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Solving Porch Problems

by Gary Katz

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Start with the Finish and Work Back to the Rough

A lot of carpenters scratch their heads every time they finish framing a porch and start on the stairs. There are so many ways to frame stairs on a porch that it's hard to make a logical choice, let alone use the same technique twice. That's why, to work on this story, we gathered together a group of carpenters, all JLC authors: Mike Sloggatt, Frank Caputo, Jed Dixon, Carl Hagstrom, Tom Brewer, and Greg DiBernardo all contributed to this article. Together we worked out a simple system for installing stringers, so you won't have to scratch your head the next time you start on the stairs.

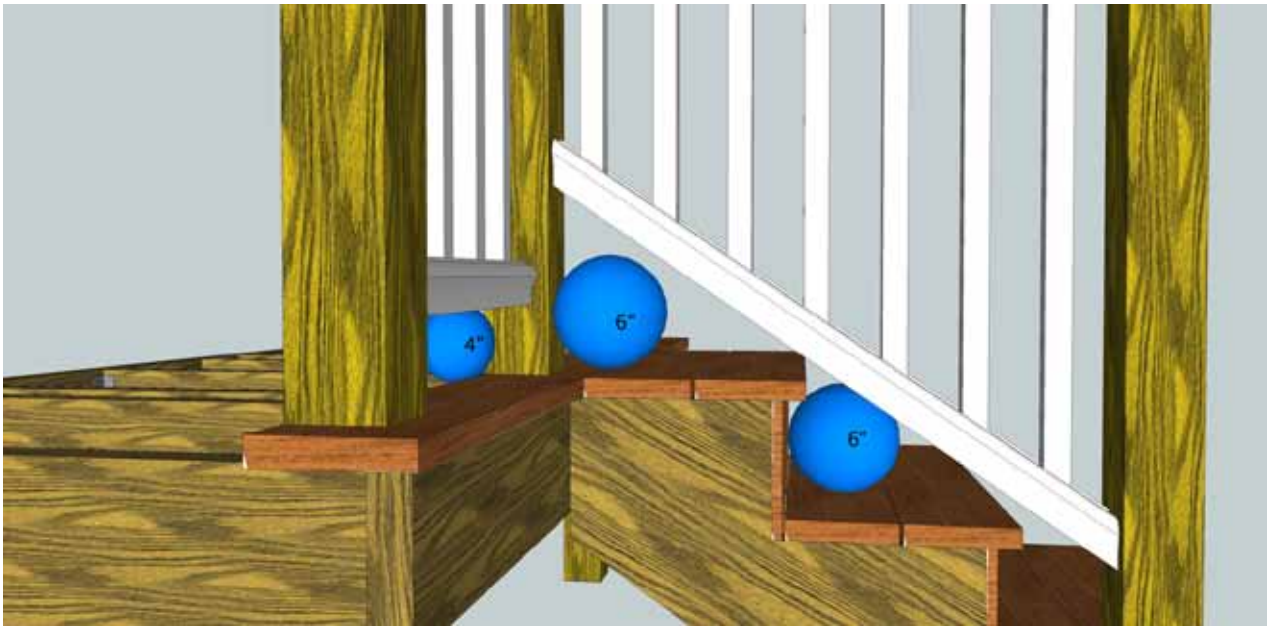
This is truly a Frame-to-Finish approach—or better, a Finish-to-Frame approach: bringing together rough carpenters and finish carpenters, we've come up with a unique system for laying out stairs *and* cutting finished skirtboads, one that should save you time as well as hair.

What to avoid

Some of the carpenters we interviewed prefer to hang their stringers right off the rim joists, cutting the first tread flush with the rough deck.

While that approach simplifies hanging the stringers—because connectors can be attached directly to the rim joist—it complicates newel post and handrail design.

For the handrail to meet code (34″ to 38″ above the nosing of each tread), a flush top tread pushes the handrail to over 40 in. above the deck, far above a standard 36 in. guardrail. Longer balusters are available from manufacturers, but raising the guard rail around the deck to 42″ blocks a potential view and makes the rail look more like a fence. Yes, a 42″ guardrail is required by some codes, like California's CBC, but not by the IRC. But the real problem with flush top treads isn't just aesthetics: the triangular space between the top tread and the bottom of the raked rail won't meet the code requirement of a 6-in. sphere, and that requirement is ubiquitous.



One solution for correcting these problems is installing a second newel post near the nose of the first tread. But that means two extra newel posts (additional costs), and a very tight spacing between newel posts, barely enough room for two balusters!

