

A Sturdy Footstool



Simple jigs ensure that angled joints come together without a hitch

BY MARIO RODRIGUEZ

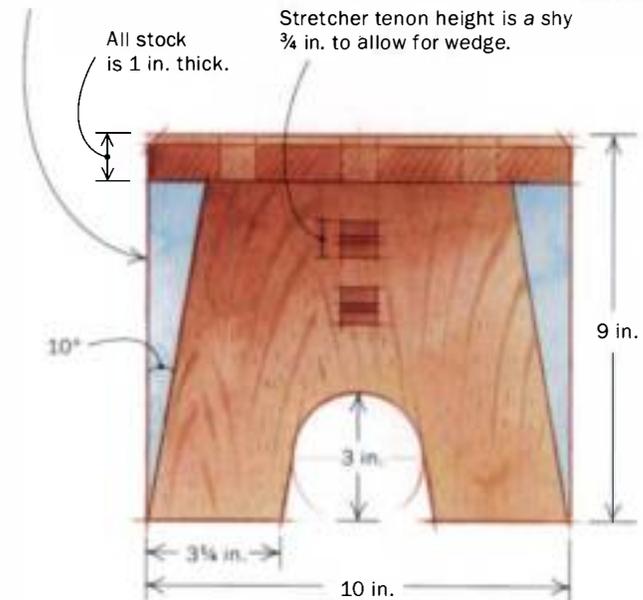
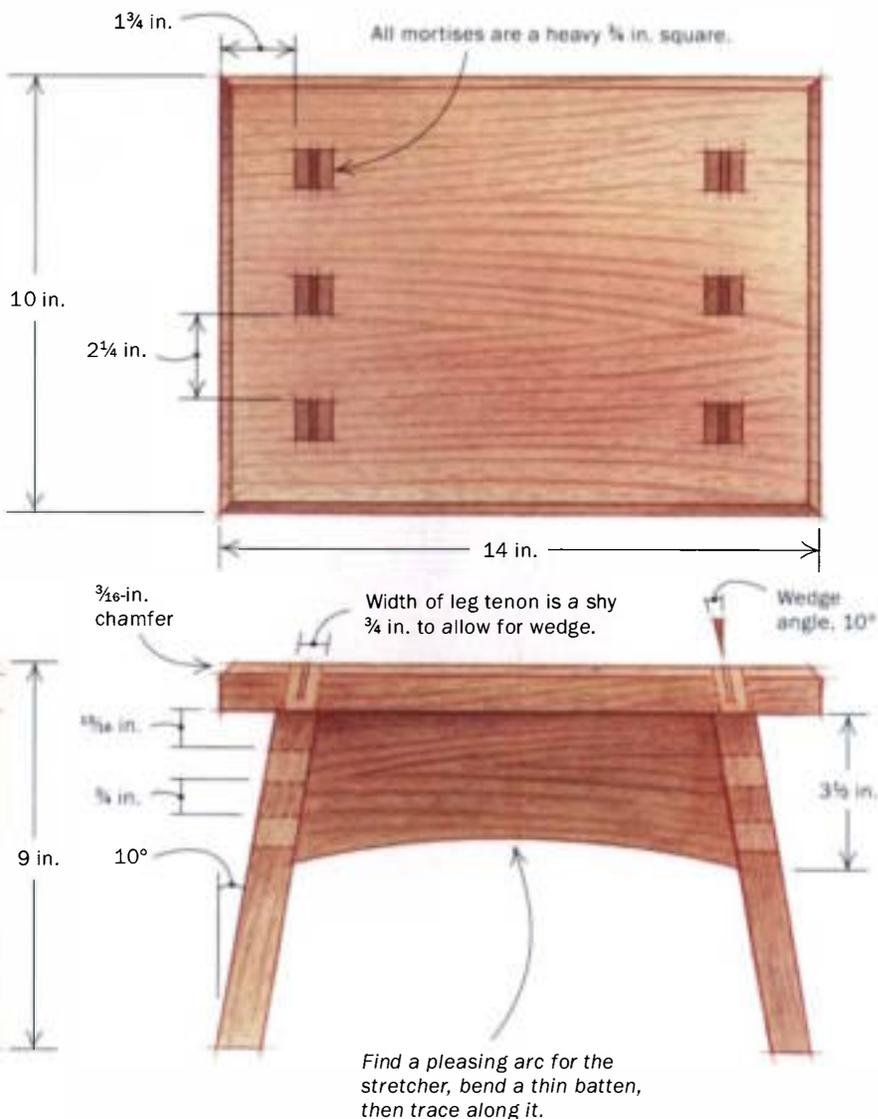
That top shelf is always just inches out of your reach. If you were a couple of inches taller, you would not have to trudge to the garage for that shaky, paint-spattered stepladder. At a time like this, wouldn't a neat little footstool be the perfect answer, tall enough to give the needed boost but small enough to tuck underneath a desk or in a corner? Small stools are also a favorite with kids, helping them do things on their own, from sneaking cookies to brushing teeth.

