Steven Holzner

Sams Teach Yourself

Google SketchUp™ 8

in 10 Minutes

SAMS

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in **10 Minutes**

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About the Author

Steven Holzner is the award-winning author of more than 100 books, specializing in online topics such as Google Buzz, Gmail, and more. He's been a contributing editor of *PC Magazine* and has specialized in online computing for many years. His books have sold more than 2.5 million copies and have been translated into 18 languages. Steve graduated from MIT and earned his PhD at Cornell. He's been a very popular member of the faculty at both MIT and Cornell, teaching thousands of students over the years. He also runs his own software company and teaches weeklong classes to corporate programmers around the country.

Dedication

To Nancy, of course.

Acknowledgements

The book you hold in your hands is the product of the work of many people. I would especially like to thank Rick Kughen, Mark Reddin, Todd Meister, Tonya Simpson, and Barbara Hacha.

We Want to Hear from You!

As the reader of this book, *you* are our most important critic and commentator. We value your opinion and want to know what we're doing right, what we could do better, what areas you'd like to see us publish in, and any other words of wisdom you're willing to pass our way.

You can email or write me directly to let me know what you did or didn't like about this book—as well as what we can do to make our books stronger.

Please note that I cannot help you with technical problems related to the topic of this book, and that due to the high volume of mail I receive, I might not be able to reply to every message.

When you write, please be sure to include this book's title and author as well as your name and phone or email address. I will carefully review your comments and share them with the author and editors who worked on the book.

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Visit our website and register this book at informit.com/register for convenient access to any updates, downloads, or errata that might be available for this book.

Introduction

Welcome to SketchUp! This book is all about Google's fantastically popular 3D modeling program, ready for you to create 3D drawings with.

SketchUp is ultrapowerful, and lets you draw models with ease. Need to draw a new engine? SketchUp can do it. Need to lay out your back yard plantings? SketchUp can help. Want to plan a new office, positioning chairs, desks, and workstations as needed? SketchUp is for you.

SketchUp's forte is 3D modeling—creating drawings of 3D objects. There are plenty of 2D drawing programs out there but very few of SketchUp's caliber and ease of use for 3D.

Want to become a SketchUp-meister? Stay tuned, you've come to the right book.

NOTE: **What's New In Google SketchUp 8**

SketchUp 8 offers a variety of new features not found in SketchUp 7. For a list of what's new in SketchUp, see http://sketchup.google.com/product/newin8.html

What's in This Book

You're going to get a guided tour of SketchUp in this book. SketchUp is too large a program to cover in complete detail in a book this size, but you're going to get a real working knowledge of SketchUp, suitable for creating just about any drawing you want.

SketchUp offers you a super-powerful set of tools to work with, and this book is about those tools. We'll see how to draw basic figures using tools such as

- The Rectangle tool
- The Circle tool

- The Polygon tool
- The Arc tool

as well as how to draw freehand.

We'll see how to use tools to convert from 2D to 3D—tools like

- The Push/Pull tool
- The Move tool
- The Rotate tool

After going 3D, we'll make use of the tools SketchUp offers for viewing 3D objects, such as

- The Orbit tool
- The Pan tool
- The Zoom tool

Having mastered 3D concepts and after we're used to creating 3D objects, we'll see how to measure lengths and angles, as well as construct construction guides with tools such as

- The Tape Measure tool
- The Dimensioning tool
- The Protractor tool

Then we'll start getting into some tools specific to SketchUp, giving you more 3D power:

- The Offset tool
- The Follow-Me tool
- The Section Pane tool

And more!

These tools are particular to SketchUp, and only SketchUp offers their kind of power. The Offset tool lets you draw copies of edges at offsets

from the original in case you want to repeat that surface (as when, for example, you're drawing an ornate window frame and want to copy a curved edge to create a whole window frame). The Follow-Me tool is an amazing one—it lets you specify a path and a shape or action, then pulls that shape or action around your path, giving you a 3D result (so, for example, if you bevel one side of a chair seat and want to bevel the other three sides similarly, you can use the Follow-Me tool). And the Section Pane tool lets you draw cross-sections through any surface in your model.

And there are yet more tools coming up, such as the Scale tool, which enlarges or reduces models just by dragging the mouse, the Text Annotation tool, which lets you add notes to your models, the 3D Text tool, which lets you draw 3D text, and more.

All of which is to say: there's a lot coming up on your guided tour.

Conventions Used in This Book

Whenever you need to click a particular button or link in SketchUp, you'll find the label or name for that item bolded in the text, such as "click the **Line tool**." In addition to the text and figures in this book, you also encounter some special boxes labelled Tip, Note, or Caution.

TIP: Tips offer helpful shortcuts or easier ways to do something.

NOTE: Notes are extra bits of information related to the text that might help you expand your knowledge or understanding.

CAUTION: Cautions are warnings or other important information you need to know about consequences of using a feature or executing a task.

What You'll Need

All you'll need to use this book is Google SketchUp itself.

SketchUp comes in two versions—free and paid. The paid version is the "professional" version, but the free version is also immensely powerful. We'll be using the free version here. All you have to do is to download and install it, following the directions at the beginning of Lesson 2.

That's it. Everything you need for this book comes in SketchUp itself. There's nothing else needed. After you've installed the free version, you're ready to roll.

LESSON 5

Going 3D

In this lesson, we're going to see what SketchUp is really all about—going 3D.

Getting Started

SketchUp's 3D capabilities are what set it apart from the rest of the pack of drawing tools. You're going to see how easy it is to create 3D models in SketchUp. Although you might think that you need to draw every edge to make a model 3D, that's not true—SketchUp operates in a very clever way to give you 3D power.

All you need to do is to draw a 2D surface (and remember, such surfaces can be aligned to any plane). Then you use one of SketchUp's 3D tools, such as the Push/Pull tool, to pull it into 3D. Thus a rectangle becomes a cube, for example.

The Push/Pull tool, which works on any surface that's in one plane, is the primary 3D tool in SketchUp. This tool lets you push or pull surfaces into 3D in a way that's quite impressive. But other tools in SketchUp have 3D power as well, such as the Move tool, which we'll also see here.

You can use the Move tool to move objects around, of course. But when you first use the Select tool to select an edge, you can use the Move tool to pull out that edge in such a way that the connected surface follows, while still being anchored on the opposite edge (think of opening a cabinet door).

We'll see both the Push/Pull and Move tools in this lesson, along with some auxiliary tools, the Select tool and the Eraser tool.

This is a big lesson for us, because it's all about 3D, and that's also what SketchUp is all about—3D.

Let's get started immediately with the Push/Pull tool.

Pulling Objects into 3D

You need to start with a basic shape or surface. For this task we'll keep things simple and use a rectangle. (Refer to Lesson 3, "Drawing Shapes: Lines, Rectangles, Polygons, and Circles" for more.)

