the face you drew them on, try these approaches:

- ✓ **Retrace one of the edges.** Sometimes that works — you'd be surprised how often.
- ✓ **Select Hidden Geometry from the View menu.** You're checking to make sure that the face you just drew isn't crossing any hidden or smoothed edges; if it is, the face you thought was flat

may not be.

- ✓ **Make sure that the face you drew on isn't part of a group or component.** If it is, undo a few steps and then redraw your shape while you edit the group or component.

## SketchUp Crashed, and You Lost Your Model

Unfortunately, SketchUp crashes happen sometimes.

The good news is that SketchUp automatically saves a copy of your file every five minutes. The file that SketchUp autosaves is actually a *separate* file, `AutoSave_your_filename.skp`. If your file ever gets corrupted in a crash, an intact file is ready for you.

The problem is that most people don't even know it's there. Where is this file?

- ✓ **If you've ever saved your file,** it's in the same folder as the original.
- ✓ **If you never saved your file,** it's in your Documents folder — unless you're on a Mac, in which case it's here:

```
User folder/Library/Application Support/SketchUp 2014/SketchUp/Autosave
```

Simple, right? Not so fast. In recent versions of the Mac operating system, there's a secret to finding the Library folder inside your User folder; it's hidden by default. Here's how you get to it:

1. *Make Finder your active application.*
2. *While holding down Option on your keyboard, choose Library from the Go menu.*

If you don't press Option, Library isn't visible in the list. Sneaky!

When you close your model, SketchUp typically assumes nothing untoward has happened and cleans up after itself by deleting the autosaved file.



To minimize the amount of work you lose when software (or hardware) goes south, always do two things:

- ✓ **Save often — compulsively, even.**
- ✓ **Use the Save a Copy As command on the File menu.**

Here's the process I recommend when you're working on a big project:

1. **Save the original version of your file as `yourfilename_Master.skp`.**

That's the file you'll always be working on.

2. **Create a folder that lives in the same place as your Master file; call it something like *Your file's name* Archive.**

3. **Every half-hour or so, choose File⇒Save a Copy As and save a numbered version of your file to the Archive folder.**

When I'm building a big model, I often have 40 or 50 saved versions of it in my Archive folder, dating back to when I first started working on it.

## *SketchUp Is Sooooo Sloooooooooow*

The bigger your model, the worse your computer's performance. What makes a model big? In a nutshell, faces.



Do everything in your power to keep your model as small as you can. Here are some tips for doing that:

- ✓ **Reduce the number of sides on your extruded circles and arcs.** See Chapter [6](#) for instructions on how to do this.
- ✓ **Use 2D people and trees instead of 3D ones.** Three-dimensional plants and people have *hundreds* of faces each. Consider using 2D ones instead, especially if your model won't be seen much from overhead.

Some models are just big, and you can't do much about it. Here are some tricks for working with very large SketchUp models:

- ✓ **Make liberal use of the Outliner and layers.** Explained in detail in Chapter [7](#), these SketchUp features were specifically designed to let you organize your model into manageable chunks. Hide everything you're not working on at the moment — doing so gives your computer a fighting chance.
- ✓ **Substitute simple forms for large numbers of complex components.** For example, insert sticks as placeholders for big sets of 3D trees, cars, and other big components. The tips for replacing components in Chapter [5](#) explain how to do so.
- ✓ **Turn off shadows and switch to a simple style, such as Shaded in the Default Styles collection.** It takes a lot of computer horsepower to display shadows, edge effects, and textures in real time on your monitor. When you're working, turn off all that stuff.
- ✓ **Use scenes to navigate between views.** Scenes aren't just for presenting your model — they're also great for working with it. If you create scenes for the different views you commonly use and with different combinations of hidden geometry, then you don't have to orbit, pan, and zoom around your gigantic model. To speed up things even more, deselect Enable Scene Transitions (in the Animation panel of the Model Info dialog box).

## *You Can't Get a Good View of the Inside of Your Model*

It's not always easy to work on the inside of something in SketchUp. You can do these things to make it easier, though:

- ✓ **Cut into your model with sections.** SketchUp's Sections feature lets you cut away parts of your model — temporarily, of course — so that you can get a better view of what's inside. Take a look at Chapter [11](#) for the whole story on sections.
- ✓ **Widen your field of view.** *Field of view* is the part of your model you can see onscreen at one time. A wider FOV is like having better peripheral vision. You can read all about it in Chapter [11](#).

## A Face Flashes When You Orbit

If you have two faces in the same spot — maybe one is in a separate group or component — you see a *Z-fighting* effect. SketchUp is deciding which face to display by switching back and forth between them; it's not a good solution, but certainly a logical one — at least for a piece of software. The only way to get rid of Z-fighting is to delete or hide one of the faces.

## You Can't Move Your Component the Way You Want

When you insert some components into your model, the components by default *glue* to faces. A glued component instance isn't actually glued *in one place*. Instead, it's glued to the plane of the face you originally placed (or created) it on. For example, if you place a sofa component on the floor of your living room, you can move it around only on that plane — not up and down.