Finding a Solution

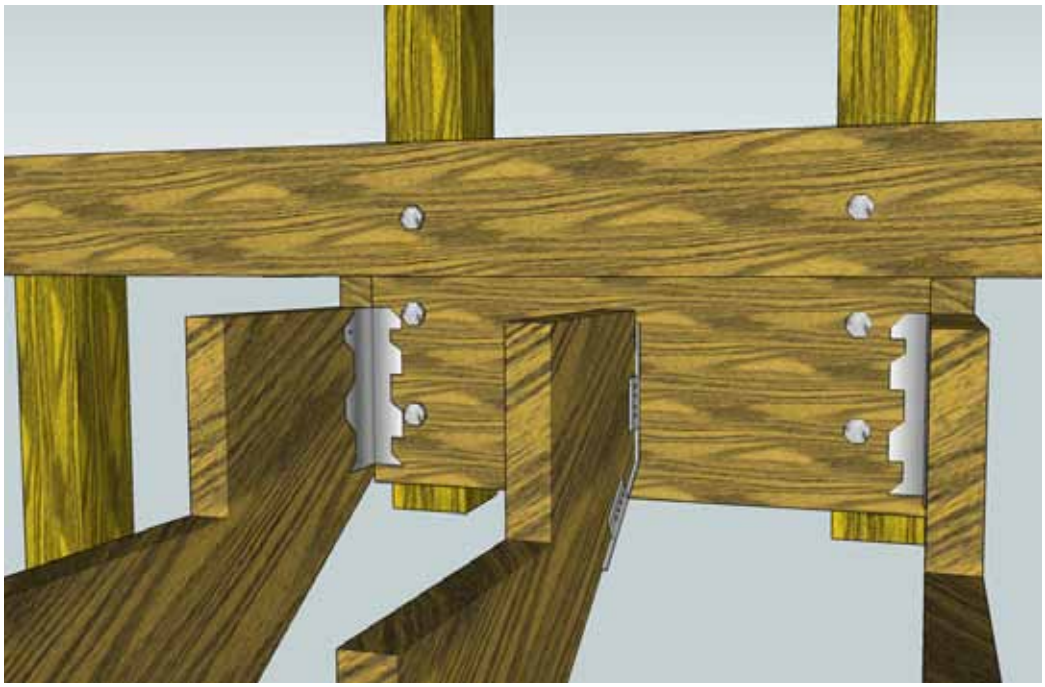
Jed Dixon saw that detail and said: "Interior stairs always begin one tread down from a landing or upper floor. There is no reason not to follow the same rule with exterior stairs. I often support interior stairs with a plywood hanger, which is the perfect solution for exterior stairs."

Greg DiBernardo, a frequent contributor to JLC and Professional Deck Builder, does just that. He hangs a 2×10 ledger beneath the rim joist to carry the stair stringers. Across the joint between the hanger and the rim joist, Greg fastens 2×4 pressure-treated blocks to strengthen the ledger.

Our group circulated a drawing of that detail and came up with several improvements. Carl Hagstrom worried that nails, and especially lags, would eventually work their way out of the blocks because of wetting cycles. He was also worried that short blocks might split, even with through-bolts for fasteners. Frank Caputo suggested using a piece of pressure-treated plywood and through bolts.

Composite & PVC Stringer Spacing

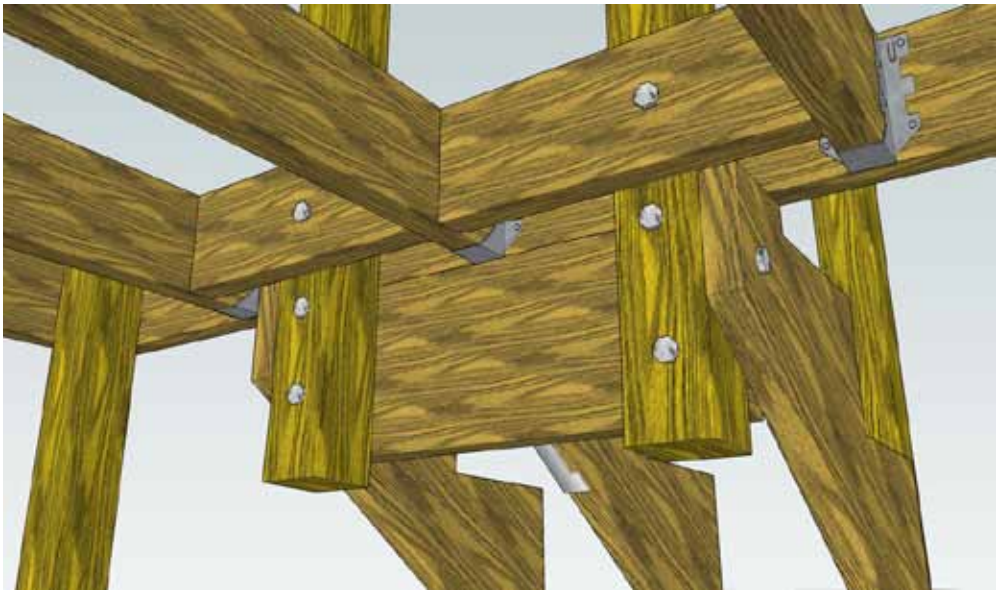
Mike Sloggatt said he would skip the hanger altogether and extend the stringers up under the deck and cut them to fit tight against the next joist, or against a header—a perfect solution for a wood deck. But modern materials aren't so friendly. TimberTech composite deck boards require a minimum stringer spacing of 12 in.; their PVC decking requires a minimum spacing of 10 in. Azek decking requires a minimum of 9″ between stringers, from center to center! For anything greater, Azek provides several recommendations for additional blocking. With all those stringers, it's much easier to install a hanger beneath the rim joist.



A Simple Solution

We continued to look for a the perfect solution until one night, after a few beers, Tom Brewer finally spoke up: "Why not extend the tails on the newel posts to support the hanger, then you can bolt the hanger through the back of the newels." (see right)

Someone else chimed in and suggested we extend the outer stringers flush with the back of the newel posts, otherwise they'd be fastened too close to the end of the hanger: Even if we used Simpson's new stringer hanger (LSCZ), the nails would be right at the edge-grain of the wooden hanger. Besides, by running the outside stringers to the back of the newel posts, bolts could pass through the stringer and the newel post in the opposite direction (see left), reinforcing the upper newels so they'd easily handle 200 lbs of concentrated load—another IRC code requirement.



Concerned about the lateral load of the stair carriage on the newel post tails, Carl Hagstrom emphasized that the base of the carriage must be fastened securely to the concrete pad—a critical component in the design: Any movement at the foot of the stringers would allow hinge-point movement between the stringers and the newel-post tails. (see below)

Just to be on the safe side, we sent a drawing of that detail to a building inspector from the City of Los Angeles. He liked the detail—a lot. His only demand was that we use 1/2″ through bolts for all fastening connections.