Use the Rectangle tool to create a rectangle similar to what you see in Figure 5.1.

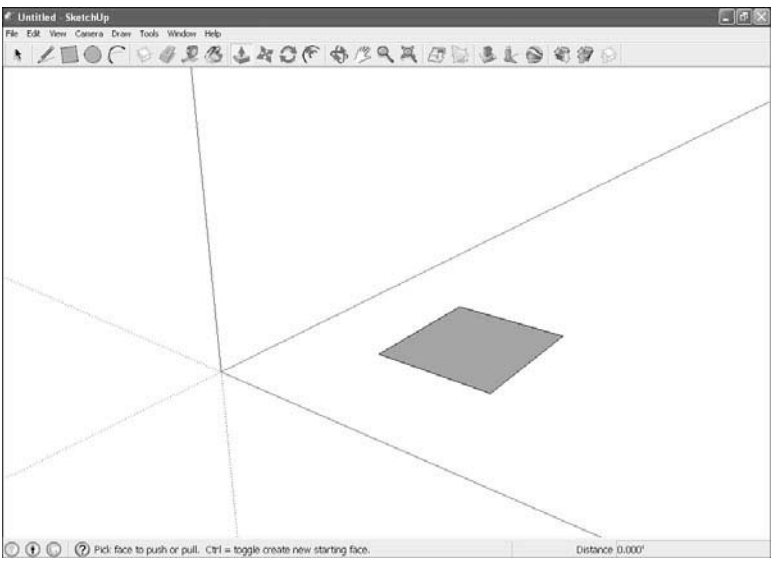

FIGURE 5.1 A rectangle.

Now, what you really want is a cube, so to transform the rectangle, we'll use the Push/Pull tool, as shown in Figure 5.2.

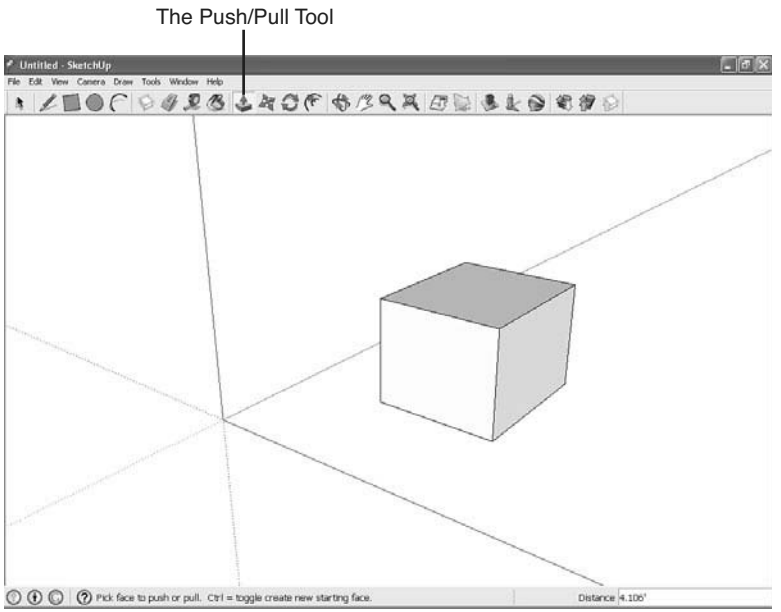

FIGURE 5.2 The Push/Pull tool and the resulting cube.

When you use the Push/Pull tool (shown in Figure 5.2), you literally pull the rectangle into a 3D shape. This tool is at the center of what SketchUp does for you, so it's an important one to learn.

Here's how to go 3D with SketchUp and the Push/Pull tool:

1. Click the **Start Using SketchUp** button and click the human figure that appears in the Engineering–Feet template to select it; press the Del key to delete it.
2. Draw a shape.
3. Click the **Push/Pull tool** in the toolbar (shown in Figure 5.2).
4. Move the mouse cursor to the surface you want to pull or push into 3D. Note that the surface must be flat.
5. Press the mouse button on the surface and drag the surface in the direction you want to extend it into 3D.

> TIP: **Pushing or Pulling Surfaces**
> Note that you can only push or pull surfaces perpendicular to themselves.

As you drag the mouse, the surface pulls into 3D. The sides of the new 3D shape are defined by the edges of the 2D shape.

6. Release the mouse button. The object becomes 3D, as you can see in Figure 5.2. As you can see, pulling shapes into 3D is one the coolest features in SketchUp.

Pushing Objects into 3D

In the previous task, you saw that you could pull a free-standing rectangle into 3D. But now take a look at Figure 5.3.

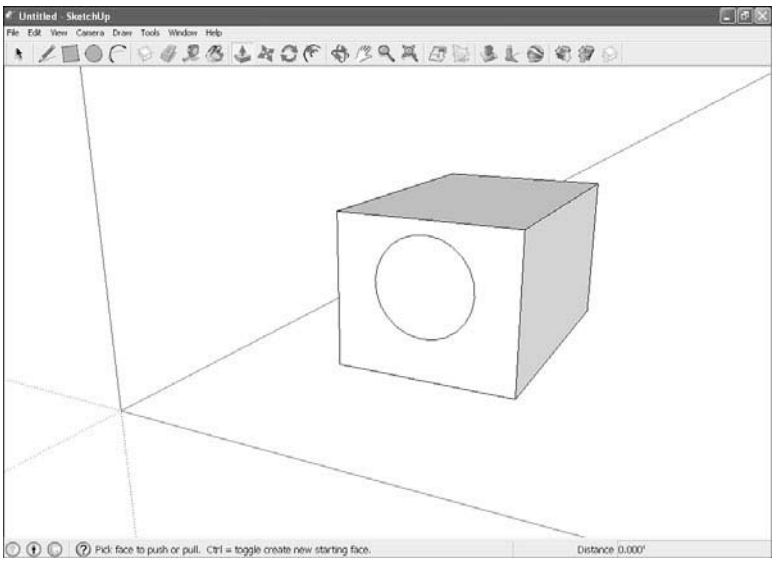

FIGURE 5.3 A cube with an attached circle.

Can you pull the attached circle into a cylinder? Yes, you can. In fact, now you have two options. Because the circle is attached to an existing 3D

surface, you have the option of not only pulling the circle out of the cube, but you can also *push* the cylinder into the cube.

Here's how:

1. Click the **Start Using SketchUp** button and click the human figure that appears in the Engineering–Feet template to select it; press the Del key to delete it.
2. Draw the cube as shown in Figure 5.3.
3. Draw a circle on the cube using the Circle tool, as shown in Figure 5.3.
4. Click the **Push/Pull tool** in the toolbar.
5. Move the mouse cursor to the circle and press the mouse button on the circle.
6. Drag the circle out of the cube to pull it into 3D, or push it into the cube to push it into 3D. You can see the circle pulled into 3D in Figure 5.4 and pushed into the cube in Figure 5.5.

