Staring Down Stairs

You can make stairs probably a million different ways in SketchUp, and in the following sections, you find two methods that work equally well.

Chapter 5 contains a third, slightly trickier (but way more powerful) way of making stairs using components. 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 you dive in, here's some simple stairway vocabulary, just in case you need it. Figure 4-27 provides 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.

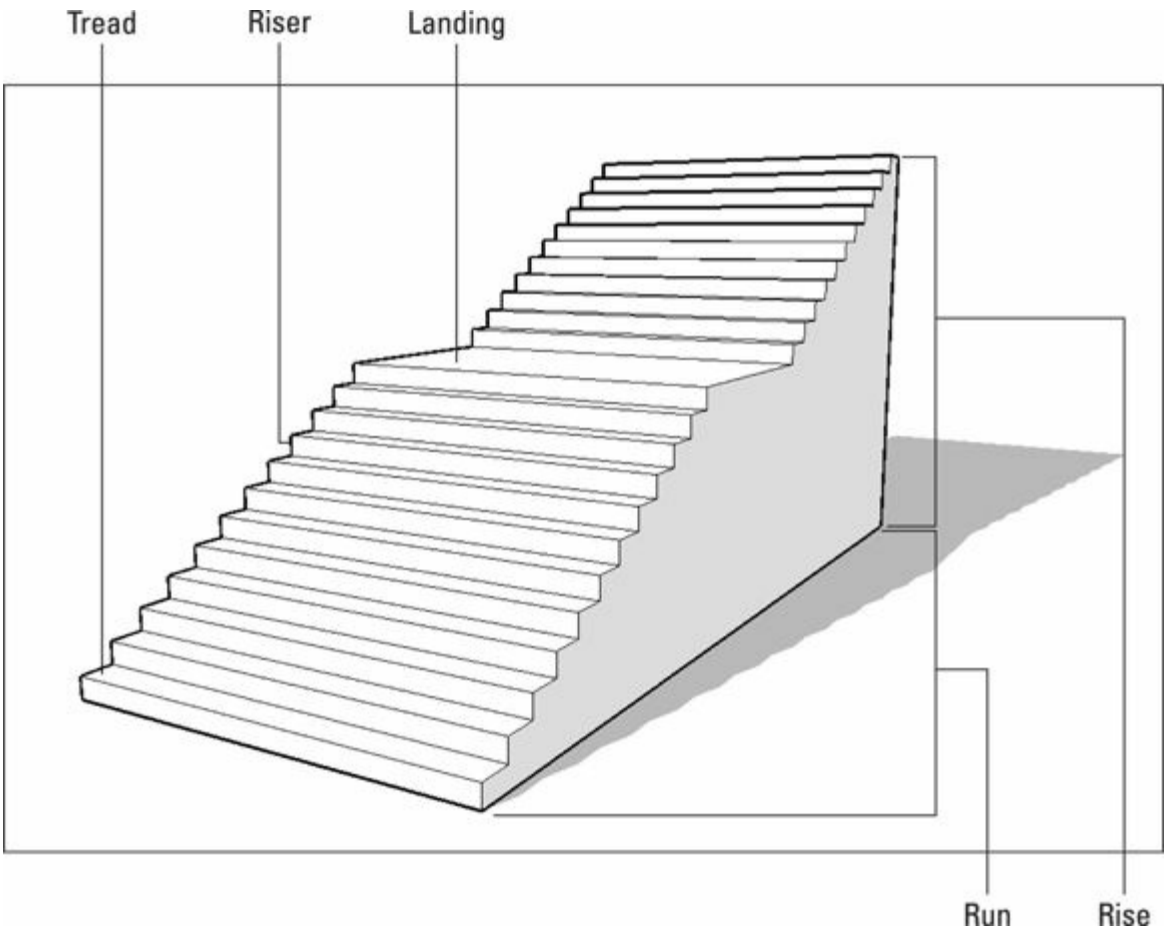

FIGURE 4-27: The anatomy of a staircase.

TIP Model steps as a group, separate from the rest of your building, and move them into position when they're done. You can read all about groups in Chapter 5.

The Subdivided Rectangles method

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

TIP The key to the Subdivided Rectangles method is 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, the Divide command comes in really handy.

Here's how the Subdivided Rectangles method works. See Figure 4-28:

1. **Draw a rectangle the size of the staircase you want to build.**
2. **With the Select tool, context-click a long edge of your rectangle and choose Divide.**

   If your staircase is wider than it is long, context-click a short edge 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.
5. **From one of the corners of your original rectangle, draw a vertical edge that's 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 we 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.

   

   REMEMBER 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.**

   

   TIP 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.