Securing the Bottom Newel Post

Deck and stair railings are required to meet a 200 lb. concentrated load in any direction. While bolting the upper newel posts to the stringers provides substantial reinforcement, securing the lower newel posts is always problematic, especially when code requirements conflict. Current IRC code requires a continuous handrail from the top riser to the bottom riser, which means bottom newel posts must be set on or in the concrete pad beyond the bottom riser. One way to meet that code requirement, and still bolt the bottom newel to the stair carriage, is to apply a continuous handrail in addition to the guard rail descending a stair. We'll discuss those options in a later article on High-end Details for Decks and Porches. To learn more about current codes and how they affect deck and porch construction, pick up a copy of the JLC Guide to Decks and Porches. For specific code definition and explanation, check out Deck Construction, which is based on the 2009 IRC.

Start with the finish

Jed Dixon always says: "Start with the finish and work back to the rough." That's the only way to solve the second problem that most carpenters encounter with stairs: keeping the risers within the code-required 3/8″ variance. The easiest way to 'see' the finish and measure from the finish to the rough, especially on a complicated stair, is with a story pole. For this article, we're 'condensing' Jed's JLC Live presentation. The only things missing are the side trips Jed takes during his clinics, and the jokes.

The Rough-to-Rough Rise

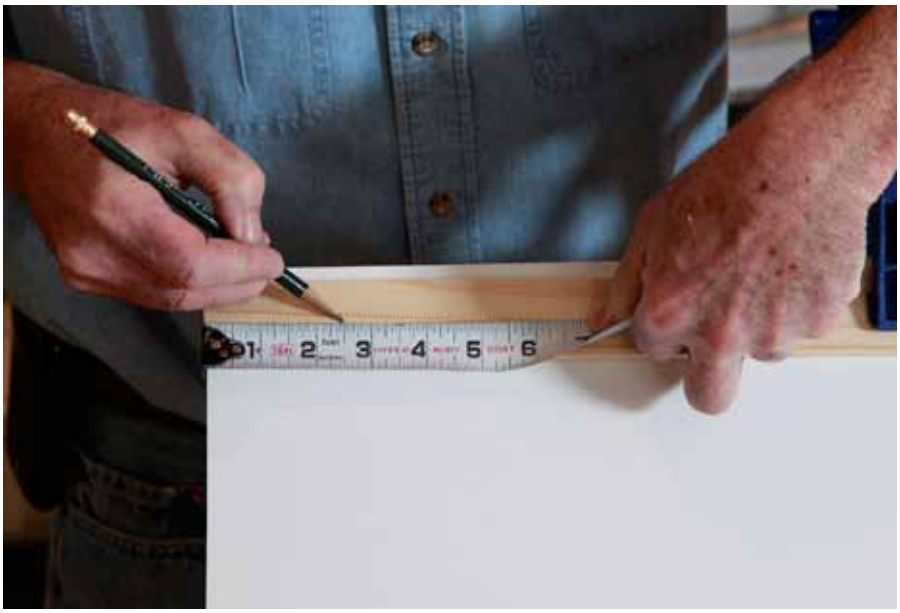
When you layout stringers, you have to measure the rough-to-rough rise from where the stair begins on the ground or concrete to the top of the deck joists. To get that measurement on a porch that's fairly close to the ground, you can hold a long level out over the joists, but on a deck that's 5 feet or more over your head, it's easier to use a laser (see photo, right). Besides the rough-to-rough measurement, you also need to know if any brick or stone or other material will be installed after the stairs are in, and how thick that material is. You also need to know the thickness of the treads and the decking.

In the example we use at lumberyard clinics, the rough-to-rough measurement is 28 5/8 in. The decking and treads are 1 in. And the stone or brick added later will be 2-1/2 in. thick.

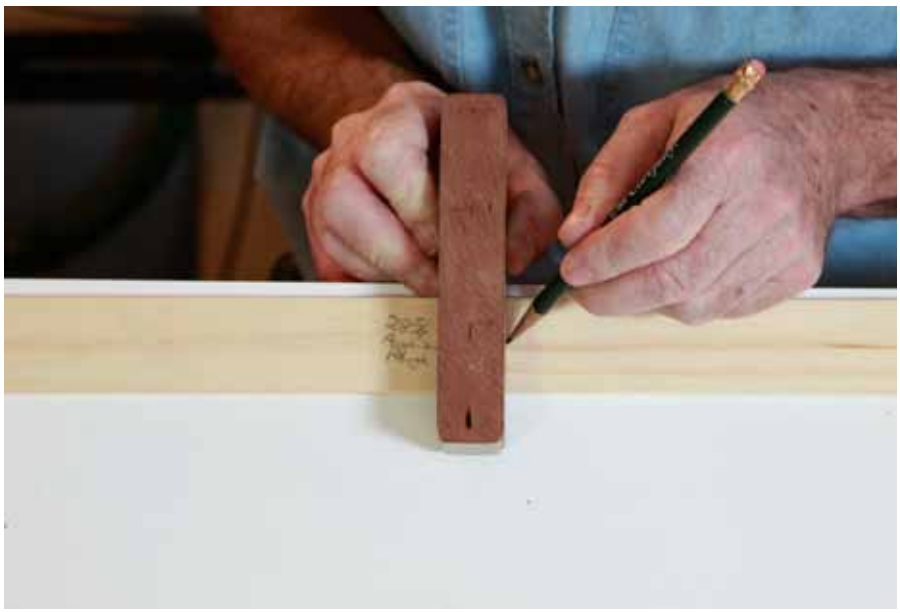
Story Pole Layout

Using a piece of 1×2 or 1×4, measure up from the bottom and make a mark a line at 28 5/8 in.—that's the rough-to-rough height of the stair.

Then start laying out the finish details starting at the bottom. Measure up 2 1/2 in. and draw a line at the top of the brick.