This gluing behavior comes in handy when you deal with things like furniture; it allows you to rearrange things with the Move tool without accidentally picking them up.

If you can't move your component the way you want to, right-click it and see whether Unglue is an option — if it is, choose it. Now you can move your component around however you want.

## Bad Stuff Happens Every Time You Use the Eraser

When you use the Eraser tool, it's pretty easy to delete stuff accidentally. Worse yet, you usually don't notice what's missing until it's too late. Here are some tips for erasing more accurately:

- ✓ **Orbit around.** Try to make sure that nothing is behind whatever you're erasing; use SketchUp's navigation tools to get a view of your model that puts you out of danger.
- ✓ **Switch on Back Edges.** When you're doing a lot of erasing, choose View⇒Edge Style⇒Back Edges. That way, you can see every edge in your model, and you're less likely to erase the wrong ones.
- ✓ **Double-check.** After I do a lot of erasing, I give my model a quick once-over with the Orbit

tool, just to make sure that I didn't get rid of anything important. Put a sticky note on your computer monitor that says something like *Check after Erase!* just to remind you.

# All Your Edges and Faces Are on Different Layers



I'll be blunt — using Layers in SketchUp is a dangerous business. Chapter [7](#) has tips you should follow when using layers, so I don't repeat them here, but here's the short version: Always build everything on Layer0, and put whole groups or components on other layers only if you really need to.

If you used layers and now things are messed up, here's what you can do to recover:

- 1. Make sure that everything is visible.**

Select Hidden Geometry on the View menu; then (in the Layers dialog box) make all your layers visible. Just make sure that you can see everything in your model.

- 2. Choose Edit⇒Select All.**

- 3. In the Entity Info dialog box, move everything to Layer0.**

- 4. In the Layers dialog box, delete your other layers. When prompted, tell SketchUp to move anything remaining on them to Layer0.**

- 5. Create new layers and follow the rules in Chapter [7](#).**

# Chapter 17

## Ten Ways to Discover Even More

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### In This Chapter

- ▶ Checking out some great, free SketchUp information
  - ▶ Discovering other helpful, paid resources
- 

Don't get me wrong — I don't think this book is woefully incomplete. I just don't think it's possible to get too many different forms of information, especially about something as dynamic as SketchUp. Some great help resources are available, and I'd be remiss if I didn't point you to them.

I devote the first half of this chapter to the free stuff; it's all online and available to anyone who wants it. In the second half of the chapter, I list some of the best nonfree SketchUp resources I know of. If you're willing to shell out a few bucks, you won't be sorry.



Incidentally, this is probably a good place to mention the dozens of free videos that accompany this book. You can link to them from this book's Web Extras page ([www.dummies.com/extras/sketchup2014](http://www.dummies.com/extras/sketchup2014)), but you can also get to them directly on YouTube. To hear my (surprisingly Muppet-like) voice while I put SketchUp through its paces, check out [www.youtube.com/user/aidanchopra](http://www.youtube.com/user/aidanchopra).

## Put Away Your Wallet

I have a confession to make: At fancy receptions, I'm the one stuffing my suit pockets with *hors d'oeuvres* wrapped in napkins. I love free stuff *that much*. So without further ado, what follows are five complimentary sources of SketchUp help.



Everything in this section requires that you have an Internet connection, so make sure that your computer is online before you try any of these.

✓ **SketchUp training resources:** SketchUp publishes first-rate materials right on its website ([www.sketchup.com/learn](http://www.sketchup.com/learn)):

- *Video tutorials:* When SketchUp first launched in 2000, it became known for its excellent video tutorials. I can't recommend them highly enough; there's nothing like seeing SketchUp in action.
- *Self-paced tutorials:* These are SketchUp files that use scenes to teach different aspects of the program in a "follow along with me" style. If this is how you like to figure things out, have a look.

- **Online Knowledge Center:** The SketchUp Knowledge Center includes hundreds of articles in question-and-answer format, created specifically to help new users along. The easiest way to get to the SketchUp Knowledge Center is to choose Help⇒Knowledge Center from the SketchUp menu bar.
- ✓ **SketchUcation:** Home of the SketchUp Community Forums, this is easily the largest and most active group of SketchUp users in the world. You find discussions, tutorials, plugins, news, and piles of other good stuff at SketchUcation. ([www.sketchucation.com](http://www.sketchucation.com))
- ✓ **SketchUp School videos:** This is a terrific YouTube channel. The free videos are first rate, and you can buy a subscription to watch over a hundred more on SketchUp School's website. I talk about the subscription videos in the next part of this chapter. ([www.youtube.com/4sketchupgo2school](http://www.youtube.com/4sketchupgo2school))
- ✓ **MasterSketchUp.com:** Matt Donley has put together a very nice site dedicated to helpful tips and tricks, videos, and other tutorials. He also just self-published a book about LayOut; you can read about it in the next section. ([www.mastersketchup.com](http://www.mastersketchup.com))
- ✓ **The SketchUp blog:** Visit the SketchUp blog regularly for news, case studies, tips and tricks, modeler profiles, plugins, and other updates. (<http://sketchupdate.blogspot.com>)

