BY GREG BURNET

# Cutting Common Rafters

**Getting back to basics** in order to lay a solid foundation for the next generation of builders, *JLC* is launching a new fundamentals series for *Training the Trades*. We will focus on many of the skills a well-rounded carpenter should acquire during his or her first year on the job; the goal is to provide a primer for people wishing to enter the industry as well as a refresher for veterans and a tool for business managers to use when training employees.

We'll cover both frame and finish skills—from laying out and cutting common framing members to hanging doors and running trim. We'll talk about the technical aspects of each element, and we'll discuss basic terminology, which is crucial to concise and effective on-the-job communication.

In this first installment, we explain the process of laying out and cutting a common rafter. There are several approaches to laying out rafters, but I'll cover the most efficient method that I've found, which uses a Construction Master calculator and a layout square. The only other tools you'll need are a tape measure and a sharp pencil.

## COMMON RAFTER LENGTH

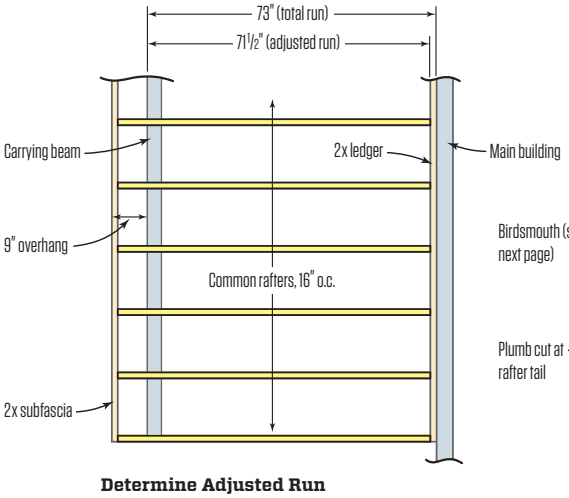
To lay out a rafter, you need to know the roof slope and calculate the rafter run.

**Roof slope** is the incline of the roof, expressed as a ratio of the number of inches of rise (vertical travel) for every foot of run (horizontal travel). In our example, we have a 7:12 roof—7 inches of rise for every foot of run. On construction calculators, slope is often called "pitch."

**Rafter run** is the horizontal distance the rafter travels. On a full gable roof, this is equal to half the building width minus *half* the ridge thickness. On a shed roof (see illustration, below), rafter run is the distance from a ledger on the main building to the outside of an addition wall or porch carrying beam. We need to adjust the total run (73 inches in our example) by subtracting 1½ inches, the *full* width of the ledger (adjusted run = 71½ inches).

The calculation sequence to find rafter length on a Construction Master is shown below. Note that rafter length is measured from the tip of a plumb cut at the top end of the rafter to the building line (shown as a dotted red line in the section/elevation below). Rafter length does not include the rafter overhang.

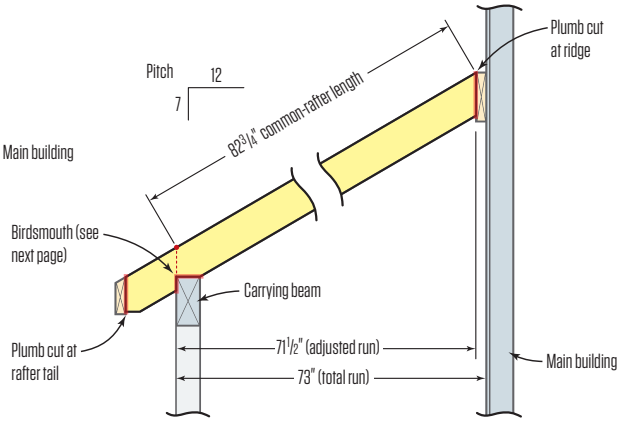
### Roof Plan




**Determine Adjusted Run**

73" (total run) – 1½" (ledger thickness) = 71½" (adjusted run)