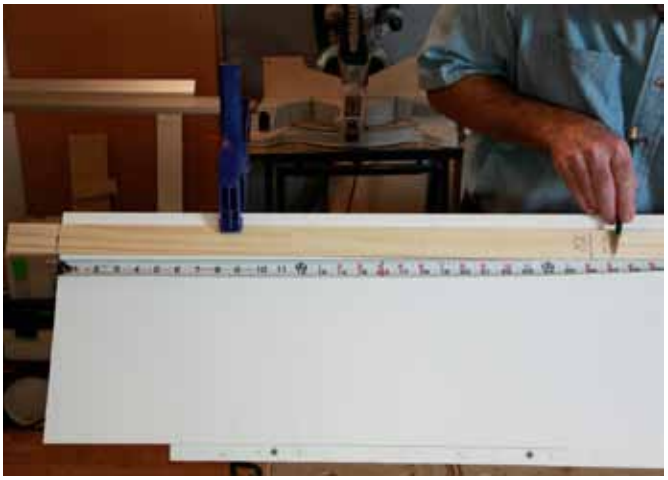


Next, layout the 1-in. decking on top of the deck joists by measuring up 1 in. from the upper rough-to-rough line.



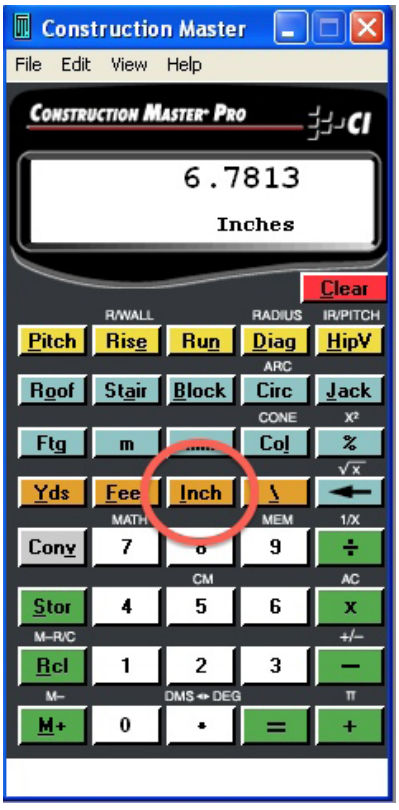
Now it's easy to 'see' and measure from the finish to the finish.

Measure from the top of the brick to the top of the deck. That's the finish-to-finish rise, in this case, 27 1/8 in. (see below; closeup on right)



Divide that measurement by the total number of risers. Because the maximum rise allowed by IRC code is 7 3/4 in., in this example we use 4 risers.

A construction calculator is a must for laying out stairs. Without it, you can't overcome cumulative error. Here's what that means: Using a calculator, enter 27 1/8 in. then divide by 4 in. The result is 6 13/16. Now clear the calculator a couple times and enter 6 13/16, then press + and = three times. The sum is 27 1/4 in. That represents a 1/8″ cumulative error in just four risers. On a taller stair, it's easy to end up with a cumulative error of over 3/8 in., especially if you're using a framing pencil to mark your lines.



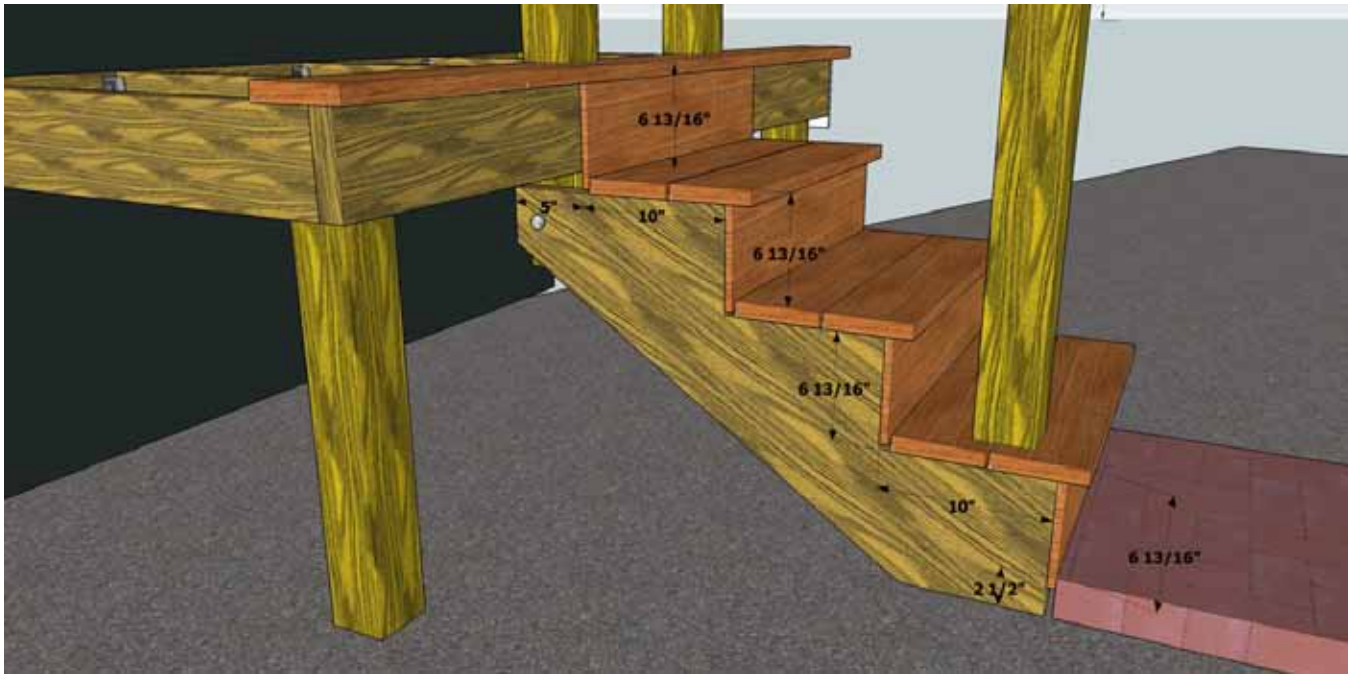
The Risers (Rise)