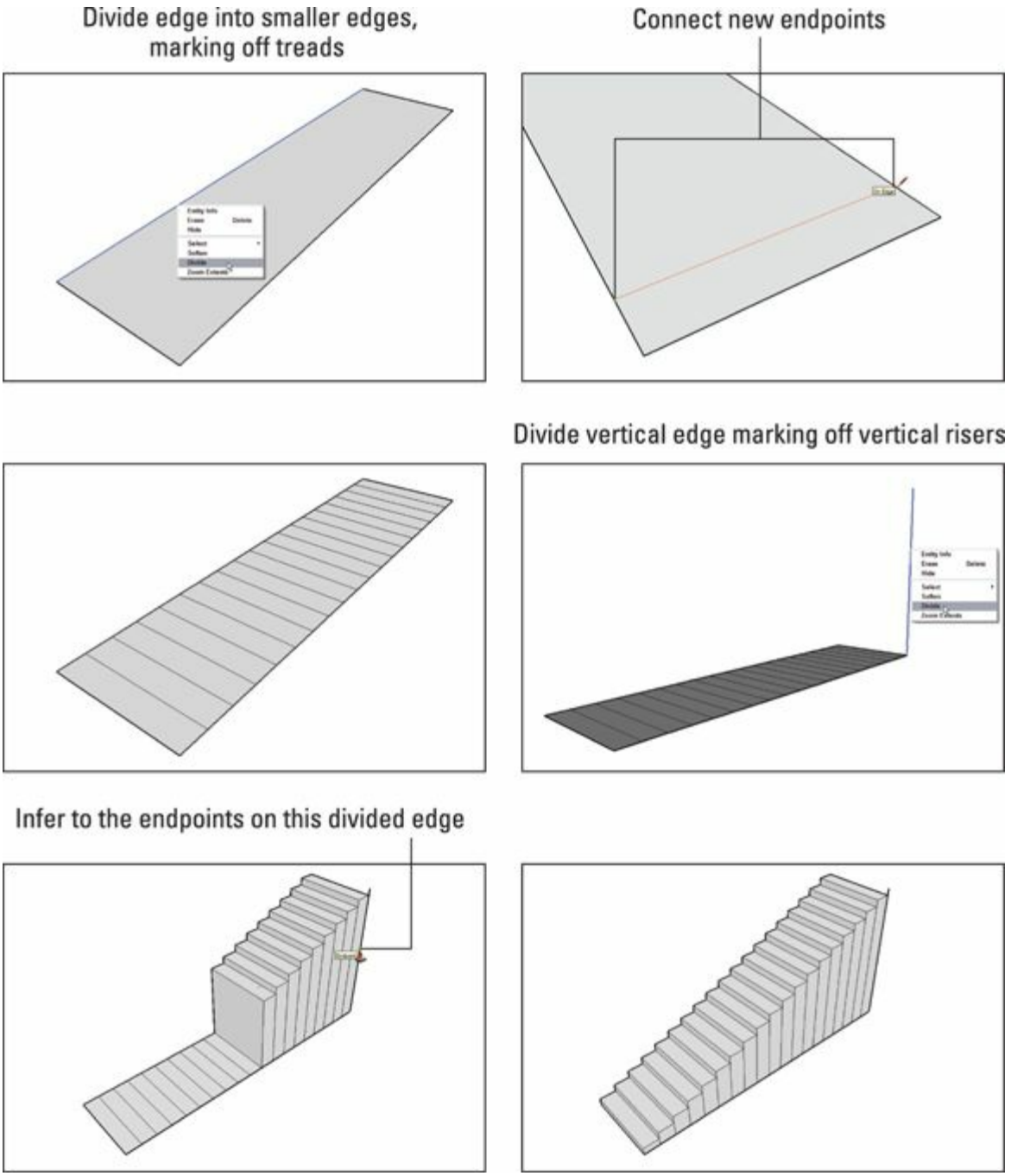

FIGURE 4-28: The Subdivided Rectangles method of building stairs.

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 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 us).

Follow these steps to make a staircase using the Copied Profile method, as shown in Figure 4-29:

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.

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

   The Line tool is a great choice, although 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 3.

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 select multiple entities. Chapter 3 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 3.

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

   For example, if you want ten steps, 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 to reflect the desired width of your staircase.**

   This part seems like magic to most folks; we don’t think it ever gets old.