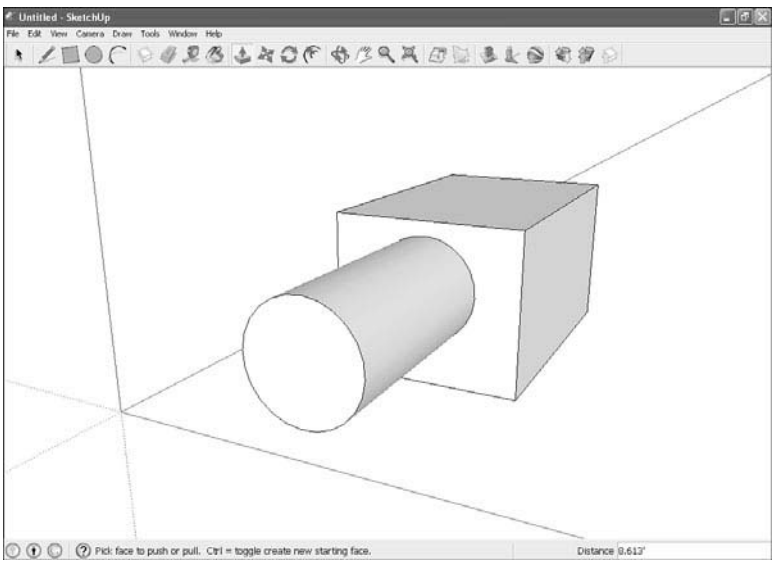

FIGURE 5.4 Pulling a circle into a cylinder.

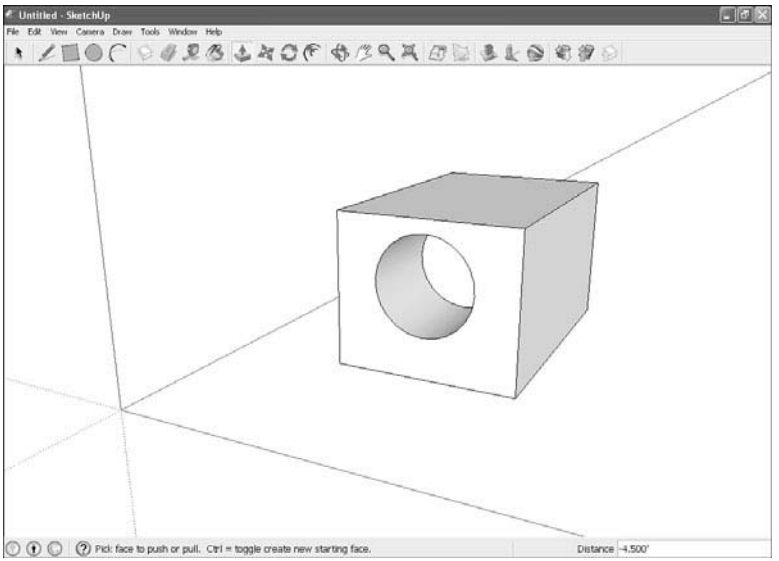

FIGURE 5.5 Pushing a cylinder into a cube.

7. Release the mouse button. The cylinder becomes 3D.

Now you can both pull and push objects into 3D.

Using Measured Push/Pull

What if you wanted to push or pull an object exactly 5 feet when making it 3D? That is, suppose you have a circle on one surface of a cube (refer to Figure 5.3), and you want to pull the circle out into a cylinder exactly 5 feet—could you do it?

Yes. Like most SketchUp operations, you can interrupt them midway and enter a measurement. Here's how it works when you're pushing or pulling objects into 3D—in this example, we'll pull a cylinder out of a cube by 5 feet:

1. Click the **Start Using SketchUp** button and click the human figure that appears in the Engineering–Feet template to select it; press the Del key to delete it.

2. Draw the cube with a circle on one surface.
3. Click the **Push/Pull tool** in the toolbar.
4. Move the mouse cursor to the circle and press the mouse button on the circle.
5. Drag the circle out of the cube to pull it into 3D, or push it into the cube to push it into 3D.
6. Release the mouse button. The cylinder becomes 3D.
7. Enter the length of the 3D object you want. In this example, we'll create a 5-foot cylinder. Enter a length and then the units—you can use these units:
   - **cm** to signify centimeters
   - **m** to signify meters
   - **'** for feet
   - **"** for inches

   Thus, 5m means five meters, 5" means five inches, and so on. In this example, we'll use 5 feet, 5', giving you the cylinder you see in Figure 5.6.
8. Press **Enter.** SketchUp changes the new 3D object's length to match what you've requested.

Note that when you release the mouse button the first time, it feels as though you've finished drawing the cylinder, but SketchUp remembers that the cylinder is still being drawn, and if you enter a length and press Enter, it'll apply that length to the most recent figure, which in this example is the cylinder.

Inferring Push/Pull

Suppose you wanted to draw two cubes to the same height, similar to what you can see in Figure 5.7, but are not satisfied with your first effort.

Can SketchUp help make the two cubes the same height?

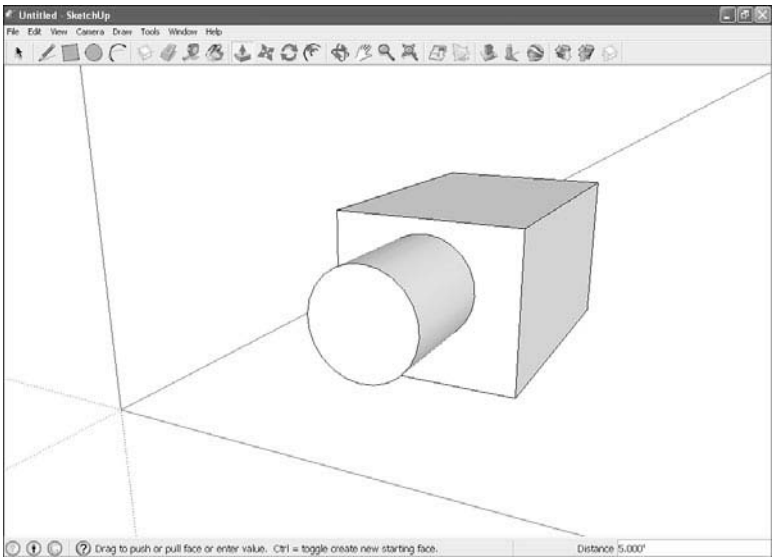

FIGURE 5.6 A measured cylinder.