A construction calculator will prevent cumulative error if you allow it to. Clear the calculator a few times, then enter 27 1/8 in. Divide by 4. The result is once again 6 13/16, but that's just the number in the display. If you push the "INCH" button (see image, right), you'll see that the calculator is actually using a decimal fraction to do the math (6.7813). The calculator is then rounding off the decimal fraction to an inch fraction carpenters are accustomed to working with. Let the calculator do its job. Press the + button ONCE then for each succeeding riser, just press the = button and the calculator will provide an exact location for every riser: 13 9/16 in. and 20 3/8 in.

Measuring from the top of the brick, layout those locations on the story pole. Those marks are the top of the deck boards on each tread. Measure back from each mark 1 in. to locate the top of each riser on the rough stringer.

The Treads (Run)

The IRC code requires a minimum tread width of 10 in., with a nosing between 3/4 in. and 1 1/4 in. A 10-in. rough tread works perfectly with most manufactured stair materials: With 1/2-in. riser stock tucked behind two 5-1/2 in. standard deck boards—on top of a 10-in. rough tread, the nosing on each tread will project about 1 in. (see below)



Stringer Template

Now that the story pole is complete, it's time to layout the stringer. Most carpenters pick a straight piece of stringer stock for the first stringer. After cutting out the treads and risers, they use that board as a template for laying out all the other stringers. But the template never ends up as perfect as you wish. First, you can't overcut the treads or stringers or you'll weaken the stringer, so you have to finish the cuts with a handsaw or jigsaw, which means the cut lines are rarely finish quality. And using a piece of 2x material for a template makes it even more difficult to get a straight clean line on every stringer.

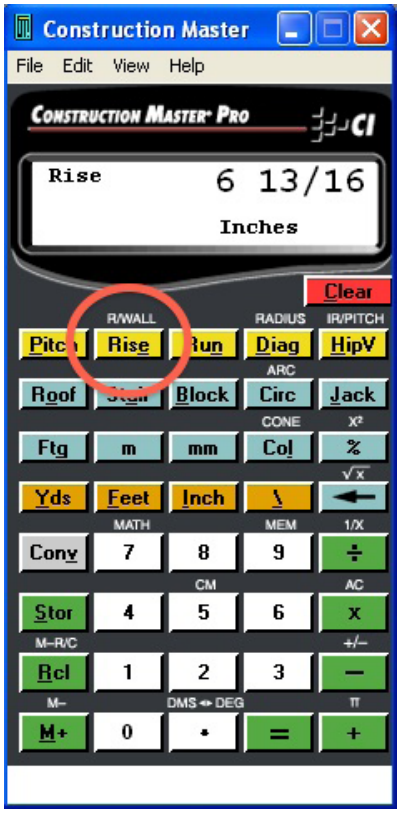
Frank uses a piece of 1×12 for stringer templates, which is easy to layout. He can overcut the treads and risers and get perfectly straight lines, and he even uses a miter saw to make the cuts, so the template can be used to cut the skirt boards, too. More on that later.

Stair Gauges (Diagonal)

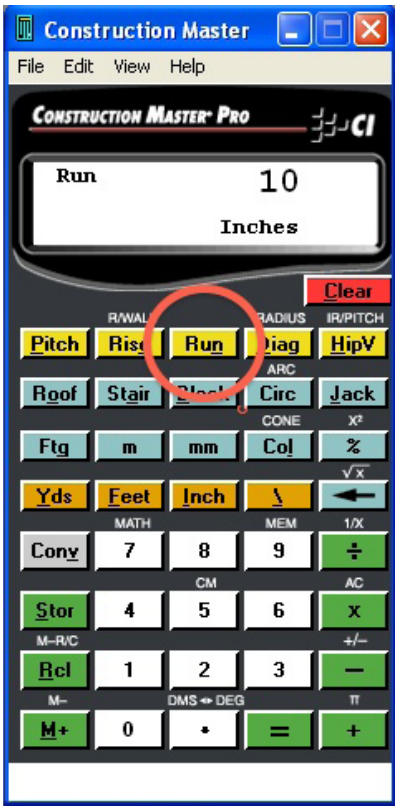
If you've ever used a gauge block to step off dentil molding, you've probably learned that gauge blocks never work perfectly. That's because of cumulative error—both small errors in math, and the thickness of your pencil line. Stair gauges are just like gauge blocks. Framing squares are great for laying out stairs—in fact, there's no better way—but used by themselves, they don't solve cumulative error problems. Instead, use a construction calculator to layout your stringer template.

Once more, divide 27 1/8 x 4 risers. The result is 6 13/16 in.

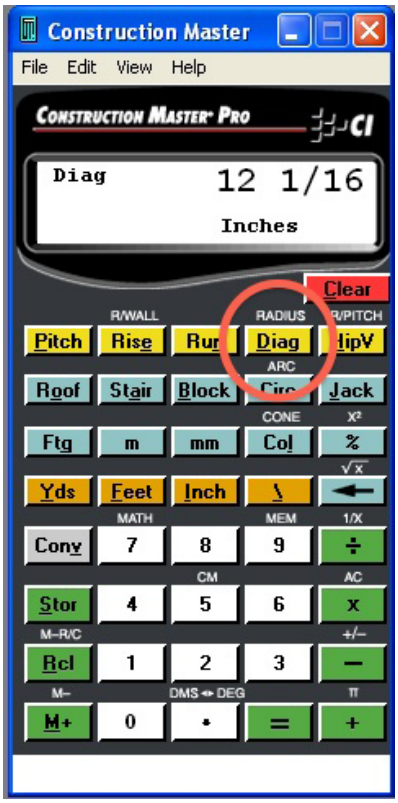
Press the “RISE” button.