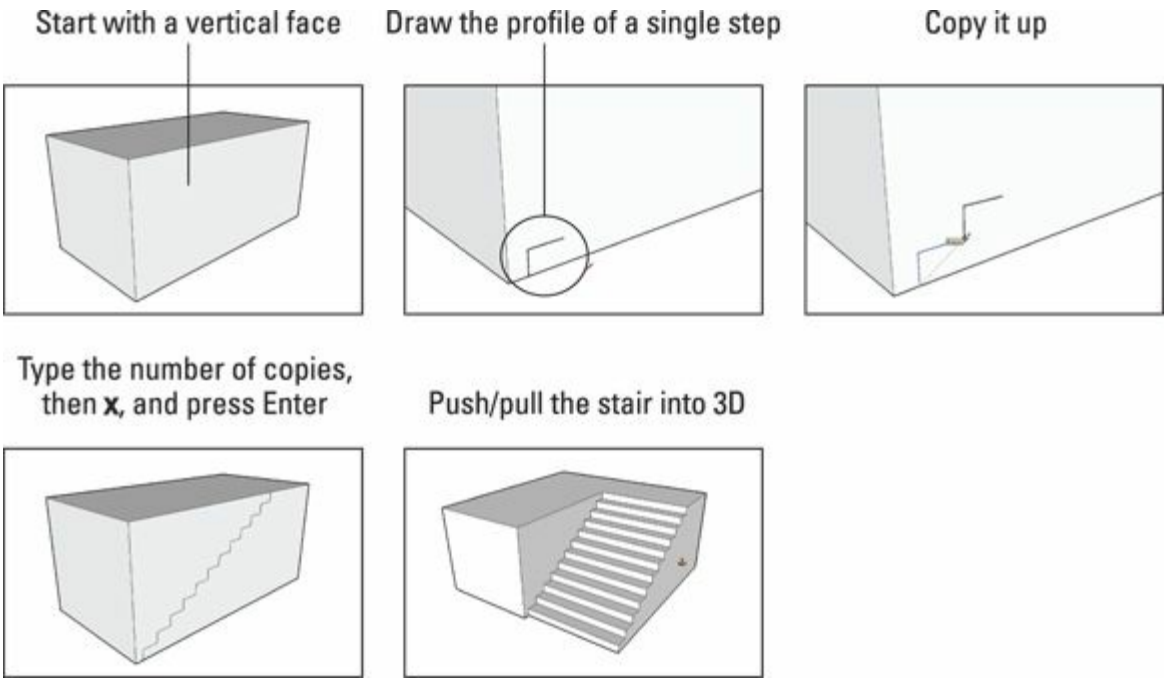

FIGURE 4-29: The Copied Profile method.

TIP This method of stairway building also works great in combination with the Follow Me tool, covered in Chapter 6. Figure 4-30 whets your appetite. Follow Me is cool beans, all the way around.

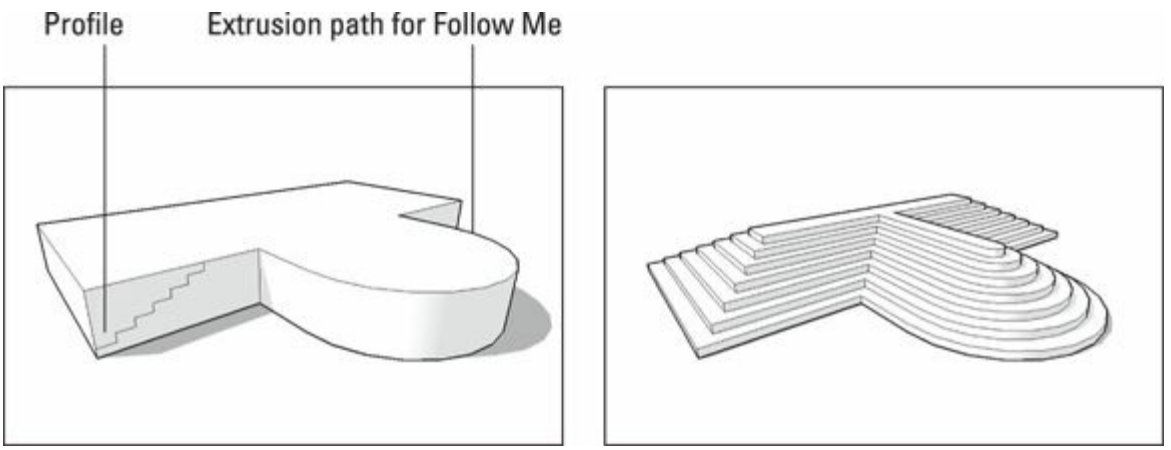

FIGURE 4-30: Using Follow Me with the Copied Profile method produces some impressive geometry, indeed.

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, this section keeps things pretty simple: The following sections show you how to identify and model basic roof forms. After that, you discover a great tool — *Intersect Face* — that you can use to assemble complicated roofs from less-complicated pieces.

TIP 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 — but that's not always possible with roofs. Google Maps offers a neat way to view an existing roof you're trying to build.

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

Before you dive in, here's a brief guide to general roof types and terminology that may come in handy for the explanations later in this chapter. Figure 4-31 illustrates each of the following terms:

- **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.

