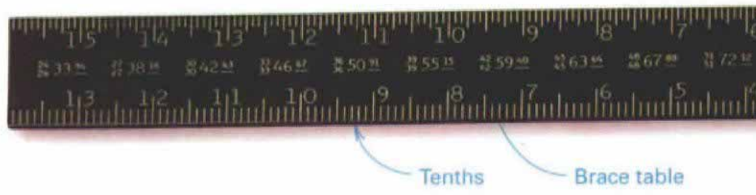
Getting More out of Your Rafter Square



If you understand the twelfth scale, your square becomes a durable calculator that never needs batteries

by Greg Ziomek

Several months ago, a coworker of mine went into a tool-buying frenzy. One of the tools he bought was a rafter square. After inspecting his new square, he became upset that not all the scales were in $\frac{1}{16}$-in. or $\frac{1}{8}$-in. increments. He insisted that the tenth and twelfth scales on the back of his square were useless and that he would always have to fumble for the front of the square to use it.

My disgruntled friend's assumptions were not completely correct. The twelfth scales, located on the back of most rafter squares, have many uses on framing jobs. These scales are especially handy for solving basic right-triangle problems and theoretical roof calculations, as well as for performing simple division and multiplication.

A rafter square has two different sides–A rafter square is composed of two arms of different lengths that meet at a right angle. The smaller arm, the tongue, measures $1\frac{1}{2}$ in. wide by 16 in. long. The larger arm, the blade, is 2 in. wide by 24 in. long. (Notice that all these dimensions are convenient sizes of layout work.) The two arms meet at a 90° angle and form the heel of the square. The front side of the square is stamped with the rafter table and octagon table; the lumber table and brace table are located on the back. The tenth and twelfth scales are on the back as well. (It is important to note that not all rafter squares have the tenth and twelfth scales.)

The twelfth scales, stamped on squares since the late 1800s, were intended as a means to calculate carpentry equations in feet and inches, thereby skipping the conversion of fractions to linear units. Because each inch is divided into 12 parts, it is possible to reduce layout work to $\frac{1}{12}$ of its original scale and still maintain the original proportions. With these scales, an inch mark can represent 12 ft., 1 ft. or 1 in.

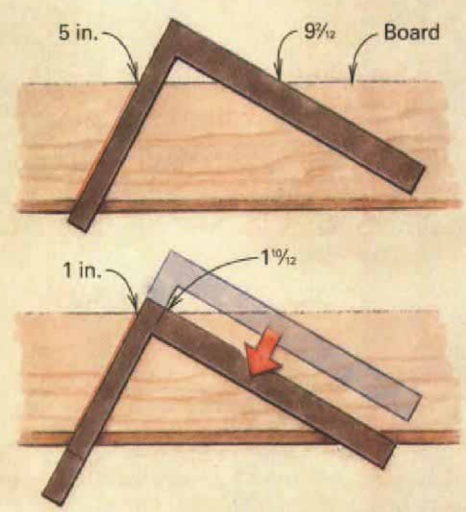
The key to accurate calculations is a sharp, straight line–To perform calculations with a rafter square, you'll need a square, a sharp pencil and a straight piece of 1x or 2x stock with crisp, sharp edges, the wider the better. A flat piece of plywood will also work; just snap a chalkline down its center and use the line as you would the edge of a board. On the facing page, you will find examples of rafter-square math. Grab a square and follow along. □

Greg Ziomek, a carpenter in South Holland, Illinois, recently earned his master's degree in architecture. Photos by Scott Phillips.

1. Dividing feet and inches doesn't require conversions

If I want to divide a wall that's 9 ft. 2 in. long into five equal bays, I position the square so that $9\frac{2}{12}$ on the blade and 5 in. on the tongue intersect the edge of the board.

