The Right Angle

Knowing how to properly use a construction calculator will provide your customers with a valuable service.

EDITOR'S. NOTE: Mike Sloggatt, an accomplished contractor, is filling in this month for Gary Katz.

I admit it; I slept through trigonometry in high school. The classes were boring, and my math teachers never applied those abstract ideas to anything real.

Now as a remodeling contractor, I've had to teach myself trigonometry, and it's one of the most valuable tools I use. After all, most home construction consists of levels upon levels of right triangles. Builders, material dealers, and carpenters will find their jobs much more rewarding and satisfying once they learn to recognize and understand right triangles and use them to simplify their work.
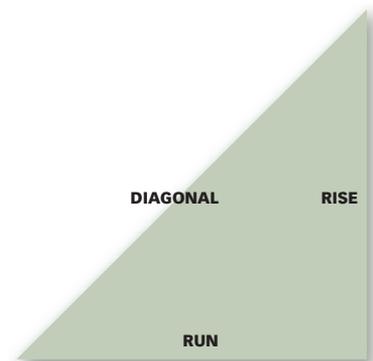
Houses today are a maze of roof lines, different pitches, arches, and angles. Whether you're doing a takeoff or framing the whole house, working without a construction calculator is like working without your glasses.

Basic trigonometry eliminates cumulative errors and guesswork—takeoffs on sloped and flat surfaces are easier to perform, fast, and spot-on accurate. For instance, ordering concrete, plywood, plate stock, and rafters becomes precise; you'll no longer add 2 ft. 'just to be sure.'

For a framing contractor, there is nothing worse than to get to the pile of roof rafter stock, only to find them too short. Then comes the call to the supply yard, requesting an urgent switch of 60 16-ft. 2x12's for 60 18-ft. 2x12's or production will come to a screeching halt. On the other hand, although longer is always better than shorter, every time a 2-ft. section of 2x12 drops to the cutting floor, the boss is counting the cost of the waste. Becoming adept at basic trigonometry can save time and eliminate unnecessary waste.

The Triangle. Given any two values of a right triangle, the calculator quickly figures the rest.

The Calculator

The key to using trig in the field is a construction calculator. It is designed to work in feet and inches without conversion, as well as perform some very advanced trigonometry formulas that are hidden behind a simple, easy-to-understand interface. Although scientific calculators and framing books work well, the speed and accuracy of the dedicated calculator is unsurpassed. The basic functions of Rise, Run, Diagonal, and Pitch are easily understood, simple to use, and fit in the palm of your hand. ➤

A construction calculator can help suppliers and builders alike navigate the maze of roof lines and pitches..

Foundation and Plate Layout

Squaring up foundations and plate layout are imperative on the complex framing jobs we do. Errors accumulate and make framing a roof a nightmare, as well as wreaking havoc on the drywall and tile subs. The 3,4,5 triangle most commonly used to square up walls and foundations has limitations. Most often the carpenter 'ranges' a chalk line through the intersecting points and extends the leg of the triangle. A slight shift of the line can cause a wall to be out of square. Calculating the Dimension with trigonometry is dead on, perfectly square the first time, every time.

To perform the calculations for the diagonal measurement:

15 ft., 6 in. Run

23 ft., 6 in. Rise

Press the Diagonal key and the Diagonal measurement will display precisely in feet and inches: 28 ft., 1¹³⁄₁₆ in.
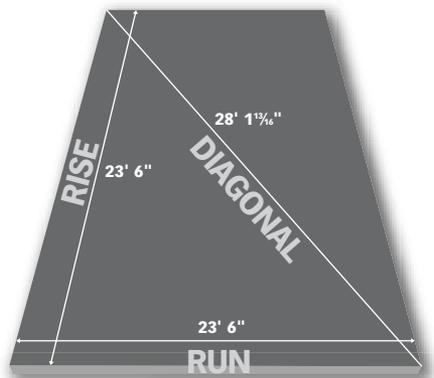
Using the known wall dimensions entered as Rise and Run, the Diagonal key shows the exact measurement needed to square up.