Recently I built this sturdy stool in mahogany. This simple project is a perfect way to spend a woodworking weekend. It can be made of short scrap pieces or a single board 10 in. wide by 50 in. long. It has

FULL-SIZED DRAWINGS ANSWER QUESTIONS

The legs are tapered and canted to angle outward on all sides. The resulting footprint determines the dimensions of the top. Make an accurate full-sized drawing to guide the construction of this project. It will be easier to take dimensions and angles directly from your drawing than to work them out mathematically. **Note:** The mortises are a heavy $\frac{3}{4}$ in. square to allow a standard chisel to slide in easily.

Don't taper the legs until the joinery has been cut.



just four parts (two of them identical), and only one type of joint to practice and perfect. It's a manageable project for a novice, but the angled through-tenons will offer a challenge to any level of woodworker.

The height of the stool is about 9 in., a little taller than a typical stair tread, keeping it compact. Yet the step is large enough to easily accommodate two adult feet, side by side, with the splayed legs adding stability.

As with the dovetail, I find the through-mortise-and-tenon joint irresistible. I like the strong contrasting squares of end grain that break up the wood's surface. But this joint invites close inspection, so make it tight and clean. Unlike a single mortise and tenon, where a misfit can be fudged $\frac{1}{16}$ in.



Mark the outlines and spacing of the mortises in the top. With two lines already scribed to mark the thickness of the mortises, use the layout gauge to mark the other edges.

one way or another, this joint must be dead-on. Wedging the tenons fills gaps, but only in one direction. Making the joinery more complicated is the 10° cant of the legs. However, I've come up with some jigs and techniques that will make things much easier on you.

Success starts on paper

I began this project by making a full-sized drawing. By laying the pieces on the drawing as you proceed, you can check the dimensions and angles of each part and the position of the mortises.

After thickening the mahogany stock, rip the pieces to width, and cut them to length. Leave an extra $\frac{1}{16}$ in. of length for

MORTISES

PLYWOOD RAMP

Make this simple jig with plywood and drywall screws. Adjust the riser block until the slope of the jig reads 10° on a large protractor.



Drill out the angled mortises. Use the ramp to position the workpiece at 10°. Square the workpiece with the edge of the ramp to be sure that the drilling angle is aligned properly. Then drill the mortises with a 3/4-in. Forstner bit.



leveling the legs and trimming the through-tenons later.

Leg-to-top joinery

The key to cutting these joints successfully is to lay out everything very carefully. Working from the drawing, mark out the thickness of the mortises across the top. Go 1/16 in. more than the thickness of the leg tenons. This will leave a gap for the wedging action to come later.

For the horizontal layout of the mortises—which must be dead-on—use a layout gauge, which is a small story stick that will standardize the width and spacing of mortises and tenons. Transfer marks from your full-sized drawing onto a small stick; then use the stick to mark all of the mortises in

the top and the tenons on the legs. For a clean outline, I use a sharp marking knife. Each mortise is a little larger than 3/4 in. to allow a 3/4-in. chisel to slip in easily.

Accurate angled mortises—These mortises and tenons aren't straight up; they're angled at 10°. The key to a great fit is to ensure that the mortises are sloped very precisely, so the exposed tenon completely fills the mortise without any gaps. However, we'll work from the top side of the workpiece, where the accuracy of the mortise and tenon will be most evident, toward the bottom side, where the 1/8-in. shoulders around the tenon will hide small gaps. So relax—a little.