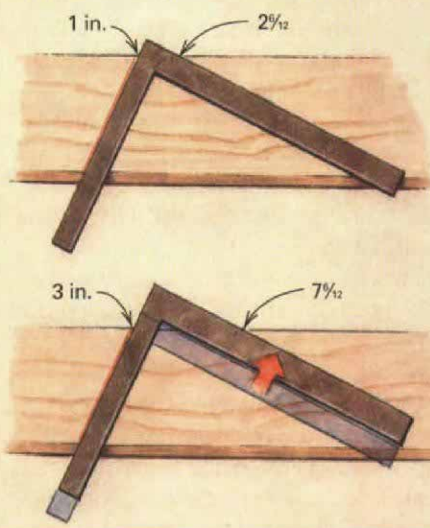
I then draw a line along the tongue and slide the square along this line until the 1-in. mark on the tongue intersects the edge of the board. The answer, $1\frac{10}{12}$, or 22 in., is read on the blade. Thus, 9 ft. 2 in. ÷ 5 = 22 in.



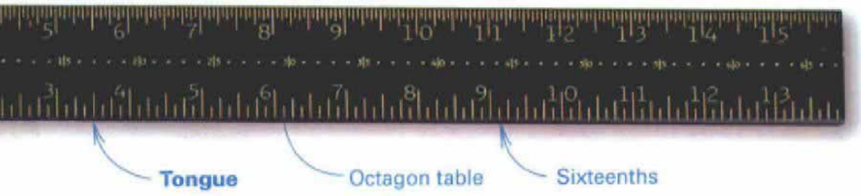
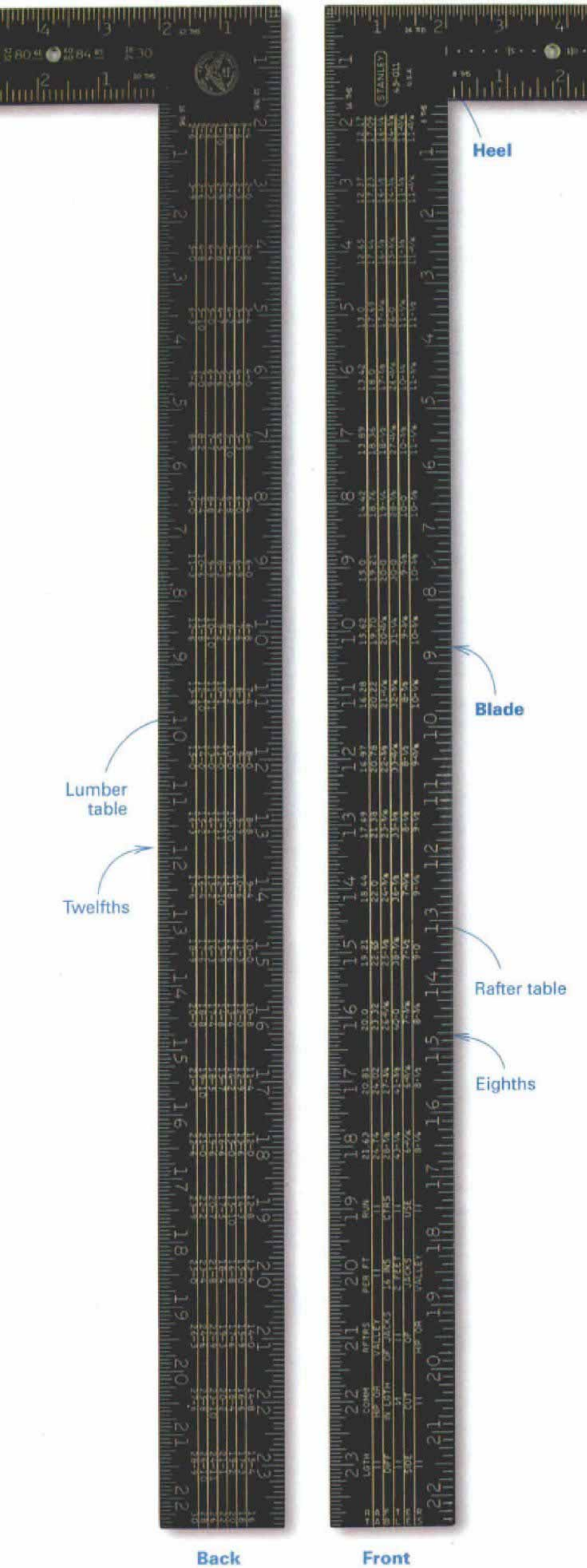
2. Multiplication with the rafter square can solve simple building problems

Here, we'll use the example of 2 ft. 6 in. multiplied by 3. Position the square so that $2\frac{6}{12}$ (2 ft. 6 in.) on the blade and the 1-in. mark on the tongue intersect the edge of the board.