## Now Get Out Your Wallet

These resources cost a bit of money, but they're worth every penny:

- ✓ **Bonnie Roskes's books:** Bonnie's *The SketchUp Book* (published by 3DVinci) was the first book available, and now she has several new titles, including SketchUp books for kids. If you think you want to get another, bigger book about SketchUp (written with architects and other design pros in mind), check out Bonnie's books at [www.3dvinci.net](http://www.3dvinci.net).
- ✓ **Daniel Tal's books:** *Google SketchUp for Site Design: A Guide to Modeling Site Plans, Terrain and Architecture* (Wiley) is, simply put, a great book. It contains tons of information about things I don't even begin to cover in mine. Dan's latest book (also published by Wiley) is *Rendering in SketchUp: From Modeling to Presentation for Architecture, Landscape Architecture and Interior Design*. It demystifies the dark art of photorealistic rendering in a way that might finally get you to try it. When you're ready to take the next step in your SketchUp relationship, get Dan's books.
- ✓ **Michael Brightman's book:** A recent addition to the SketchUp bookshelf, Michael's *The SketchUp Workflow for Architecture: Modeling Buildings, Visualizing Design, and Creating Construction Documents with SketchUp Pro and LayOut* (Wiley) is a watershed in the history of SketchUp publishing. He came up with a viable workflow for using SketchUp Pro (including LayOut) to produce complete construction document sets that look just like the ones you'd normally use AutoCAD or Revit to make. The stuff in this book is insanely clever — you have to read it to believe it.
- ✓ **Alex Schreyer's book:** The title of *Architectural Design with SketchUp: Component-Based Modeling, Plugins, Rendering, and Scripting* (Wiley) certainly implies that it's a book for architects. That's not strictly true; it's actually a great resource for anyone looking to find out

more about all of the topics in the subtitle. Alex deserves special credit for his skillful introduction to Ruby scripting for nonprogrammers.

- ✓ **Matt Donley's book:** The man behind MasterSketchUp.com has just written an e-book called *SketchUp to LayOut: The Essential Guide to Creating Construction Documents with SketchUp Pro and LayOut*. Unlike Mike Brightman's book (which I mention earlier), Matt's book approaches the subject from more of a beginner's perspective. It also shows woodworking and kitchen and bath examples, which should appeal to people who aren't architects.
- ✓ **SketchUp School subscription videos:** I mention the free School videos in the previous section, but the School designers have also produced some of the world's finest SketchUp educational/training videos; you can pay for a subscription to watch them on the School website ([www.sketchupschool.com](http://www.sketchupschool.com)). The production quality on these things is outstanding, and Mike Tadros and Alex Oliver (two of the School guys) do an amazing job of teaching SketchUp for both Windows and the Mac.
- ✓ **Dennis Fukai's books:** Three words: jaw-dropping detail. Dennis's books are hard to describe. He's written seven of them, each is fully illustrated in SketchUp, and each teaches a different subject. If you want to discover more about using SketchUp in building construction or more about construction itself, or you just want to be completely inspired by what you can do with SketchUp, have a look at these books. Search for his name on Amazon ([www.amazon.com](http://www.amazon.com)) or go to his company's website, [www.insitebuilders.com](http://www.insitebuilders.com).

## ASSESSMENT PATTERN

**CIE- Continuous Internal Evaluation (30 Marks)**

**SEE- Semester End Examination (20 Marks)**

**SEE- Semester End Examination (40 Marks) (should be converted in actual marks (20))**

| Bloom's Category | Tests |
|------------------|-------|
| Remember         | 05    |
| Understand       | 07    |
| Apply            | 08    |
| Analyze          | 07    |
| Evaluate         | 08    |
| Create           | 05    |

**CIE- Continuous Internal Evaluation (100 Marks) (should be converted in actual marks (30))**

| Bloom's Category Marks<br>(out of 100) | Lab Final<br>(30) | Lab Report<br>(10) | Continuous lab<br>performance<br>(30) | Presentation &<br>Viva (10) | External Participation in<br>Curricular/ <b>Final Project Exhibition</b><br>(10) |
|--|-------------------|--------------------|---------------------------------------|-----------------------------|--|
| Remember/ <b>Imitation</b>             | 05                |                    | 05                                    | 02                          | Attendance<br>10   |
| Understand/ <b>manipulation</b>        | 05                | 05                 | 05                                    | 03                          |  |
| Apply/ <b>Precision</b>                | 05                |                    | 05                                    |                             |  |
| Analyze/ <b>Articulation</b>           | 05                |                    | 05                                    |                             |  |
| Evaluate/ <b>Naturalisation</b>        | 05                | 05                 | 05                                    |                             |  |
| Create                                 | 05                |                    | 05                                    | 05                          |  |