### Section/Elevation

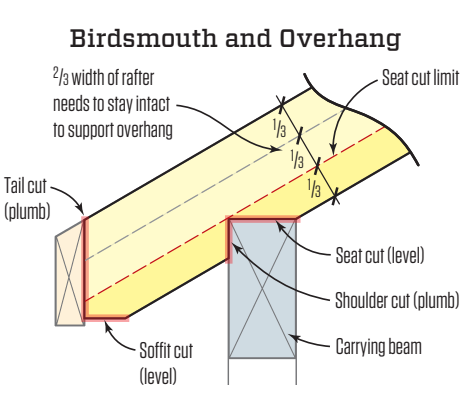



**Calculate the Rafter Length**

On the Construction Master, punch in the following sequence:

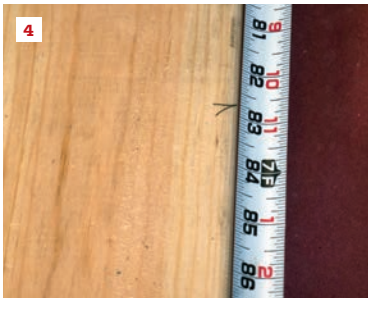
71 [Inch] 1 [/] 2 [Run] 7 [Inch] [Pitch] [Diag] = 82¾"

Photos by Sue Burnet / Illustrations by Tim Healey

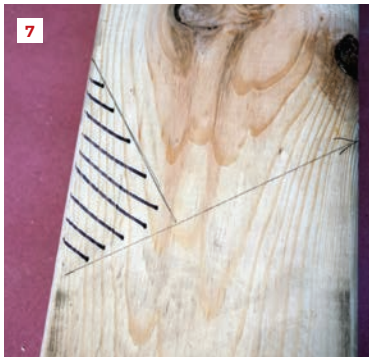











**Rafter stock.** I start by selecting material that's as straight and free of twists as possible. Even good lumber usually has a bit of a crown, so I sight down the edge of the material **(1)**, and place a mark pointing to the edge where the crown faces up. We will install the rafters with crowns facing up, so I place that side towards me on a bench or sawhorses.

**Plumb cut.** Next, I mark a plumb cut on the end of the rafter that will butt the ridge or ledger board. To do this, I line up a Swanson Speed Square on the top edge of the rafter and pivot it until the appropriate slope mark ("7" on the square's "Common" scale for a 7:12 roof) lines up with the board's edge **(2)**. Using a sharp pencil, I strike a line across the face of the material, and I use a circular saw with a good blade to cut to the line.

**Rafter length.** I can now hook a tape measure on the long point of this plumb cut **(3)** and measure for the length of the rafter. In this case, it's 82 3/4 inches. **(4)**.

**Birdsmouth.** Place a square at the 82 3/4-inch mark, and draw another plumb line, parallel to the top cut **(5)**. This line represents the shoulder of the birdsmouth.

**Birdsmouth depth.** Whenever a roof has an overhang, you don't want to cut too deep a birdsmouth. As a general rule, you want to leave roughly two-thirds of the width of the rafter stock intact to support the overhang (see illustration, top left). In this case, we have 2x6 rafter stock, so we want to leave roughly 3 5/8 inches (it doesn't need to be exact). This is measured square to the board, not along the plumb line.