Draw a line along the tongue, and move along this line until the 3-in. mark intersects the edge of the board. The answer, $7\frac{6}{12}$, or 7 ft. 6 in., is read on the blade. Thus, 2 ft. 6 in. x 3 = 7 ft. 6 in.



Drawings: Dan Thornton

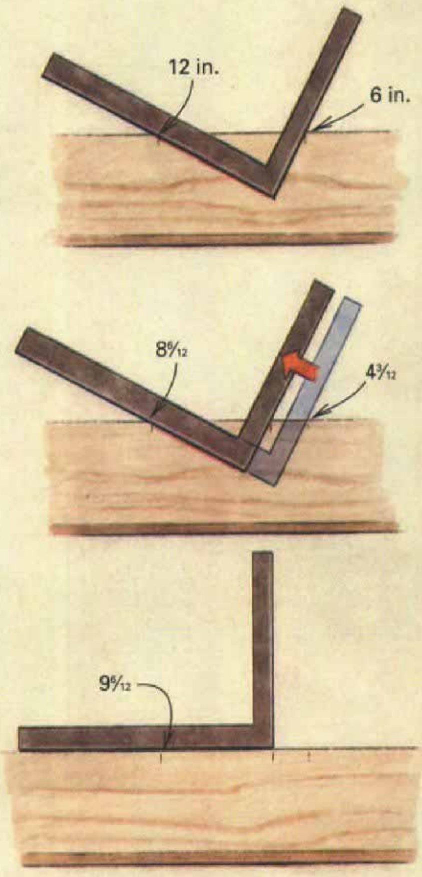



3. A quick way to estimate the length of roof rafters

Let's say your roof has a total run of 8 ft. 6 in. and a pitch of 6-in-12. Position the square so that the 6 on the tongue and the 12 on the blade are touching the board edge (12 in. equals the run; 6 in. represents the rise).

Draw a line along the blade and slide the square along this line until $8\frac{6}{12}$ intersects the edge of the board. The total rise is read at the intersection of the tongue and board, $4\frac{3}{12}$, or 4 ft. 3 in.

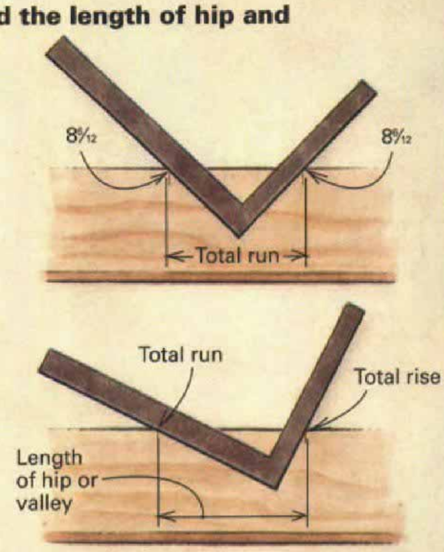
Now, mark the intersecting points of the square and board, then measure the distance between these marks with the twelfth scale. The distance is $9\frac{6}{12}$, or 9 ft. 6 in., the theoretical length of the rafter.



4. Figuring the run and the length of hip and valley rafters

To determine the run of a hip or valley rafter, position the square on a board with the run of the common rafter ($8\frac{6}{12}$) on the blade and the tongue. Mark these two points and measure between them with the twelfth scale. The distance is $12\frac{0.25}{12}$ in., or a total run of 12 ft. ¼ in.

To find the theoretical length of the hip or valley rafter, position the square with the total run on the blade and the total rise on the tongue. The distance between these points is the theoretical length of the hip.



SEE ERRATA AT END OF ARTICLE

Errata

In Greg Ziomek's article "Getting More Out of Your Rafter Square" (*FHB* #111, pp. 96-97), we mistakenly labeled the sixteenth scale as Twelfths" and the eighth scale as "Sixteenths." If you read the fine print on the photograph of the framing square, you can see which scale is which.