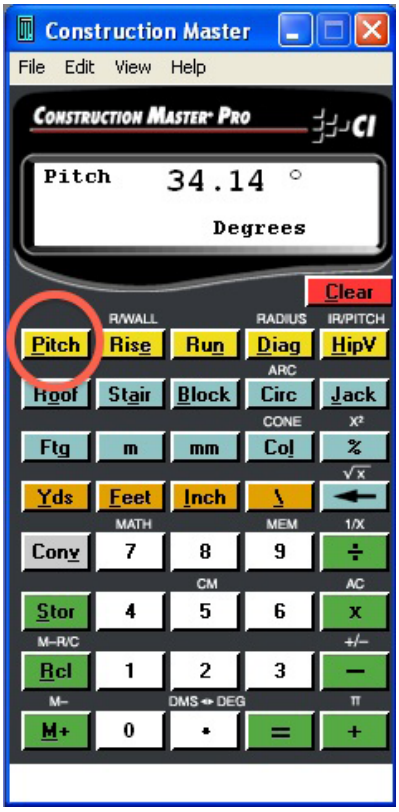
Enter 10 in. then press the “RUN” button.



Next, press the “DIAGONAL” button.



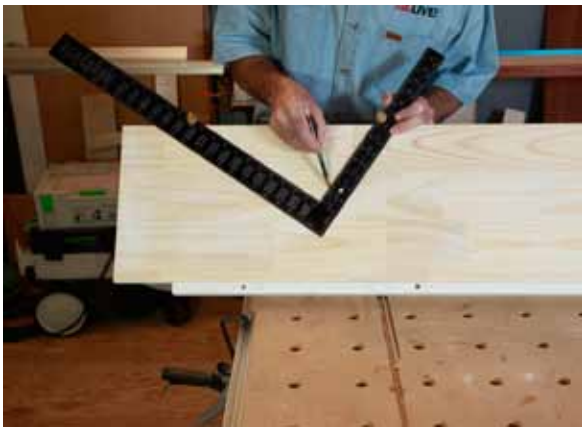
That’s the measurement you want!



We allowed Jed ONE side trip in this article because this is an important tip! While you have the diagonal measurement on the calculator, press the PITCH button (see image, right) and record the pitch of the stair. That’s going to be important when you cut the template and the balusters! The pitch on this stair is 34.14 degrees.

With the diagonal measurements, you can eliminate cumulative error from tread to tread. The distance between the tip of tread #1 and tread #2 is 12 1/16. Now press the + button and then the = button. The distance to the tip of tread #3 is 24 3/16. Press the = button for the remaining tread locations. In this example, 36 1/4 in. would be top edge of the deck.

Start by striking a line for the first riser, about 16 in. from the bottom of the template. (see image, right) We've installed the stair gauges on the inside of the framing square, to make it easier to do live presentations, but whether you install them on the inside or the outside doesn't matter—as long as the rise is 6 13/16 in. and the run is 10 in.



Next, hook your tape on the tip of the first riser and measure up the diagonal to the second riser—12 1/16 in.

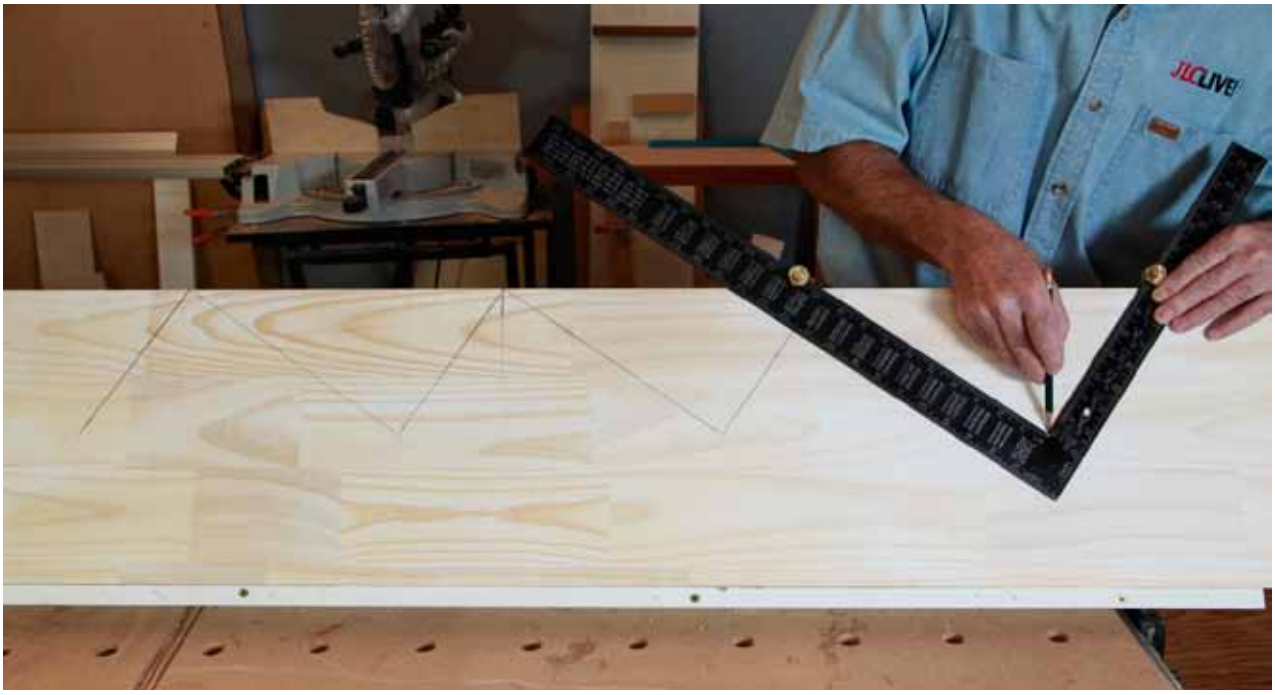
Mark all the diagonals with the tape measure secured in the same place.

