Framing Stairs with a Landing

An L-shaped staircase is less complicated than you might think, and the framing techniques shown here will improve even the most basic set of stairs

BY RICK ARNOLD

MAKE STAIR MATH A CINCH

A cheap office calculator with basic functions can be used to figure out the math for a set of stairs, but a construction calculator is a better choice. Not only does it allow measurements to be figured in feet, inches, and fractions, but it also offers handy shortcuts for calculating diagonals, risers, and treads. To me, these shortcuts are a critical part of a trouble-free stair installation.

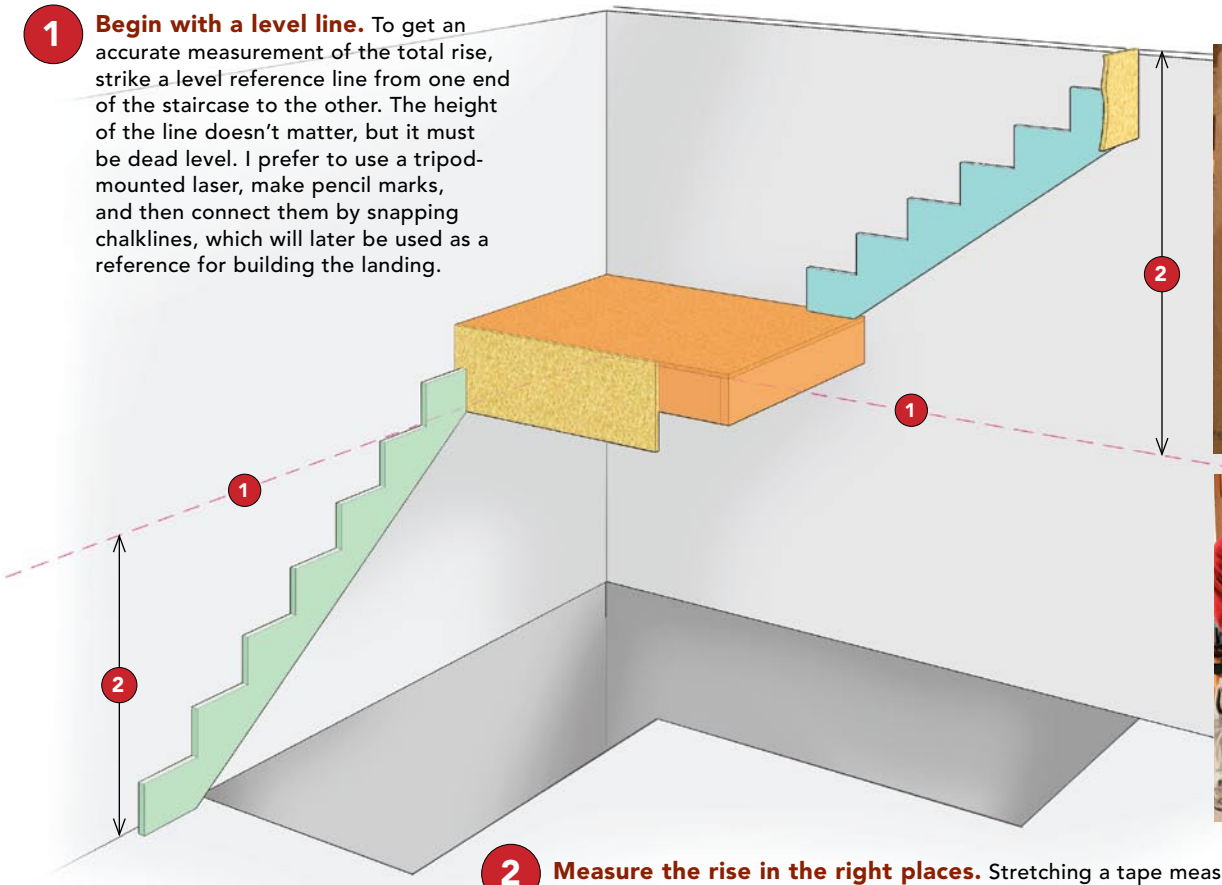
When builders struggle with a stair layout, it's almost always because they get hung up on the rise portion of the calculation, especially with the adjustments for flooring and stair treads that haven't been installed yet. Add a landing to the equation, and eyes will glaze over altogether.