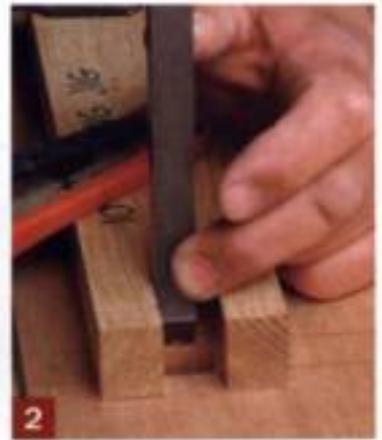
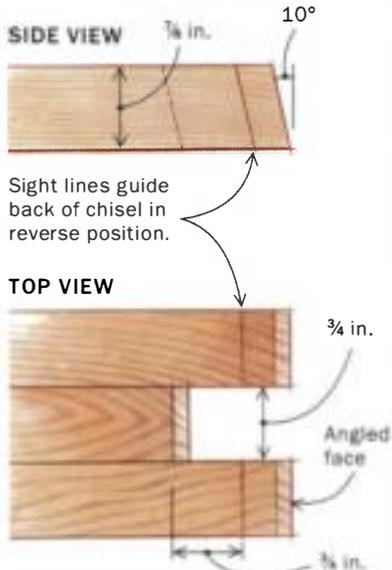
Drill out the majority of the waste on a

drill press—supporting the workpiece with a 10° ramp and using a 3/4-in. Forstner bit (see the photo and drawing above). This makes the chisel work much easier. The other secret to cutting these mortises accurately is to use a chisel guide (see the photos and drawings on the facing page). This is a simple jig made of three faces, each one cut to 10°. The center section, which matches the fat 3/4-in. width of the mortises, is set back about 1 in. This pocket keeps the back of the chisel at the 10° angle and regulates the width of the mortise. The two angled sections that jut forward are used as a visual guide to keep the back of the chisel at the same angle when you work on the opposite angled wall of the mortise.

I square up the drilled holes with a series

CHISEL GUIDE

Start with a block of wood with one end beveled at 10°. Then rip it into three pieces and reglue them to create the offset configuration.



Three-chisel process. With the help of the chisel guide, use a 3/4-in. chisel to remove the corners (1), a 1/2-in. mortising chisel to rough out the rest (2) and a 3/4-in. chisel to clean up the walls (3).

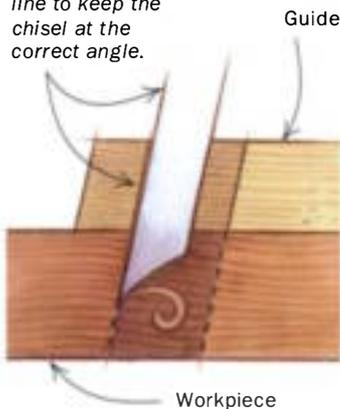


of chisels. I use a 1/4-in. chisel to cut corners into the round holes and create a little room, then turn to my 1/2-in. mortise chisel to ride the slope and sides of the guide block, and cut the mortise to shape. Finally, I use a 3/4-in. chisel to clean up the walls, flaring them slightly toward the hidden (bottom) side of the mortise, to allow easier assembly without compromising the appearance of the completed joint. Be sure to back up your workpiece with a piece of scrap to prevent blowing out the back of the mortise where your chisel exits.

While you're set up to drill and square up the mortises, do the pair of mortises in each of the legs. Use the plywood ramp and the chisel guide again—but pay close attention to the direction of the angle in relation to the mortises. You don't need a layout stick here, because the extra room for wedging adds a fudge factor to the spacing of these double mortises and tenons. As you proceed, check everything against your full-sized drawing.

The leg tenons—The next step in joining the legs to the top is to lay out and cut the

Use the sight line to keep the chisel at the correct angle.



Guide works both ways. The chisel guide also helps you cut the opposite angled wall of the mortise. Draw a line on the wall of the chisel guide parallel to its front edge.





Cut the angled shoulders. Set the tablesaw blade angle to 10°, and work to a scribed layout line when cutting the narrow outside shoulders.



Set the blade to 90° to cut the outside cheeks. This board is wide enough to be run on end. There will be a little waste left to be pared away later. The opposite cheek will require a change in blade height.

leg tenons. Remember to leave them a little long, to be trimmed flush later. While the legs are still square (the sides untapered), cut the 1/8-in.-wide shoulders to their 10° angle on the tablesaw, working by eye to a layout line. After returning the sawblade to 90°, stand the board on end and cut the outside cheeks.

Next mark out the width and position of each tenon using the layout gauge, and make the interior cheek cuts on the bandsaw. Use the 10° plywood ramp to make the bandsaw blade meet the tenon shoulders evenly.

Cut out the waste with a coping saw; then use a chisel to trim the shoulders and pare the cheeks. Monitor your progress by frequently placing the top over the leg tenons and look-

ing down into the mortises to see how the tenons are lining up.

As you continue to test-fit the pieces, note that the tenons should fit snugly across their width, but there should be wedging room left in their thickness.