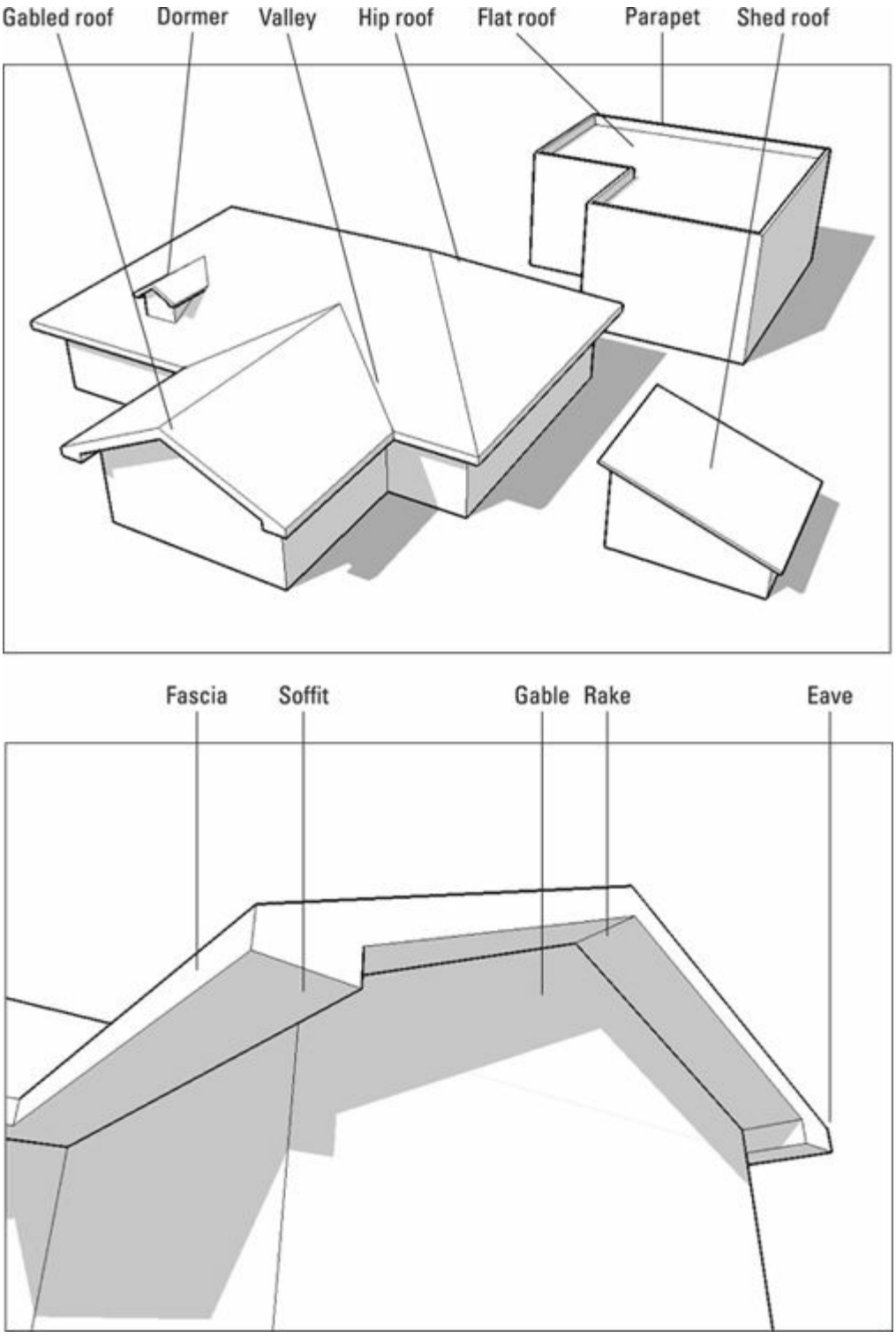

FIGURE 4-31: Some different kinds of roofs, and their various and sundry parts.

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 4-32:

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.**

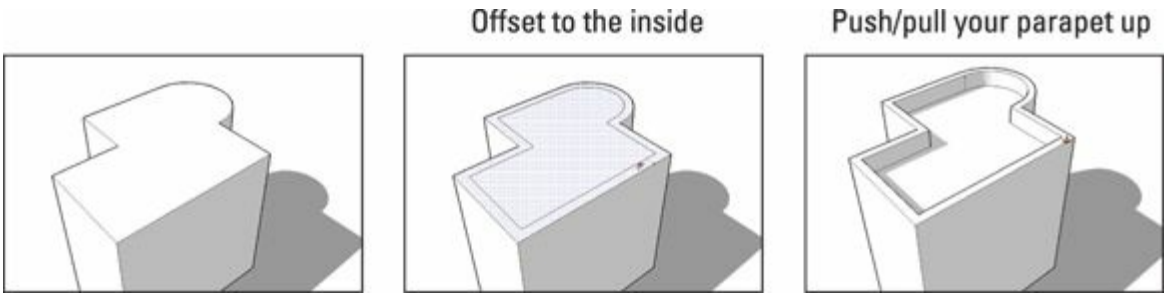

FIGURE 4-32: Modeling parapets on flat-roofed buildings is easy.

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.** As we warn you elsewhere in this section, you should always make a group out of your whole building before you start working on your roof.
- **Draw a top view of your roof on paper first.** Working out the roof's basic shape in your mind can help you figure out how to manage the roof's details. Adding measurements and angles is even better because these details help you know what to do in 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. To find out how this tool works, open the Instructor panel and then activate the Protractor tool. Chapter 3's section on rotating can also help you, because, in many ways, the Protractor tool behaves like the Rotate tool.