In truth, accurately laying out a set of stairs, even with a landing, isn't as complicated as it seems. Once you think about the landing as just another stair tread, the rest of the math falls into place. An L-shaped stair is three separate pieces (two staircases and a landing), but only after the calculations are done and the stringers are marked is the stair separated into three sections. By then, the hard work is done.

Contributing editor Rick Arnold is a builder in North Kingstown, R.I. Photos by Justin Fink.

EVERYTHING DEPENDS ON AN ACCURATE RISE

1 Begin with a level line. To get an accurate measurement of the total rise, strike a level reference line from one end of the staircase to the other. The height of the line doesn't matter, but it must be dead level. I prefer to use a tripod-mounted laser, make pencil marks, and then connect them by snapping chalklines, which will later be used as a reference for building the landing.



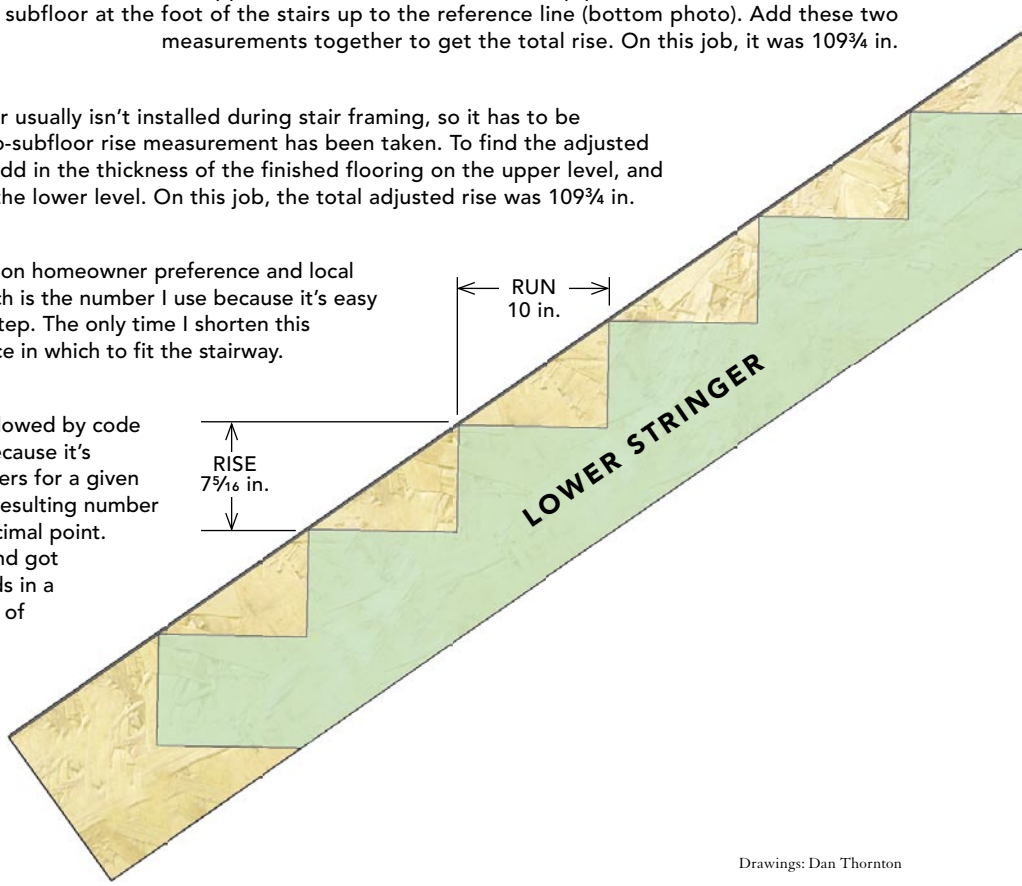
2 Measure the rise in the right places. Stretching a tape measure between the lower and upper levels to find the total rise won't take into account any slight changes in height caused by out-of-level floors. Instead, take measurements where the stairs begin and end. First, measure down from the upper floor to the reference line (top photo), and then measure from the subfloor at the foot of the stairs up to the reference line (bottom photo). Add these two measurements together to get the total rise. On this job, it was 109¾ in.