Add the stretcher next

Working from your drawing, lay out the stretcher. Cut the ends on the chopsaw to 10°. You've already cut the mortises in the legs. Now you can cut the stretcher tenons using the same techniques and jigs as before; however, note that the stretcher tenons are angled in a different direction from the leg-to-top joinery. Once again, there is extra space in the mortise for the wedging action. Start on the tablesaw, cutting the outside shoulders and cheeks of the tenons. But before moving on, set the legs into the top, and place the stretcher shoulders between them to check the fit.

When you are done cutting and fitting the tenons, bandsaw the curve along the underside. Again, you can clean up the curve with a spindle sander or with a spokeshave and cabinet scraper, as I do.

The leg taper and cutout

The sides of the legs also have a 10° taper. Take the angle and dimensions off the full-sized drawing and cut just off the line on the bandsaw.

Then smooth the edges on the jointer or with a handplane.

Beside adding a little visual interest to the design, the leg cutout helps to overcome an uneven floor. Draw the arc with a compass, and use a sliding bevel to extend the lines parallel to the taper of the legs. Again, make the rough cut on the bandsaw, and then clean up the cutout with a spindle sander or with rasps, files and sandpaper, as I do.

Assembly is also tricky

This is a difficult project to assemble because all of the parts—and all of the mortises and tenons—must converge at once. First you should assemble different parts, and place the partial assemblies on the drawing and against each other to check angles and fit. After tweaking and adjusting the parts, dry-fit the whole stool.

Getting the stool together and apart again won't be easy. Some advice: Work carefully, move slowly and be patient. Then position your clamps, and slowly draw the stool together. Listen for creaks and groans, and watch for splits. If you see the leading edge of the tenon splitting the top edge of a mortise upward, either tap the split area down with a mallet and small block, or trim the tenon.

Kerf the tenons for the wedges—Before gluing up, saw a thin kerf into the end of each tenon. This kerf will receive a small

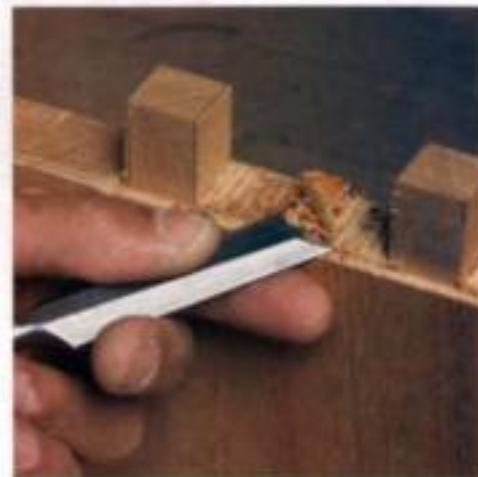




Use the same layout gauge for the tenons. There is no room for error here, and the layout gauge will ensure that the tenons match the mortises.



Use the angled ramp on the bandsaw. This lets the blade cut all the way to the angled shoulder. Leave a little on the cheeks for paring, and cut kerfs into the waste areas.



Fit the leg to the top. Clean up the shoulders with a sharp chisel, then pare the sides of the tenons, checking them frequently against their mating mortises.

wedge, which will spread apart the tenon, locking it in place and closing the small gap. I find that a handsaw makes an appropriate kerf. Go about $\frac{3}{4}$ in. deep. Note that the wedges in through-tenons should always be oriented against the grain surrounding the mortise; otherwise, the wedges, which pack a lot of punch, will split the mortised piece.

After applying white glue, which sets more slowly than yellow, draw all of the parts together completely. Let things set up for roughly 15 minutes, remove the clamps and blocks and tap in the wedges with a little glue on the tip of each one. A good angle for these small wedges is 10° . Tap them in until the gap around the tenon closes.

Finishing up

Leave the stool for at least 12 hours to let the wedges set up firmly. Then trim and plane them flush.

The last detail before sanding and finishing the piece is to chamfer the top. First, scribe lines $\frac{3}{16}$ in. back from the edge. Then with a block plane angled at 45° , work down to the lines to leave a crisp, even chamfer. Of course, a router would also do the job, but I like the subtle character of handwork. □

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The parts all converge at once during glue-up. Dry-fit everything beforehand. Assemble one leg and the top, the other leg and the stretcher, then drive the joints together carefully.



Walnut wedges add contrast. Cut the wedges to a 10° angle and tap them into the kerfs in the tenons until the tenons spread to fill the mortises.