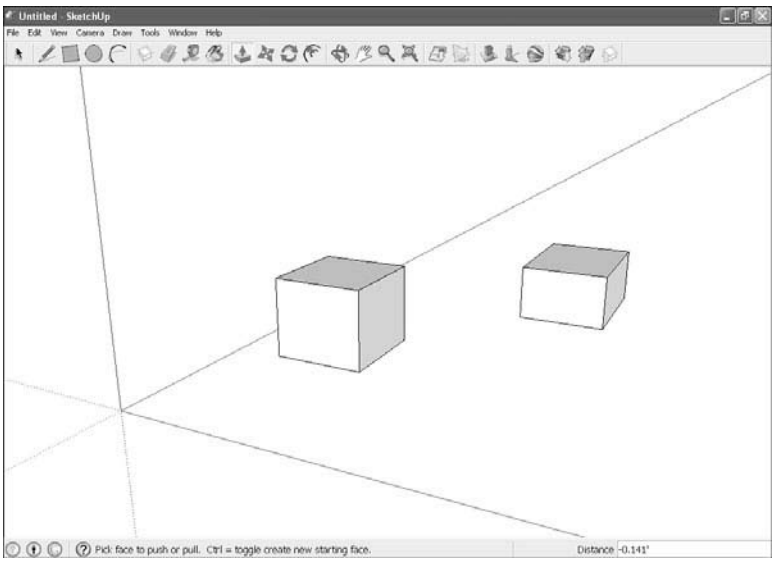

FIGURE 5.7 Two cubes.

Yes, it can—through inferring. Because it's so common when creating models to want one object to match another in some dimension (think of the length of table legs, for example), SketchUp allows you to set an object's length by referring to another object that already has the length you want. This process is called inferring (See Lesson 2, "Up and Running with SketchUp").

When drawing 3D objects, you can infer the length on one object to another object, making the first object's length match the second object. Here's how it works in the example of the two cubes in Figure 5.7:

1. Click the **Start Using SketchUp** button and click the human figure that appears in the Engineering–Feet template to select it; press the Del key to delete it.
2. Draw two rectangles in the x-y plane.
3. Click the **Push/Pull tool** in the toolbar.
4. Pull the rectangles into cubes of different heights, as shown in Figure 5.7.
5. With the Push/Pull tool, click the top surface of one of the cubes.
6. Move the mouse to the top surface of the other cube. A dotted blue line extends from the first surface to the surface you're inferring, as shown in Figure 5.8, and the first cube (the one you clicked first) snaps to the height of the second cube (the one you're inferring to), as you can see in the figure.
7. Click the top surface of the second cube. The height of the first cube becomes frozen to match the height of the second cube.

Inferring provides an easy way to make the length of objects match in SketchUp.

Cutting Openings

Another cool feature that you will want to take advantage of in SketchUp is using the Push/Pull tool to "cut" or create the illusion of openings in shapes.

Suppose you've just drawn a rectangle that represents a wall. For example, see the wall in Figure 5.9.

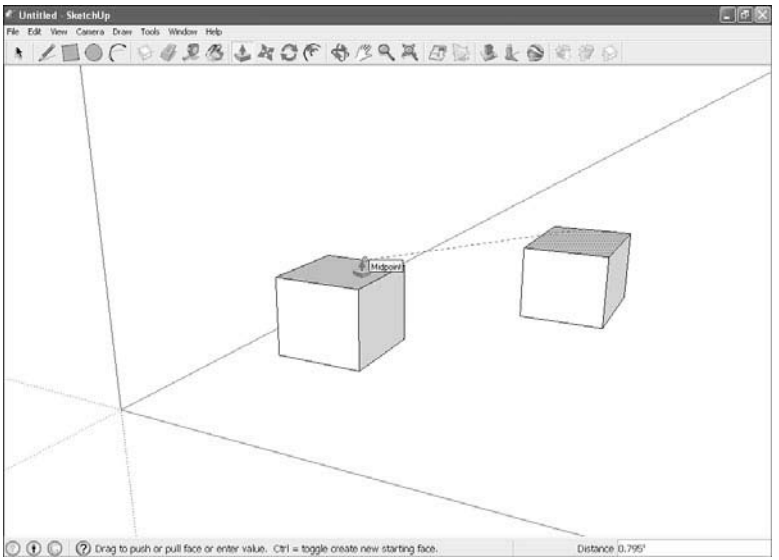

FIGURE 5.8 Making the cubes equal height.

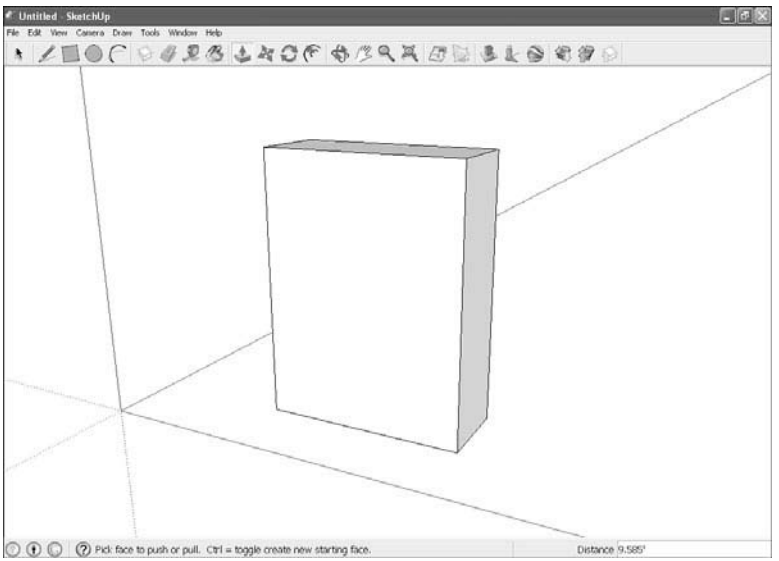

FIGURE 5.9 A 3D wall.

Now say that you want to cut a window into that wall. How could you do it?

The Push/Pull tool has a special property—you can cut objects right out of existing 3D objects. Here's how it works:

1. Click the **Start Using SketchUp** button and click the human figure that appears in the Engineering–Feet template to select it; press the Del key to delete it.
2. Draw the 3D wall, such as the one you see in Figure 5.9.
3. Draw the 2D outline of the window you want to cut into the wall. You might use a rectangle, as shown in Figure 5.10.