3 Find the adjusted total rise. The finished floor usually isn't installed during stair framing, so it has to be accounted for mathematically after the subfloor-to-subfloor rise measurement has been taken. To find the adjusted total rise, take the total rise measured in step 2, add in the thickness of the finished flooring on the upper level, and subtract the thickness of the finished flooring on the lower level. On this job, the total adjusted rise was 109¾ in.

4 Keep treads simple. The tread depth depends on homeowner preference and local codes, but it typically can't be less than 10 in., which is the number I use because it's easy to work with and provides a comfortable finished step. The only time I shorten this depth is when I have a limited amount of floor space in which to fit the stairway.

5 Choose a riser height. The maximum height allowed by code is 7¾ in., but I typically begin with 7½ in. simply because it's more easily divisible. To calculate the number of risers for a given stairway, divide the adjusted total rise by 7.5. The resulting number likely will have a digit or two to the right of the decimal point.

On this job, for instance, I divided 109¾ by 7.5 and got 14.63. Because it's not possible to have 14.63 treads in a staircase, I divided the total rise by the full number of steps. In other words, 14.63 was rounded down to 14 and up to 15 for my calculations. This left me with answers of 7 13/16 in. (14 treads) and 7 5/16 in. (15 treads). I chose 7 5/16 in. because a slightly lower rise makes a more comfortable step.