Roof Framing Calculations

TYPICAL SCENE: A harried contractor needs to order his lumber at the last minute for a job tomorrow. He lays out the crumpled set of prints on the counter. How long are the rafters? The scaling looks like 12 ft., but it's awfully close. In this case, the contractor can turn to the counter top construction calculator to figure this out. Using a calculator to find the Rafter length is simple. Since the print tells
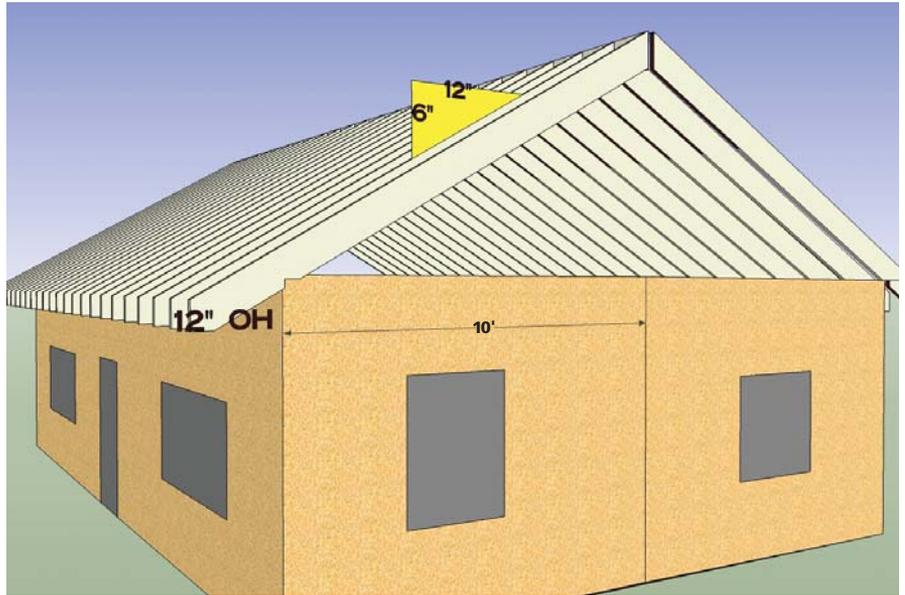
Calculating the length of common roof rafters with overhang can be quick and easy.

us we are framing a 6-in. pitch, the building is 20 ft. wide with a 12-in. overhang. Our rafters only "run" half the building width, so therefore, the Run value becomes 10 ft. (20 divided by 2.) We also need to add the overhang to the run to get the required length of the rafter.

Just like the square up on the floor, this Right angle stands up in the air. To figure the rafter length on the CM, enter 10 ft. +1 ft. = 11 ft. and then press RUN.

Since we know the pitch is given as 6 in., enter 6 in. Pitch. Pressing the Diag key gives us the length of the rafter as 12 ft.

3 ⁶⁄₁₆ in. If we hadn't figured that out, we might have sent 12-ft. rafters instead of the necessary 14 ft.

While we're at it, now that we know the length of the rafter, we have what we need to accurately calculate the roof sheathing underlayment and roofing material. Make sure you suggest they add that to the order too! ➤