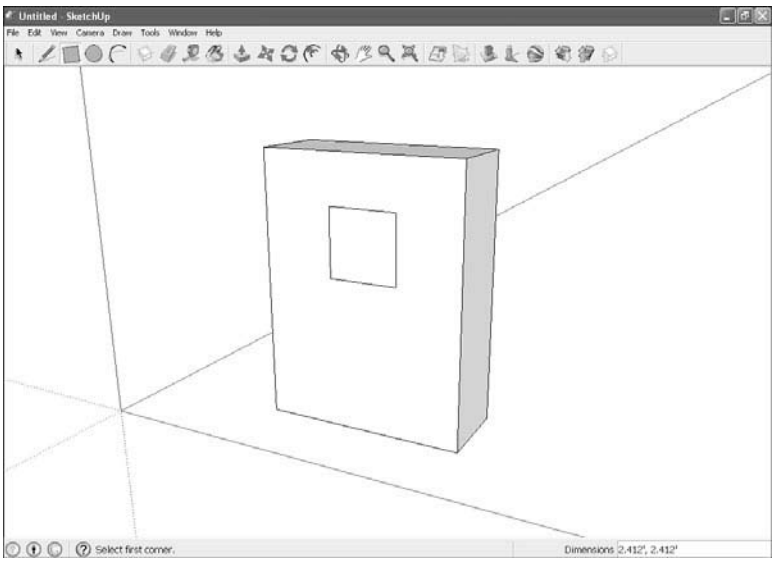

FIGURE 5.10 A 3D wall with a rectangle.

4. Click the **Push/Pull tool** in the toolbar.
5. Push the window outline through the wall to the other side. The part you've pushed disappears, leaving a cutout, as you can see in Figure 5.11.

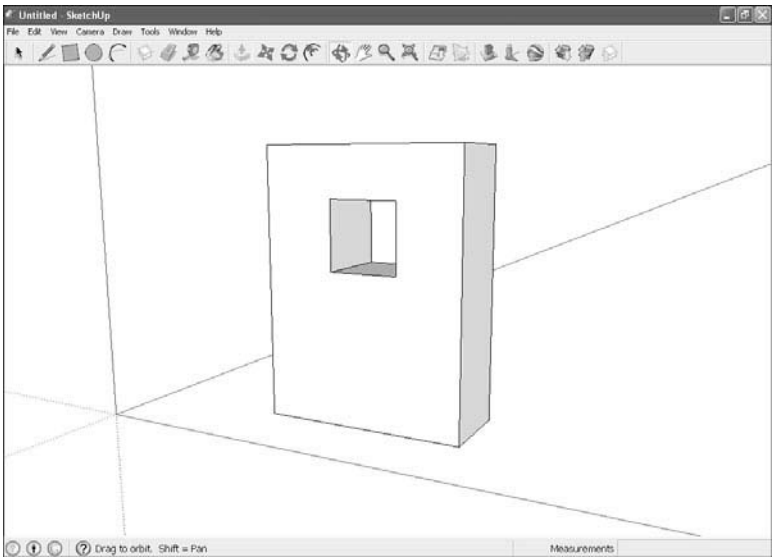

FIGURE 5.11 A 3D wall with a window.

So that's the trick—to create a cutout, push a shape through a 3D object until the shape disappears. Very cool.

Erasing Edges with the Eraser Tool

You can use the Eraser tool to erase edges, and that can help when you're going 3D. For example, take a look at the block in Figure 5.12.

Suppose you wanted to push the rectangle you see on the block through to create an opening, but SketchUp won't let you cut out the opening. What's wrong? And, how can you fix it?

For this task we will use the Orbit tool (refer to Lesson 2) and the Eraser tool (introduced in Lesson 4, "Drawing Shapes: Arcs, Freehand, Text, and 3D Text"). Follow these steps to solve the most common problem when cutting openings:

1. Click the **Orbit tool** in the toolbar.
2. Orbit around the entire 3D object you're trying to push an opening through.

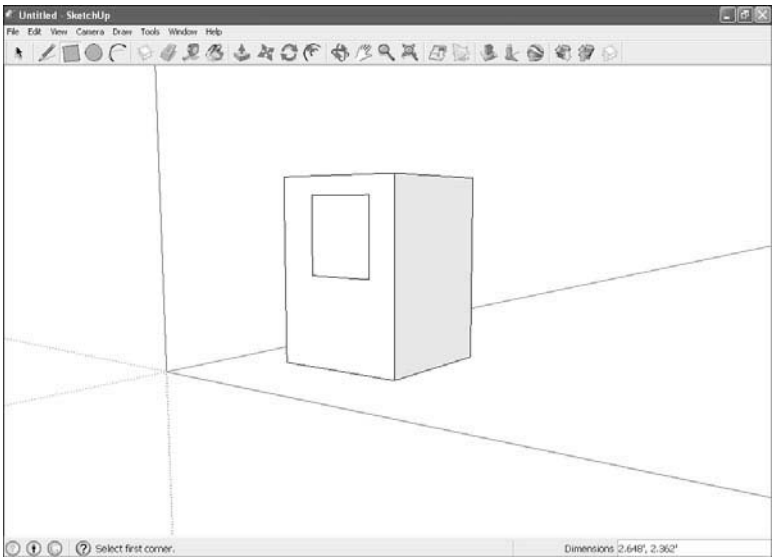

FIGURE 5.12 A 3D block with rectangle.

3. Search for obstructing edges—SketchUp won't push openings through edges. In the case of the object in Figure 5.12, it turns out that there's an edge drawn across the back of the object, as you can see in Figure 5.13. This edge will stop SketchUp from pushing an opening through the object.
4. To get rid of unwanted edges, select the **Eraser tool** in the toolbar.

> TIP: **The Eraser Tool Is Only to Erase Edges**
>
> In SketchUp, you use the Eraser tool only to erase edges. But if you want to get rid of a surface, it's easy—just erase all its edges.

5. Click the unwanted edge. When you do, that edge disappears.
6. Push the rectangle through the object to the other side with the Push/Pull tool. The part you've pushed disappears, leaving a cutout, as you can see in Figure 5.14.

So that's the way you use the Eraser tool—to erase unwanted edges. And if you want to get rid of a surface, erase its edges.

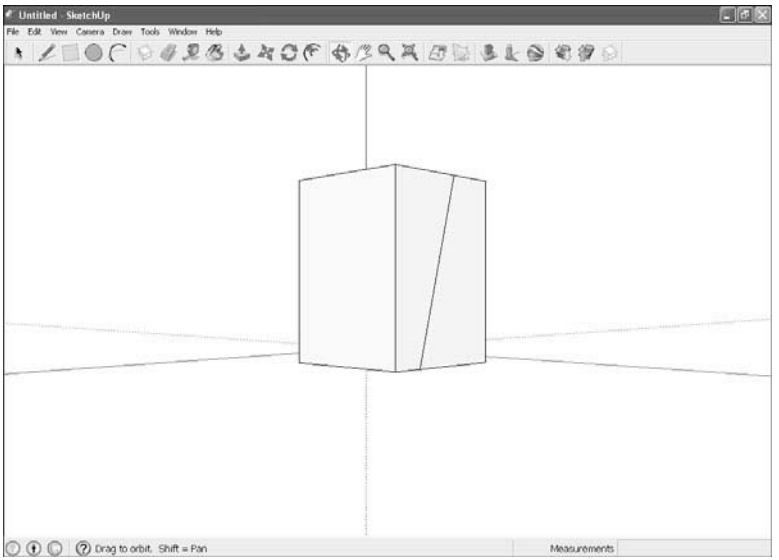

FIGURE 5.13 A 3D block from the back, showing a blocking edge.

