

## Laying out and cutting common rafters



**A**lthough trusses dominate

new construction in most parts of the country, traditional cut rafters are still the go-to approach to roof framing in some areas. They're also common in remodeling work and in small jobs such as entry-porch roofs.

Laying out rafters involves some math, but only for the first one. After it's been laid out and cut and its fit has been checked, it serves as a pattern for the rest. The two starting points for any rafter are the roof pitch—that is, the rise and run—and the building width. The run, or horizontal part, is always 12 (except in the case of a hip rafter), but the rise, or vertical part, varies. For example, an 8-in-12 (or 8-pitch) roof angle would rise 8 in. for every 12 in. of run. The second starting point is the building width. Even when you're working from a set of building plans, which list this dimension, always verify it by measuring between the top wall plates, from the outside face of the sheathing on one side to the outside face of the sheathing on the other.

When you have these two pieces of information, you can then deter-

### STEP BY STEP



**1** **Mark the ridge plumb cut.** Hold the pivot point of the rafter square on a straight piece of rafter stock. Using the "common" line, align the number corresponding to your pitch with the edge of the stock, and mark the ridge cut. Flip the square to the other side to complete the mark.



**2** **Make the ridge plumb cut.** Use a sharp blade in a circular saw to split the layout line. Cutting up from the bottom of the rafter leaves a splinter-free edge that you'll appreciate when using this rafter as a template later on.



**3** **Mark the length.** Hook a tape measure on the point of the ridge cut, and pull the tape along the top of the rafter. Mark both the calculated rafter length and the overhang.



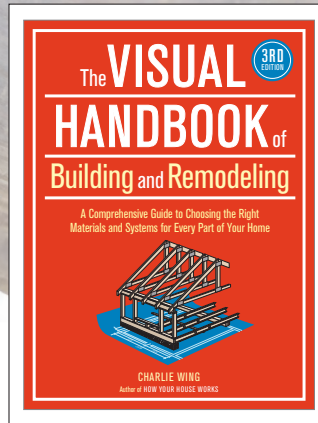
**4** **Lay out the bird's mouth and bottom plumb cuts.** Using the same technique as for marking the ridge cut, mark plumb lines for the bird's mouth and the bottom of the overhang.

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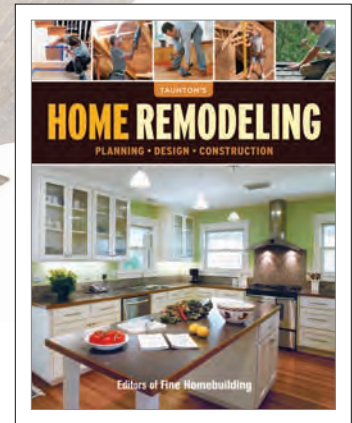
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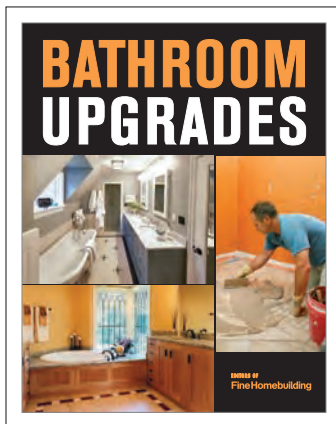
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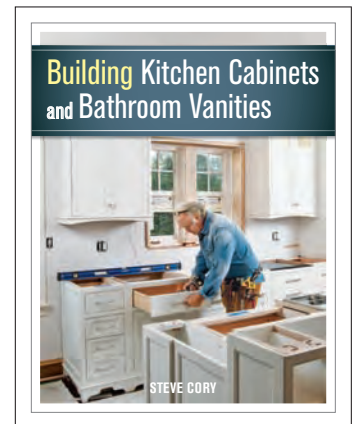
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RAFTER ANATOMY



mine the rafter length and lay out the cuts.

Doing the math

Let's say that the measurement between the outside of the plates for an 8-in-12 entry-porch roof is 6 ft. Each rafter spans half that distance, so the theoretical total run (the horizontal distance the rafter spans) is 3 ft., or 36 in. From that, you have to deduct half the thickness of the ridge board to find the actual run. In most cases, a ridge board is a 2x that's one or two sizes deeper than the rafters (to provide enough depth for the full cut end of the rafter to bear on the ridge, a code requirement). The actual width of a 2x ridge is 1½ in., so deduct half of that, ¾ in., from the theoretical total run of 36 in. Actual run: 36 in. - ¾ in. = 35¼ in.