Creating eaves for buildings with pitched roofs

Aidan's 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 4-33:

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

   Keeping your roof separate makes your model easier to work with.

2. **With the Line tool, 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. **With the Offset tool, 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.

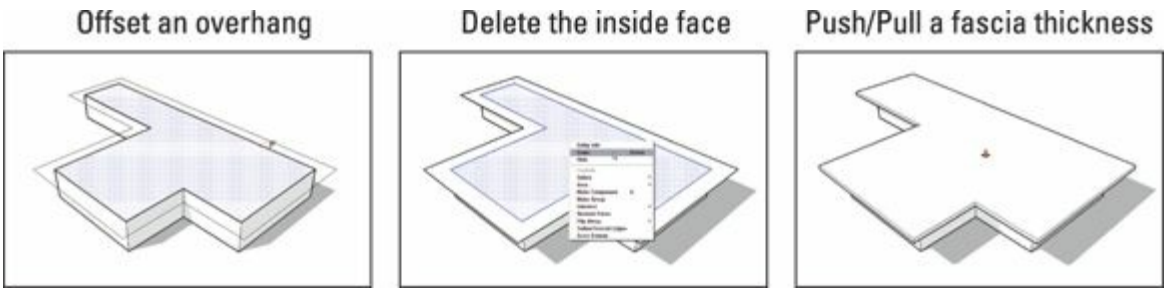

FIGURE 4-33: Eaves are the parts of the roof that overhang a building's walls.

Constructing gabled roofs

You can construct a gabled roof in a bunch of ways (every SketchUp expert has her favorite), but one method works particularly well.

Follow these steps to build a gabled roof, which is shown in Figure 4-34:

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. **With the Protractor tool, create an angled guide at the corner of your roof.**

   The nearby sidebar, "Pitched roofs can make you crazy," points you to help with the Protractor.

   TECHNICAL STUFF 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 you are 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. **With the Line tool, 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 4-35, extrude it back until it's completely "buried." The section "Sticking your roof together with Intersect Faces," later in this chapter, has more information on how to make a complex roof.

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

Gabled roofs have more details than we can cover, but Figure 4-36 shows a few common ones.