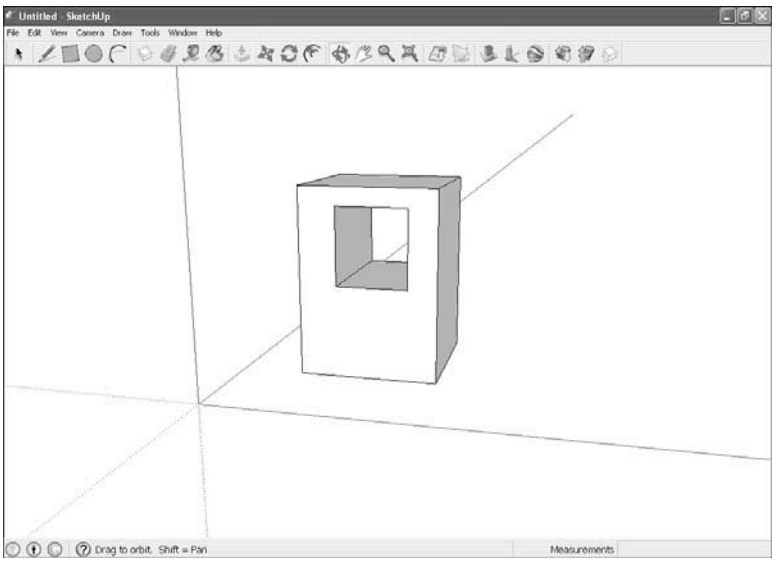

FIGURE 5.14 A 3D object with a cutout.

Selecting Edges and Surfaces with the Select Tool

Now that you've mastered drawing surfaces and are working with 3D objects, it's time to see how to select edges, surfaces, and objects using the Select tool.

Knowing how to select edges, surfaces, and objects is important for many actions in SketchUp, because you often have to indicate to SketchUp just what item you're working with. For example, when you want to make a copy of an object, you start by selecting that object. Selecting an object brings it to SketchUp's attention by telling it just what item you're working with. When you want to use the Move tool to pull out an edge from an object into 3D, you start by selecting that edge.

When you select an object, SketchUp indicates your selection by drawing it in a slightly different color than it was before, or by making it appear dotted. After you've selected an item, you can use that item as the target of your following operations, as we'll see. For example, if you had three boxes and wanted to make copies of only one, you'd start by selecting the box you want to make copies of, and then the appropriate menu choices to copy the item, as we're going to see in this lesson.

Selecting surfaces and edges is easy. Just click the **Select tool** in the Getting Started toolbar (recall the Select tool has an arrow as its icon, and is the first tool on the left in the Getting Started toolbar), and click the surface or edge you want to select.

When you select a surface, SketchUp fills the surface with blue dots. When you select an edge, SketchUp colors it blue.

Selecting an entire object is also easy, because the Select tool lets you draw selection rectangles automatically. Just press the mouse button outside the object and drag the mouse over the object to draw a selection rectangle, as you see in Figure 5.15.

When you release the mouse button, the entire object will be selected (and you can use menu selections to copy it, move it, and so on), which means all its surfaces will be dotted in blue, and its edges will be drawn in blue.

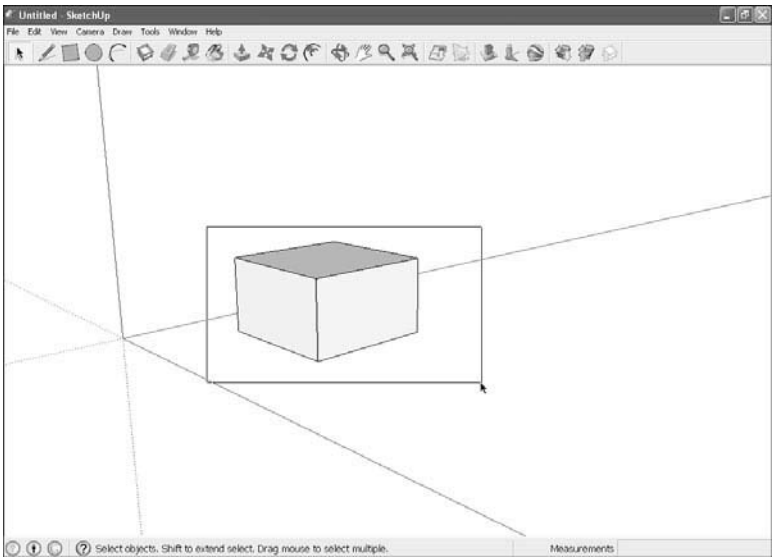

FIGURE 5.15 Drawing a selection rectangle.

Now we know how to select edges, surfaces, and objects. Let's start putting that knowledge to work in the next task.

Copying Objects

You'll often want to copy elements in SketchUp. For example, we're going to construct a table later on in this lesson by creating one table leg and then making a few copies for the other legs. Copying objects guarantees you exact duplicates when having an exact duplicate is important—as when you're making actual table legs.

Being able to copy objects is an essential skill in SketchUp, so here's how you do it. In this case, we'll make a copy of a simple cube:

1. Click the **Start Using SketchUp** button and click the human figure that appears in the Engineering–Feet template to select it; press the Del key to delete it.
2. Draw a horizontal rectangle.

3. Click the **Push/Pull tool** in the toolbar.
4. Move the mouse cursor to the rectangle and press the mouse button on the rectangle.
5. Press the mouse button on the rectangle and drag the rectangle up to extend it into a 3D cube, as shown in Figure 5.16.

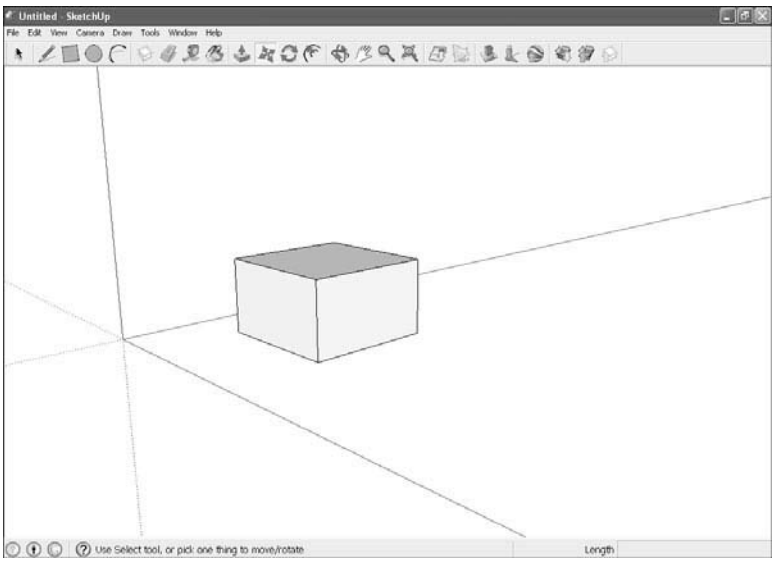

FIGURE 5.16 Drawing a cube.