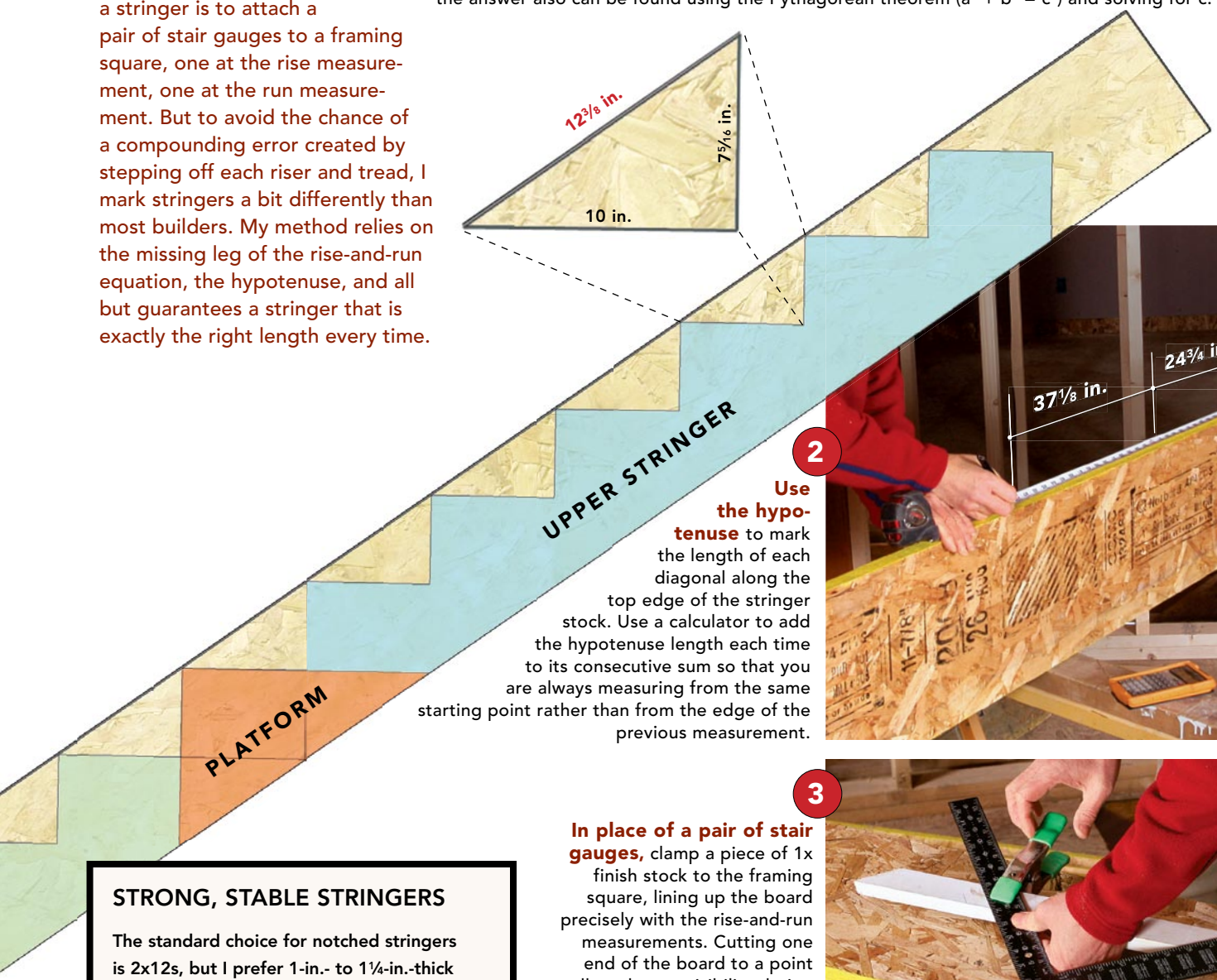


Drawings: Dan Thornton

4 STEPS TO PERFECT STRINGERS

The common approach to laying out the steps on a stringer is to attach a pair of stair gauges to a framing square, one at the rise measurement, one at the run measurement. But to avoid the chance of a compounding error created by stepping off each riser and tread, I mark stringers a bit differently than most builders. My method relies on the missing leg of the rise-and-run equation, the hypotenuse, and all but guarantees a stringer that is exactly the right length every time.

1 **Begin by determining the triangle's hypotenuse,** which is the diagonal leg of the triangle formed by the riser and tread measurements. A construction calculator makes this operation easy, but the answer also can be found using the Pythagorean theorem ($a^2 + b^2 = c^2$) and solving for c.



2 **Use the hypotenuse** to mark the length of each diagonal along the top edge of the stringer stock. Use a calculator to add the hypotenuse length each time to its consecutive sum so that you are always measuring from the same starting point rather than from the edge of the previous measurement.

3 **In place of a pair of stair gauges,** clamp a piece of 1x finish stock to the framing square, lining up the board precisely with the rise-and-run measurements. Cutting one end of the board to a point allows better visibility during the layout. It doesn't matter how much the pointed end overhangs the framing square.

4 **Begin with the pointed board** lined up to the end of the stringer stock, and mark the rise and run on the face of the stringer. Keep moving the jig down the stringer, aligning the pointed stock to each hypotenuse mark made during layout, and mark each step.

STRONG, STABLE STRINGERS

The standard choice for notched stringers is 2x12s, but I prefer 1-in.- to 1¼-in.-thick engineered rim-board stock instead. This man-made material is straight and flat to begin with, but it's also less likely to move with changes in seasonal humidity, meaning there's less risk of squeaky finished stairs. This thinner material also allows three separate stringers to be clamped together and gang-cut. This eliminates the slight profile deviation from one stringer to the next that is typical with individually marked and cut stringers.

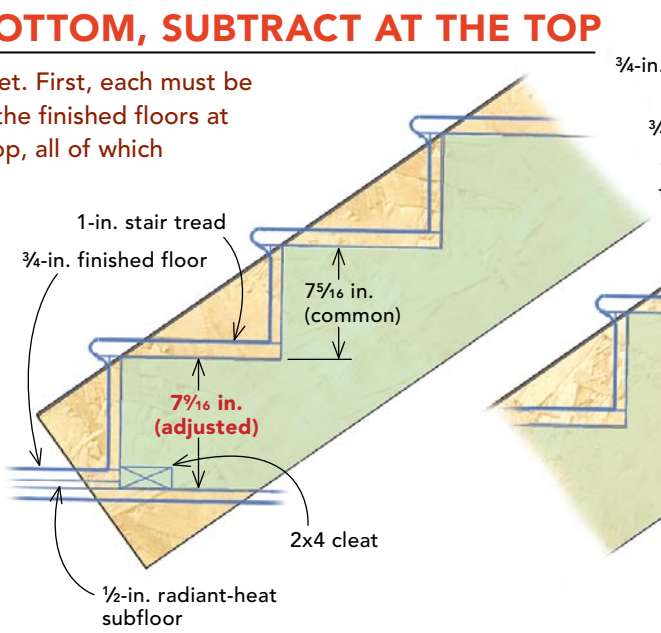
I've never had a problem with using rim-board stock for stringers, but it's still a good idea to check with your local inspector before you commit to building. I used Norbord rim-board stock on this job, but iLevel also makes a similar product.