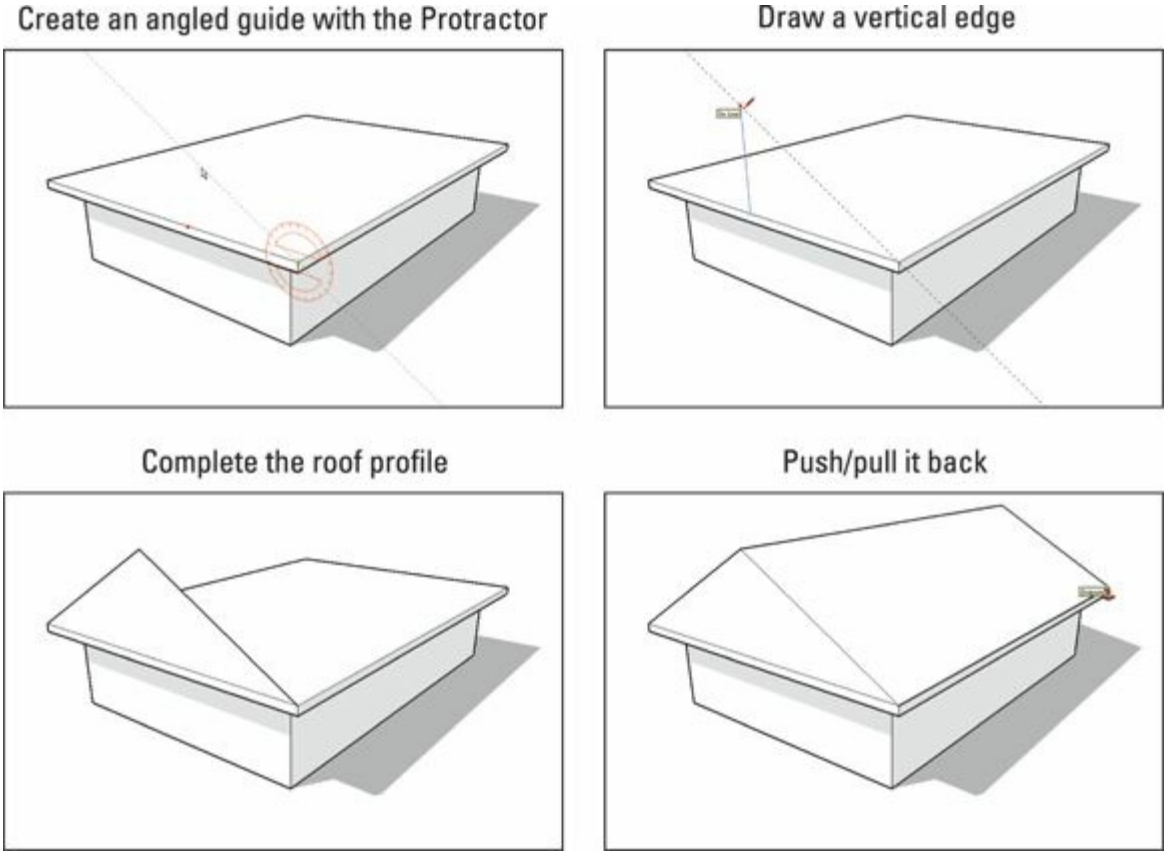

FIGURE 4-34: Gabled roofs are relatively easy to make in SketchUp.

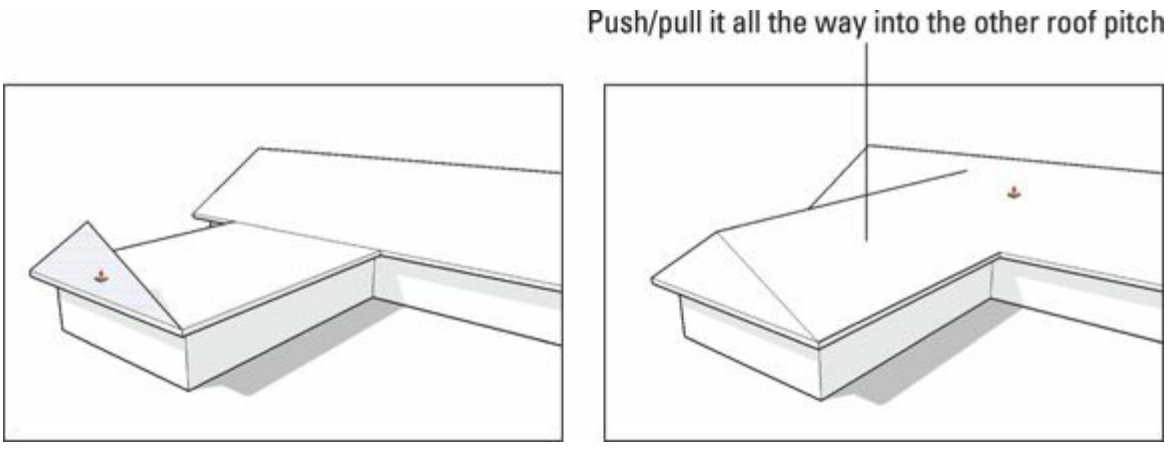

FIGURE 4-35: If your gabled roof is part of a larger roof structure, it may just run into another roof pitch. Let it.

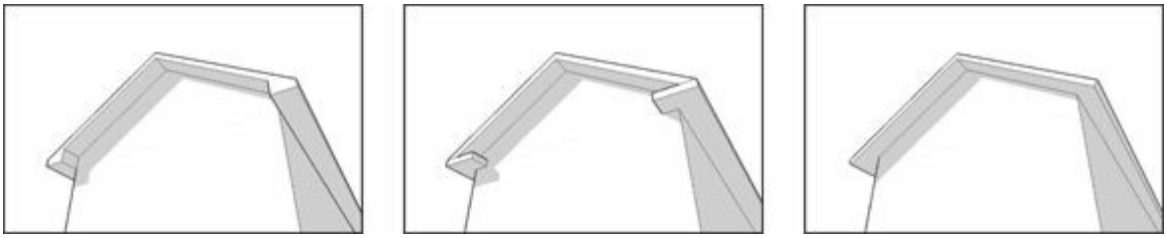

FIGURE 4-36: Some common gabled roof details.

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 for yourself:

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, as shown in Figure 4-37.**
4. **Draw edges from the point on the ridge you just located to the corners of your roof, as shown in Figure 4-37.**