**Seat cut**. Set the flange of the square on the plumb line that marks the birdsmouth shoulder, and slide this flange to the approximate depth of your seat cut (following the 2/3 rule). In this case, the width of the carrying beam we are bearing on is 3 1/2 inches, and that's close to what we end up with for the length of the seat cut **(6)**. But the birdsmouth doesn't need to have full bearing. On a steeper roof, it will be shorter; on a shallower roof, the seat cut will be longer. The birdsmouth (identified in the photo with hatch marks) can be cut now **(7)**, but I usually wait until I have laid out the tail cuts.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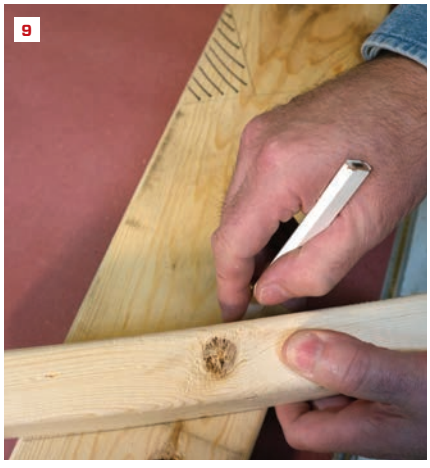
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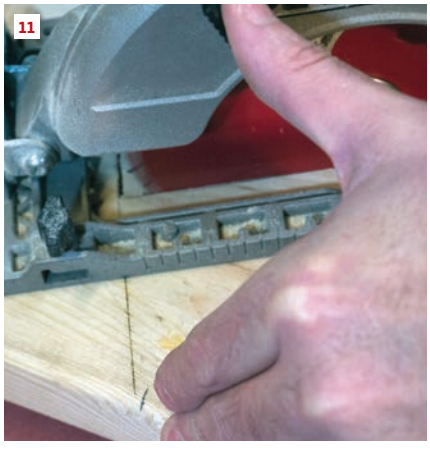
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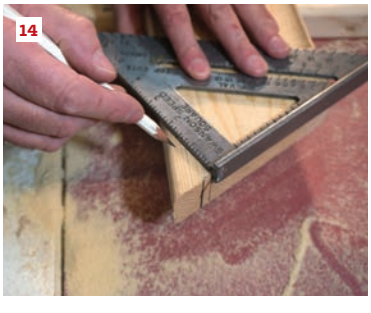
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**Tail cut.** In our example, the roof has a 9-inch overhang as measured on a level plane from the building (see Roof Plan, page 13). I lay this out by measuring horizontally across the rafter **(8)** from the birdsmouth shoulder. (It's not shown, but you may want to use a square to make sure you are pulling the tape square to the birdsmouth shoulder.) I mark a plumb line here using the layout square, the same way I did for the top cut and for the shoulder of the birdsmouth.

**Boxed eaves.** If we had open eaves, I would cut the rafter ends plumb on this line. In our case, however, we will have boxed eaves, and the ends of the rafter will be tied together with a 2x6 subfascia. So using a scrap of 2-by material, I just draw a line 1 1/2 inches back from the plumb line **(9)**. In the photo, I have used black hatch marks to note where the subfascia will land relative to my rafter **(10)**. I can now make this plumb cut, chopping off the hatch marks.

**Cutting the birdsmouth.** With the saw out, I also cut the birdsmouth. The birdsmouth is a stopped cut, or notch. It's important not to overcut the lines, as doing so can weaken the rafter. When using a circular saw, stop the cuts right at the intersecting marks of the plumb and seat lines **(11)** and finish the cuts with a hand saw or jigsaw.

**Soffit cut.** The plumb cut at the end of the rafter is longer than the 2x6 subfascia is wide. Therefore, I want to cut off the long point of this plumb cut so it doesn't protrude below the subfascia or interfere with the soffit material. The simplest way to do this is to hold a scrap of the subfascia material in position **(12)** and mark the bottom edge. I also deduct another 1/4 to 1/2 inch to be sure that none of the tails will extend into the finished soffit, and I strike a mark **(13)**. To make the soffit cut, I hold my square on the plumb cut, and mark a "level" line square to the plumb cut **(14)**. The final tail cut is made along that line **(15)**, and the resulting rafter can be used as a pattern to lay out all the other common rafters.

*Sue and Greg Burnet are co-owners of Toolbelt Productions (toolbeltproductions.com), an education and training firm for the building industry.*