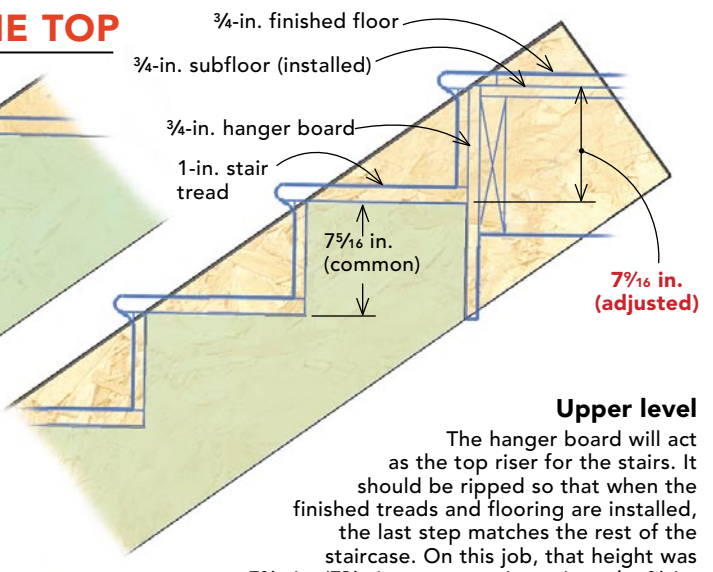
ADD AT THE BOTTOM, SUBTRACT AT THE TOP

Don't cut the stringers yet. First, each must be adjusted to account for the finished floors at the bottom and at the top, all of which will be installed later.

Lower level

On this job, I added 1¼ in. for the finished flooring and radiant-heat subfloor and subtracted 1 in. for the finished stair treads. This left an adjusted first step of 7⁹⁄₁₆ in.





Upper level

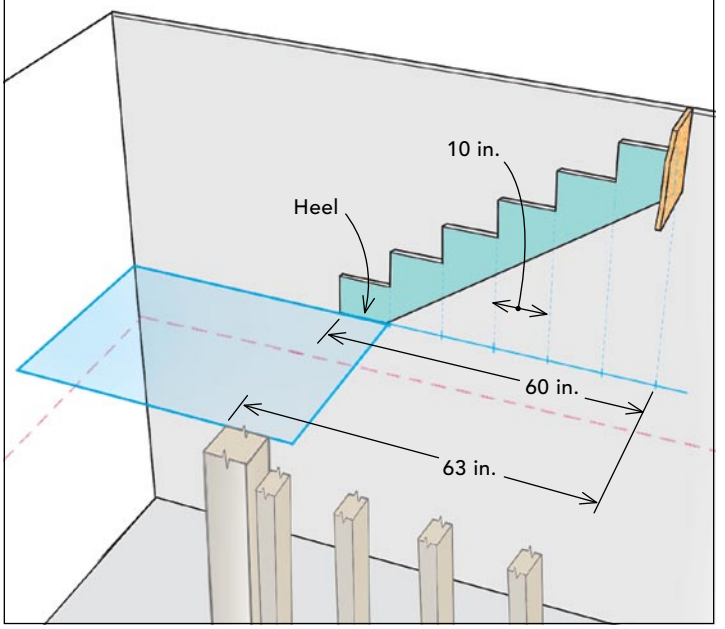
The hanger board will act as the top riser for the stairs. It should be ripped so that when the finished treads and flooring are installed, the last step matches the rest of the staircase. On this job, that height was 7⁹⁄₁₆ in. (7⁵⁄₁₆-in. common rise, minus the ¾-in. finished floor, plus the 1-in. finished tread).