The rafter length is the diagonal measurement along the top edge of the rafter from its tip to a point directly above the outside of the wall plate. There are two simple ways to find it. The first is to plug

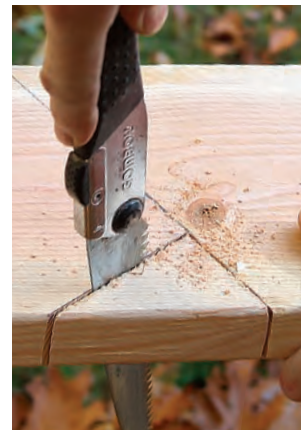
STEP BY STEP



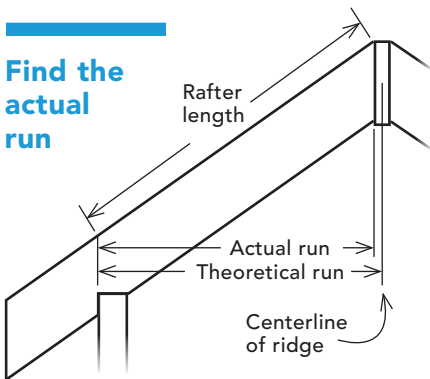
**5 Mark the level cut.** Align the inside of the square's flange with the plumb cut, and align the number corresponding to the combined width of the wall plate and the thickness of any sheathing with the bottom of the rafter. Mark the cut.



**6 Cut the bird's mouth.** Make both the level and the plumb cuts, splitting the lines and stopping at the corner. Many carpenters overcut the corner so that the scrap drops out, but this weakens the rafter.



**7 Finish the bird's mouth.** Use a handsaw, reciprocating saw, or jigsaw to complete the plumb and level cuts.



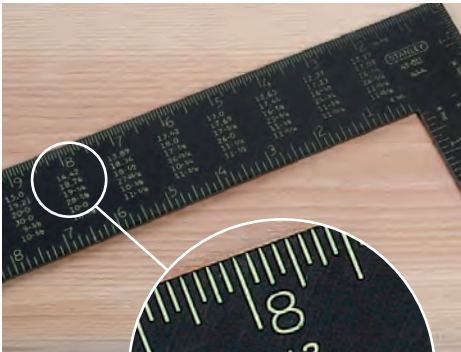
Find the actual run



**8 Mark the rest of the rafters.** The first rafter serves as a template for the others. Stop blocks screwed to the top of it speed placement. Cut two rafters, and then check their fit before cutting the entire roof.

the numbers into a construction calculator or app. For the example of an 8-in-12 roof, enter 8 Pitch, then 35¼ in. Run. Press the Diag key to get the rafter length.

Alternatively, you can use the table on a framing square and some fourth-grade math. Most framing squares have a line labeled “Length of common rafter per foot [of] run.” Follow that line to below the number that represents the roof pitch (here, 8), and find the rafter length per foot of run—in this case, 14.42 in. Because it’s



**Old-school calculator.** The tables on a framing square provide all the information needed to lay out any roof. Building this roof required only the rafter length per foot of run, which is found under the number that corresponds to the roof pitch.

easier to do the math in inches rather than feet and inches, I convert the length per foot of run to length per inch of run.

Find the rafter length per inch of run by dividing the length per foot of run by 12:

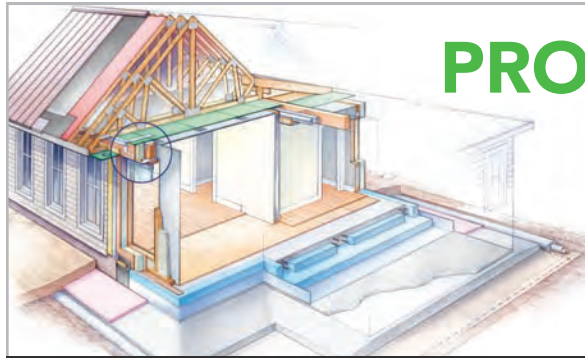
$$14.42 \div 12 = 1.2 \text{ in.}$$

Find the rafter length by multiplying the length per inch of run by the actual run:

$$1.2 \times 35.25 = 42.3 \text{ in. (42}\frac{5}{16} \text{ in.)}$$

You also need to find the rafter length for any overhang beyond the outside of the wall plate. The process for that is essentially the same as finding the rafter length, except that there’s no ridge. Deduct the thickness of the fascia from the actual run. Once the rafter length is dialed in, it’s time to lay out a rafter.

Senior editor Andy Engel learned to frame houses from several old-school carpenters. Photos and drawing by Rodney Diaz.



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