Now you can place the framing square on the template aligning the upper edge with the diagonal measurement mark at 12 1/16 in. and there won't be any cumulative error.

To be certain the framing square is right on the measurement mark, hold your pencil on the mark,

then slide the framing square right up to the pencil and scribe the riser line.

Use the same technique for the laying out the next two risers and treads. (see below)

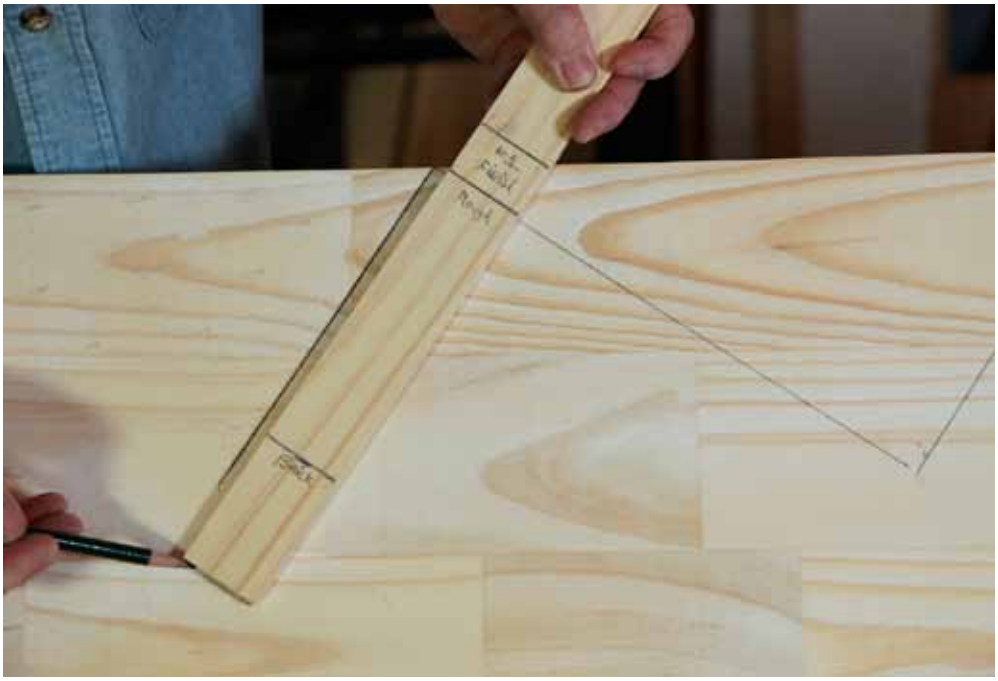


Make the template rough-to-rough

Even though all the treads and risers are laid out, the template is far from finished. At this stage it could be either a finish-to-finish template or a rough-to-rough template. Stringers are rough framing, so we need to cut the template for the rough measurements. That means transferring a few details from the story pole to the template.

Bottom details

Hold the story pole on the template with the bottom of the first tread board on top of the first tread, then strike a line across the bottom of the story pole.