   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.**

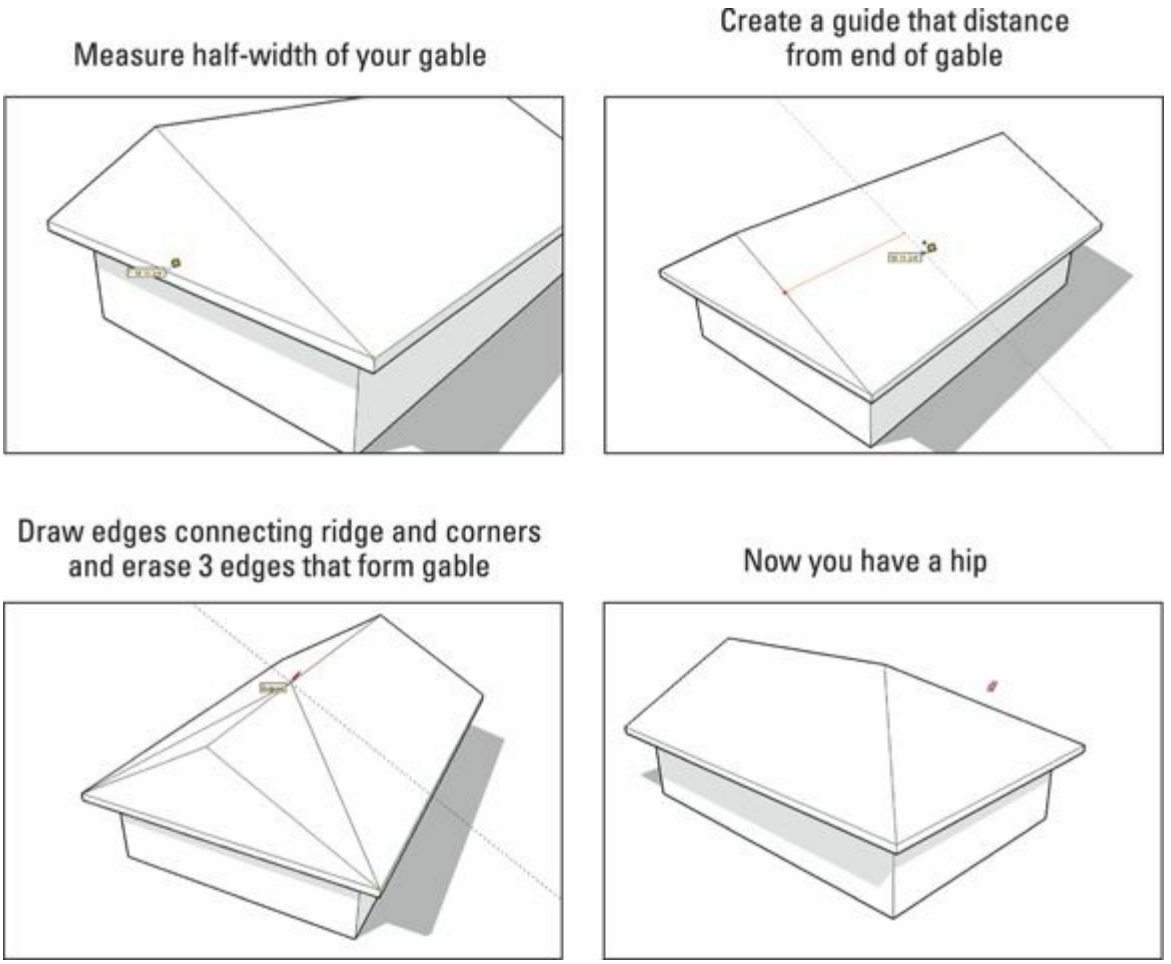

FIGURE 4-37: To make a hip roof, start with a gabled one.

Sticking your roof together with Intersect Faces

In general, the newer and more expensive a house is, the more roof slopes it has. Who knows why this is the case? Maybe folks think complex-roofed houses look more like French chateaus. Whether crazy roofs are a good thing isn't relevant to this book, but they're a pain in the, um, gutters to model.

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 4-38 shows what we 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, the Eraser can remove the edges you don't want — the rest of the cylinder, in this case.
- **Intersect Faces and the Eraser tool go hand in hand.** Anytime you use Intersect Faces, you need to follow up by deleting unwanted geometry. To find it all, orbit, zoom, and pan around your

model, zapping stray lines and faces with the Eraser as you go.

- **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:* 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
    - *Context-click and choose Intersect Faces.*
    - *Choose Edit ⇒ Intersect Faces.*

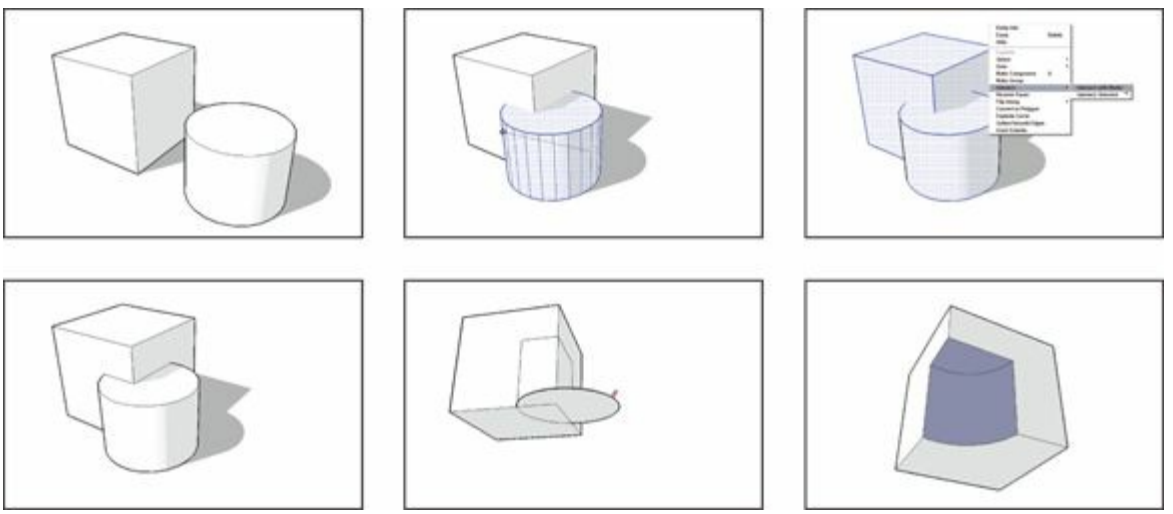

FIGURE 4-38: Using Intersect Faces to cut a partial cylinder out of a cube.