6. Click the **Select tool** in the toolbar.
7. Select the cube by pressing the mouse button outside it and dragging the selection rectangle that appears over the cube. Now you've selected the object you want to copy.
8. Select the Edit menu's **Copy** item.
9. Select the Edit menu's **Paste** item. When you do, a copy of the object appears at the location of the mouse cursor. Moving the mouse cursor moves the copy of the object.

10. Move the mouse cursor to the location at which you want to place the copy of the object.
11. Click the mouse. The copy of the object appears at the location you clicked the mouse and stops moving around with the mouse cursor. You can see an example in Figure 5.17, where we've copied the cube.

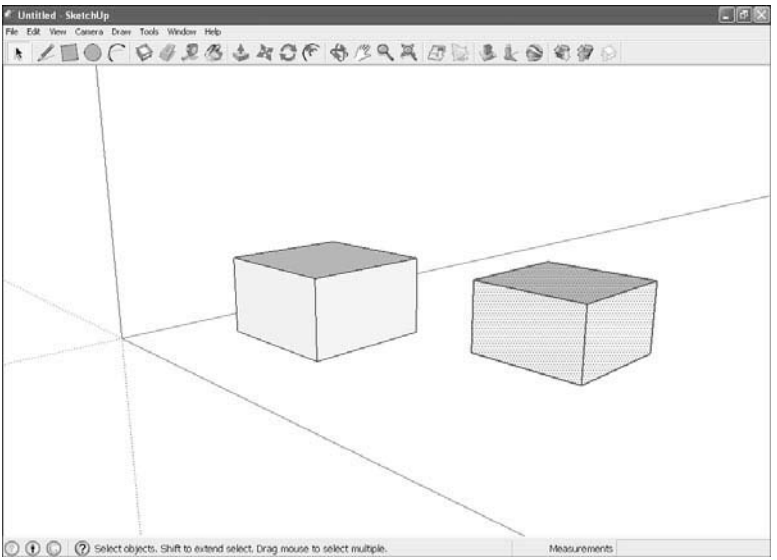

FIGURE 5.17 Copying a cube.

That's it—now you can copy objects.

Moving Edges and Surfaces with the Move Tool

You can use the Move tool to pull edges into 3D. Take a look at the cube in Figure 5.18.

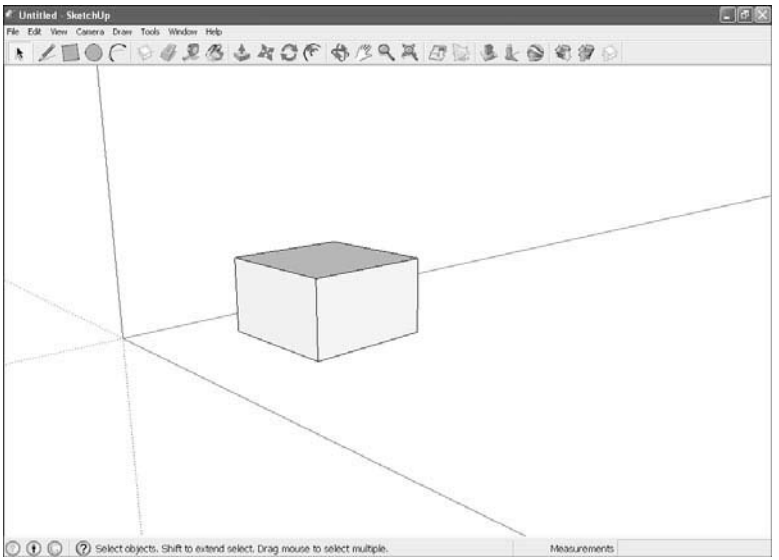

FIGURE 5.18 A cube.

That's fine—but what if you wanted to draw a ramp instead, such as the one you see in Figure 5.19?

You can easily convert the cube in Figure 5.18 to the ramp in Figure 5.19 using the Move tool, which you can use to grasp edges and pull them into 3D (the Push/Pull tool lets you only push or pull surfaces).

Here's how it works—in this example, we'll convert a cube to a ramp.

1. Click the **Start Using SketchUp** button and click the human figure that appears in the Engineering–Feet template to select it; press the Del key to delete it.
2. Draw a horizontal rectangle.
3. Click the **Push/Pull tool** in the toolbar and move the mouse cursor to the rectangle.
4. Press the mouse button on the rectangle and drag the rectangle up to extend it into a 3D cube, as shown in Figure 5.18.

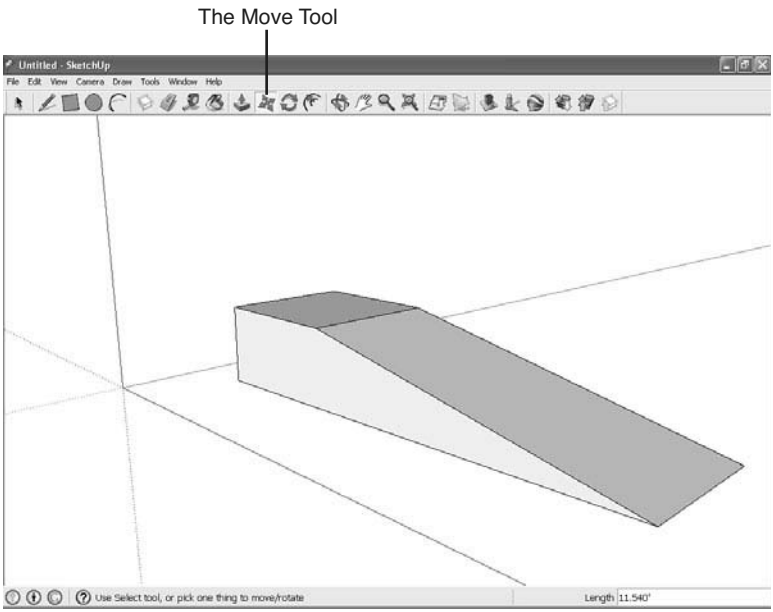

FIGURE 5.19 A ramp created by using the Move tool.