If your sales force is adept at using a construction calculator, they can offer suggestions for other products that will be neccessary on a particular job.
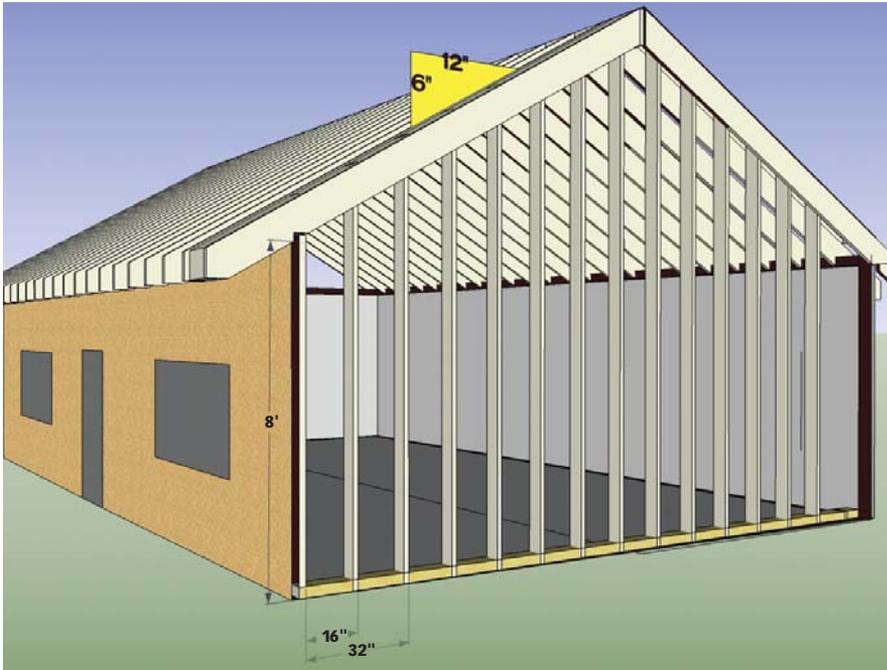
Understanding basic trigonometry offers spot-on accuracy when calculating numerous dimensions for your customers. Successfully calculating gable end stud lengths is only one example.

Helping customers doublecheck their orders inspires tremendous loyalty.

Gable End Stud lengths

Calculating gable end stud lengths is a breeze using a calculator and trigonometry. Most contractors order full length and use the cutoffs as blocking. With today's stiffer building codes, and the popularity of cathedral ceilings, going to 2x6 tall wall studs is a necessity.

Figuring out the lengths requires a little more thought, but it's not all that hard. We know the height of the main wall plate, (in our illustration, it's 8 ft.) To get the additional length of the stud, we'll calculate the rise of the triangles that are above the plate.

The two known elements are:

1. **Roof pitch**
2. **Run of the studs. (either 16 in. on center or 24 in. on center)**

We want to solve the Rise of each stud. Here's the math: Enter 6 in. Pitch and then 16 in. Run

Pressing the Rise button tells us that the rise of the stud is 8 in. for a 6-in. pitch roof. (The actual first stud length is 8 ft. plus 8 in.).

Athough this is useful for ordering material, I use the dimensions to cut my studs to length.

Here are the lengths needed for our wall for each side:

8 ft. 8 in.

9 ft. 4 in.

10 ft.

10 ft. 8 in.

11 ft. 4 in.

12 ft.

12 ft. 8 in.

13 ft. 4 in.

Based on my calculations, I would order the following for each end of the house: six 10 ft.; six 12 ft., and four 14 ft., since this gives me the least amount of waste.

This is a simple example of an easy pitch: For example, an 11-in. pitch needs a rise of 14 $\frac{11}{16}$ in. added to each stud. Using the same method will tell us exactly the length we need without guessing.

Trigonometry simplified through the use of a construction calculator is a valuable skill and it will enhance the accuracy of your counter sales team. Allow your crews to dial in their material list with precision.

Although it's primarily the customer's job to supply the yard with a material list, a competent sales team can win the confidence, loyalty, and trust of the clients by being able to help doublecheck numbers.

There is no ad campaign that will instill the loyalty that that type of good service will. Continuing education is not just for your sales staff, but also for your best customers. A round of golf will be remembered for a few weeks, but share something with them that makes their job more efficient, and teach them about using new products to their advantage to make their crews more productive, and they'll never forget it. ■

MIKE SLOGGATT is the owner of Sloggatt General Contractors, a high-end remodeling firm in Long Island, N.Y, specializing in additions and restoration on late 19th and early 20th century homes for nearly 30 years. Mike presents seminars and workshops on a wide variety of construction topics at lumberyards and national trade shows, from framing to finish.