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 4-39 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.**

TIP If you grouped your building and roof the way we recommend earlier in this chapter, here's a timesaving trick: 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 create edges everywhere faces *intersect* — that is, everywhere faces pass through each other without an edge.

3. **With the Eraser, *carefully* delete the extra geometry on the inside of your roof, as shown in Figure 4-39.**

   Although this erasing can be a lot of work, it's a whole lot easier than using the Line tool and SketchUp's inference engine to figure out where complex roof details should go.

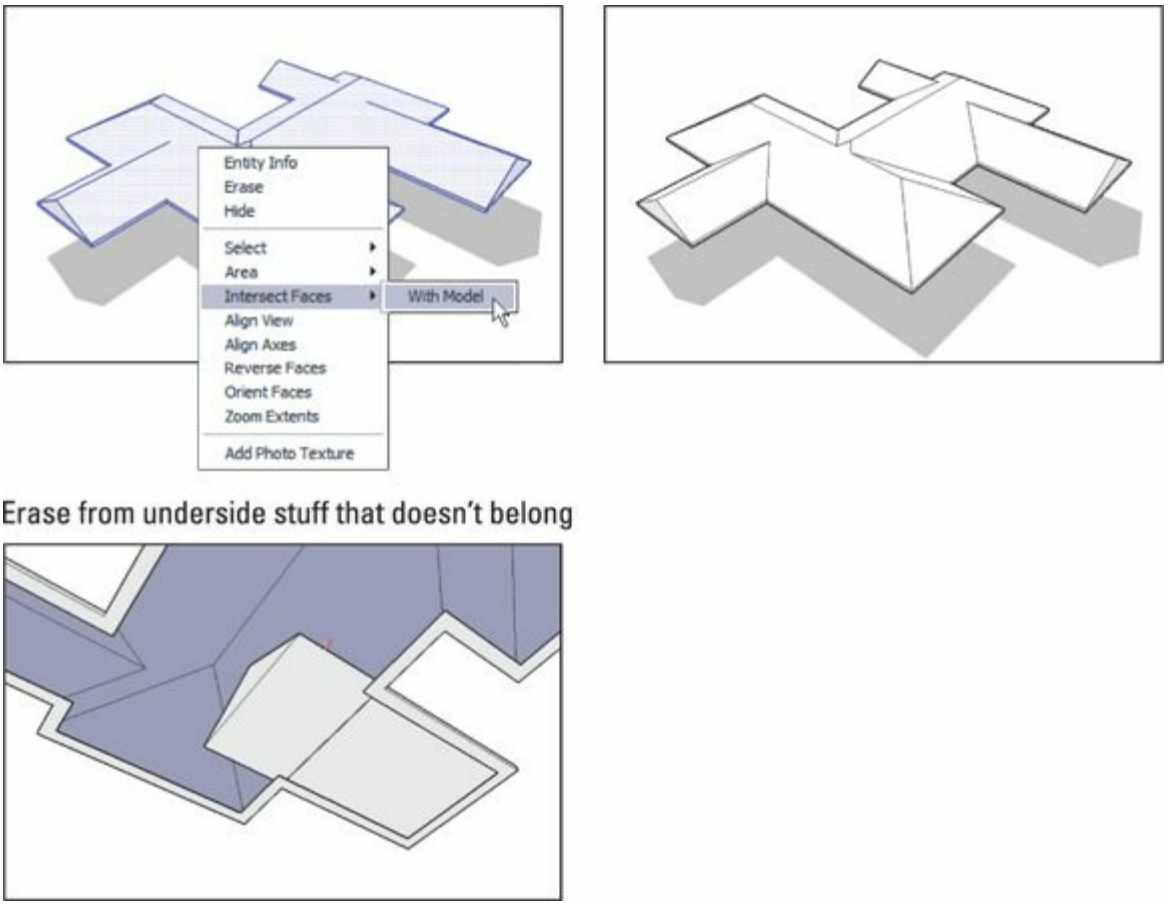

FIGURE 4-39: Here's a typically complex roof that Intersect Faces can unify.

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 3 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, which is beautiful to watch but beyond the scope of this book.

All the same, the following figure shows how the Line tool and SketchUp's venerable inference engine help you draw a gabled dormer on a sloped roof surface. With practice, you can do it.