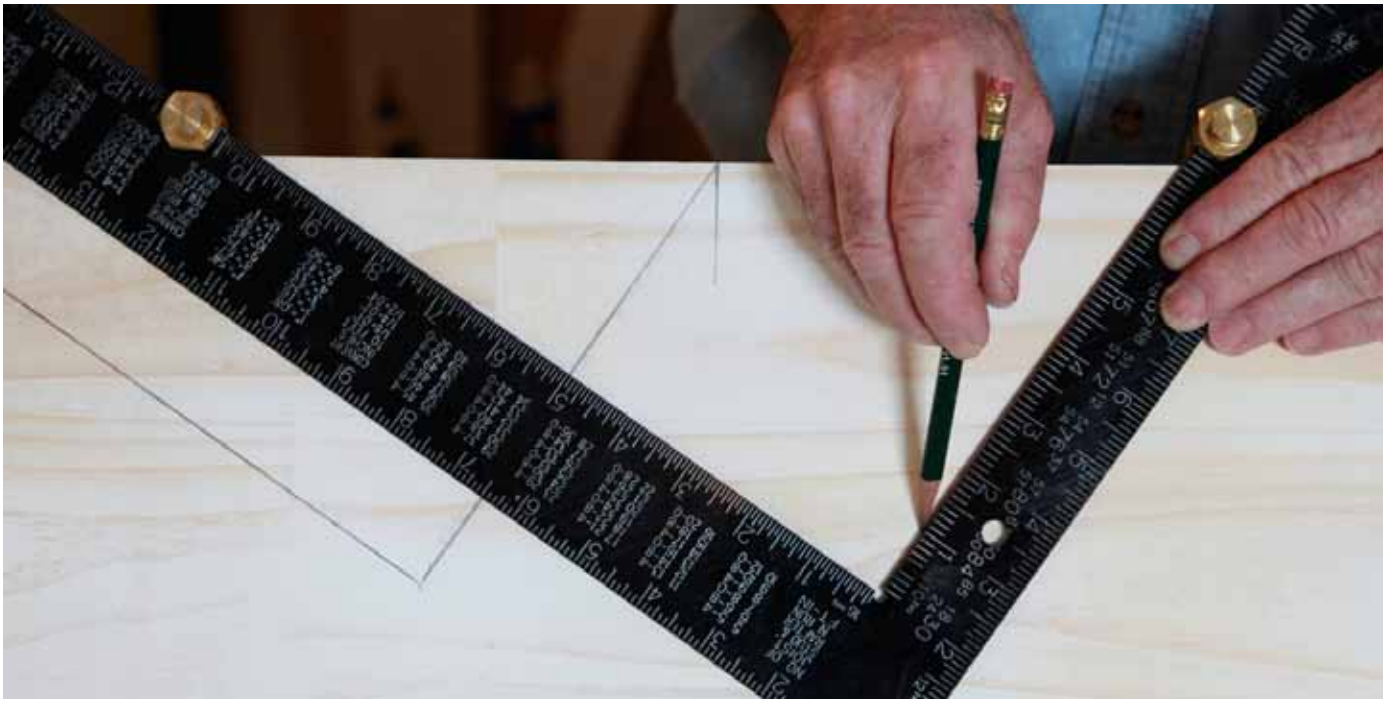


Then extend that line across and beneath the first tread—that's the line of the concrete pad.

Using the story pole is the easiest way to avoid a bottom riser that's too tall and ensure that the stringer sits right on the rough concrete pad. With that detail completed, the template can only be used for rough-to-rough layout.

Top Details

The top of the stringer is a little tricky because it extends 5 in. to the back of the newel post. Mark that dimension by holding the framing square at the 5-in. mark. (see below)



To make it easier to install the stringers, Mike Sloggatt likes to cut the stringers so the tops register off the bottom of the deck joists. In the set we use for our clinics, the joists are only 2×4s (it's just a set!),

so we measure down from the tip of Riser #4 (the top of the deck) 3 1/2 in,

then use the framing square to scribe a line along the top of the stringer.

If you're using 2×6 joists, you'd measure down 5 1/2 in.; for 2×8 joists, the notch would come down 7 1/2 in. and cut into the extended tread line.

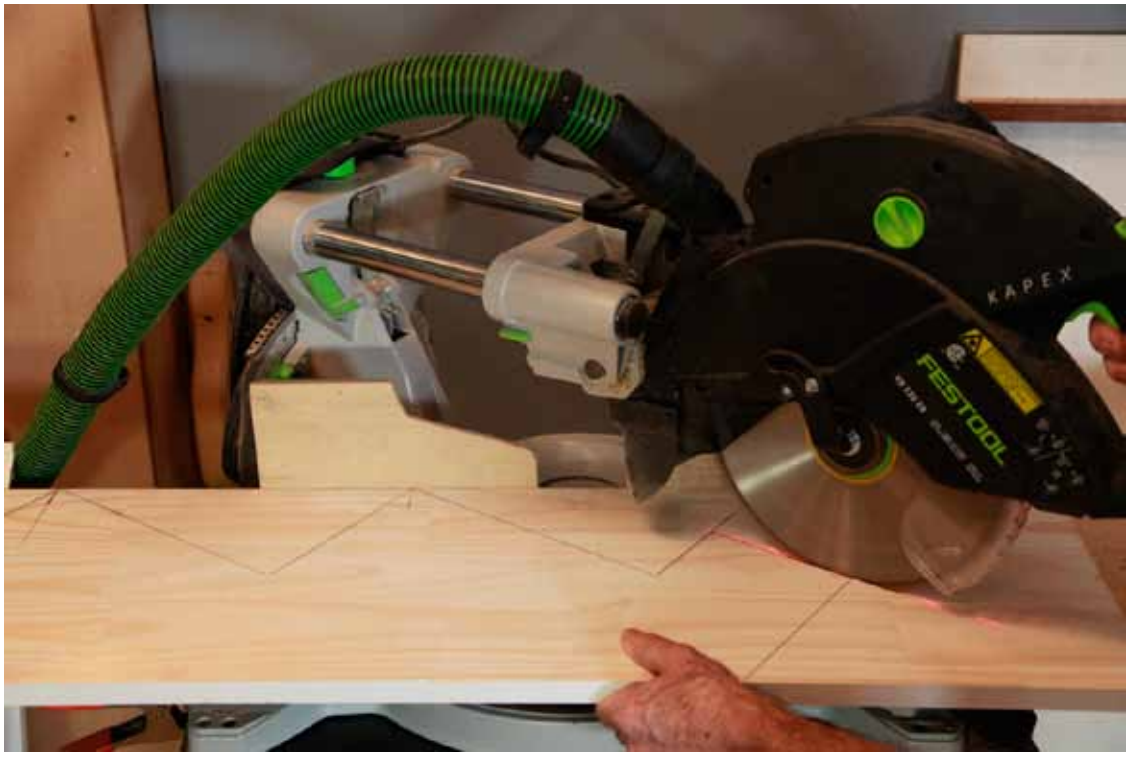
Cutting the template

We said earlier that a miter saw is the best thing to use for cutting the template, and it's surprisingly easy to do.

Start with the riser diagonals toward you.

Swing your saw to the complementary angle of the pitch (90-34.14 = approx. 56 degrees). Cut the bottom of the template at that angle, then flip the template end for end and roll the template so the diagonals are against the fence.

First cut the top of the template, then cut each of the treads.



Next, swing the saw to 34 degrees and cut the risers, working from the top down.

Finally, flip the board one last time and cut the top where the back of the stringer flushes out with the back of the newel post.

You only have to swing the saw once.

In our next story, we'll show you how to use the same template for cutting out the finished skirt board—with a router! And we'll share some great tips on installing manufactured handrail on a rake, and dressing up a high-end deck.