LOCATE THE LANDING BEFORE CUTTING THE STRINGERS

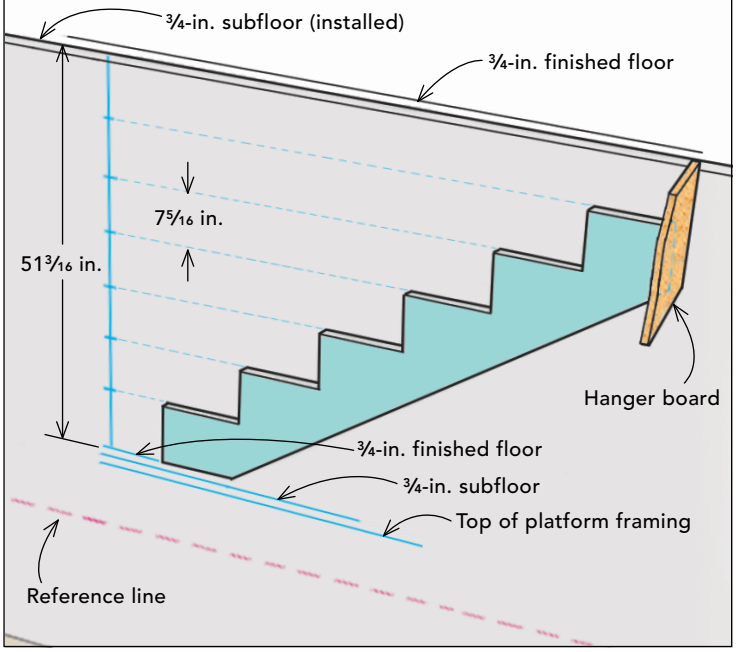
If this were a straight run of stairs, the next step would be cutting the stringers. But for an L-shaped stairway, first the landing must be located and built to figure out how many risers and treads will be in each leg of the staircase. The width of the landing is dictated by the width of the stairwell; that part is easy. The length and height take a bit more work.

1 Length The limiting factor here is the distance from where the hanger board will attach at the top of the stairs to where the stairs turn the corner at the end of the shorter wall. Then it's a matter of figuring how many treads will fit in that length, making sure to leave a few inches of wiggle room for the overhang of the finished treads.

On this job, I had 63 in. of length to work with, which meant I could fit six treads and still have 3 in. before hitting the corner of the wall. With this measurement, all I had to do was factor in the depth of the heel so that it was fully supported by the platform.



2 Height The height is just as easy as the length; simply add up the risers. On this job, there were seven risers, or a total rise of 51³⁄₁₆ in. Then, as long as the finished flooring on the landing is the same thickness as the finished flooring on the upper level, measure 51³⁄₁₆ in. down from the upper level to find the top of the landing subfloor. Adjust this mark down to account for the landing's ¾-in. subfloor, and you have the top of the necessary platform framing. From here, use the reference line snapped in the first part of the stairbuilding process as a benchmark to locate the top edge of the rest of the platform framing accurately.



ONE STRINGER TO MARK THEM ALL

The landing on an L-shaped stairway is basically just an oversize tread that gets framed in place, so the number of risers and treads on the stringer will be reduced by one. Once the entire staircase is laid out as one stringer, count out the number of treads needed for the lower leg and upper leg, then mark the middle where the single piece will be separated in two.

The marked stringer becomes the template. With the marked stringer on top, clamp all three pieces together, and gang-cut them using a 10-in. circular saw (www.bigfootsaws.com). Don't overcut the inside corners of the stringers; finish the cuts with a reciprocating saw instead. Last, trim the plumb cut of the middle stringer by ⅛ in. to set it back slightly when installed. This eliminates the chance of bowed finished risers.

SET THE STRINGERS WITH ROOM FOR THE FINISH

Once the stringers have been cut, assemble the lower and upper sections. I use framing nails to tack in a 2x4 cleat at the bottom of each section and 3-in. drywall screws to fasten the ¾-in.-thick hanger board to the plumb cut on the top of each stringer.

Flush at the top, flat on the bottom. If the math has been done correctly, the preassembled sections should drop into place so that the hanger board is set flush to the top edge of the subfloor and the 2x4 cleat sits flat on the lower level. When I assemble each section of stairs, I leave a 1½-in. gap on each side of the stairs to make installation of the drywall and stair skirtboards easier. The ½-in. drywall will rest atop the plywood, and the skirtboard will slide into the remaining 1-in. gap, eliminating the need to notch the board around each tread.