5. Select the **Move tool** in the toolbar (as shown in Figure 5.19).
6. Press the mouse button on the lower-right edge of the cube.
7. Drag the edge away from the cube to form the ramp. As you drag, the ramp extends from the cube.
8. Click the mouse at the location you want for the end of the ramp. When you do, the ramp becomes permanent (unless you erase it), as shown in Figure 5.19.

That's how the Move tool works in 3D. Using this tool, you can drag edges, not surfaces, into 3D, as in the case of making a ramp from a cube.

As its name implies, you can also use the Move tool to move individual objects around. Simply use the Select tool to select the object, and then move the object into place with the Move tool.

Drawing 3D by Subtracting Elements

You often draw 3D objects by subtracting elements. To show how this works, we'll draw a table like the one you see in Figure 5.20.

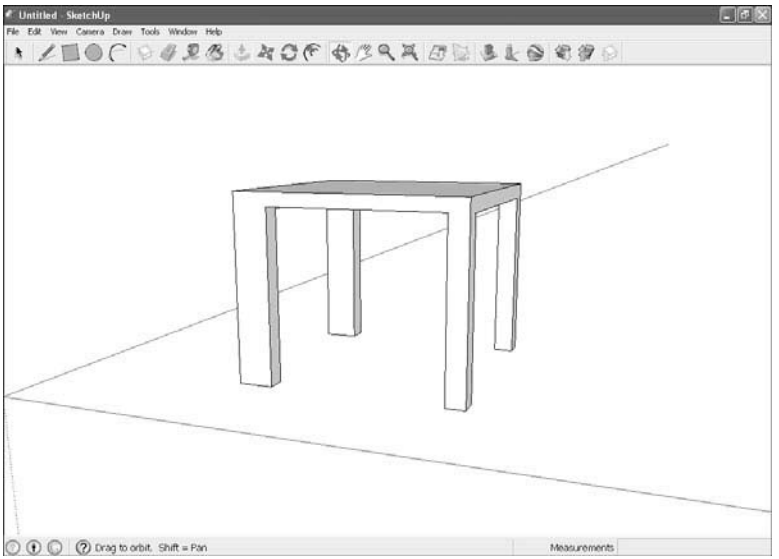

FIGURE 5.20 A 3D table.

How was that table created? Here's how:

1. Click the **Start Using SketchUp** button and click the human figure that appears in the Engineering–Feet template to select it; press the Del key to delete it.
2. Draw a horizontal rectangle.
3. Click the **Push/Pull tool** in the toolbar and move the mouse cursor to the rectangle.
4. Press the mouse button on the rectangle and drag the rectangle up to extend it into a 3D cube.

5. Select the **Rectangle tool** in the toolbar.
6. Draw a rectangle on the cube as shown in Figure 5.21.

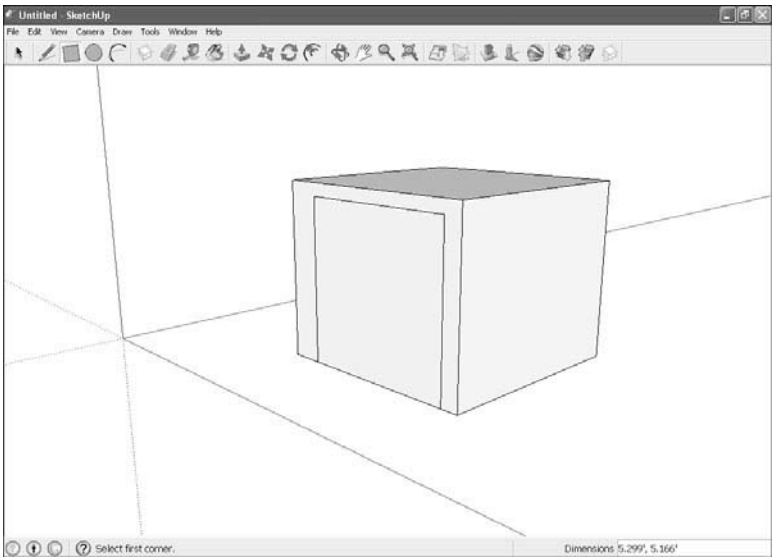

FIGURE 5.21 Adding a rectangle to a cube.

7. Select the **Push/Pull tool** in the toolbar.
8. Push the rectangle through the cube until you get a cutout in the shape of the rectangle.
9. Select the **Rectangle tool** in the toolbar.
10. Draw a rectangle on a cube surface adjacent to the first surface where you drew a rectangle. Draw the rectangle so that pushing it through will give you two of the table's legs.
11. Select the **Push/Pull** tool in the toolbar.
12. Push the rectangle through until you get a cutout in the shape of the rectangle. You can see what the result will look like in Figure 5.22.

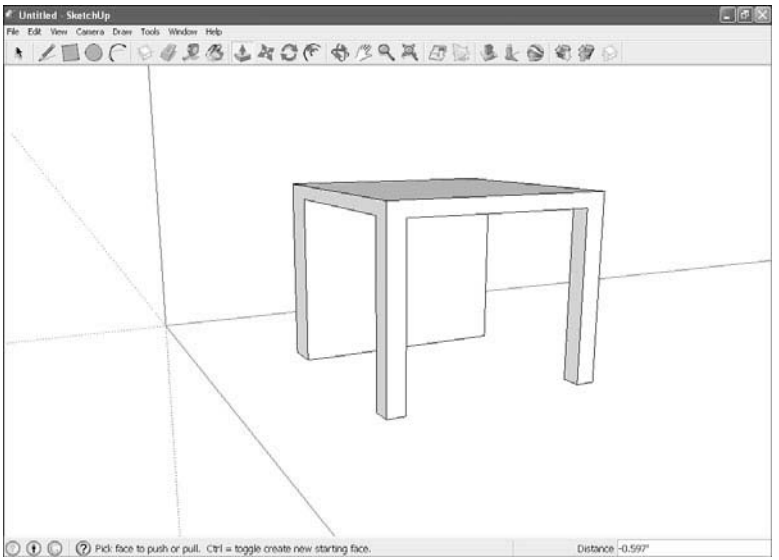

FIGURE 5.22 Pushing through a rectangle.

13. Select the **Rectangle tool** in the toolbar.
14. Draw a rectangle on the remaining vertical cube surface. Draw the rectangle so that pushing it through will give you the final two table legs.
15. Select the **Push/Pull tool** in the toolbar.
16. Push the rectangle through until you get a cutout in the shape of the rectangle. That creates the table in Figure 5.20.

And that's one technique for drawing 3D—by subtracting elements.

> TIP: **Making the Table Legs Identical**
>
> If you want to make sure the table legs are identical in all dimensions, you can use inferring. Select the Move tool, hover over the surface of a leg, then click another leg's corresponding surface to snap to the corresponding measurement.

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