

## Pinned miter combines strength and beauty

BY RUSSELL JENSEN



On one of my many quests over the Internet for woodworking knowledge, I happened upon a fellow woodworker from Japan who had gone into great detail about traditional Japanese furniture joints. Of the 50 or so joints illustrated, one really caught my eye: The kane tsugi (literally, right-angle corner) joint is basically a miter and a pinned bridle joint fused together. After making many examples of the joint, I am still impressed at its incredible strength. Even without glue, the joint is almost impossible to move once you insert the pin.

Traditional Japanese joinery normally consists of a lot of painstaking handwork, but this joint can be created using a simple jig, some power tools, and a

small amount of handwork—a nice combination.

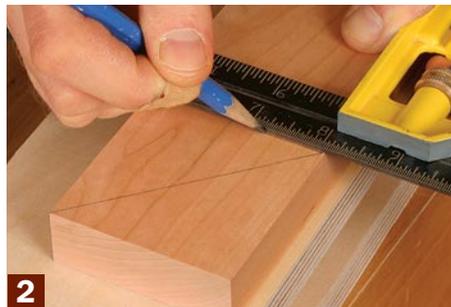
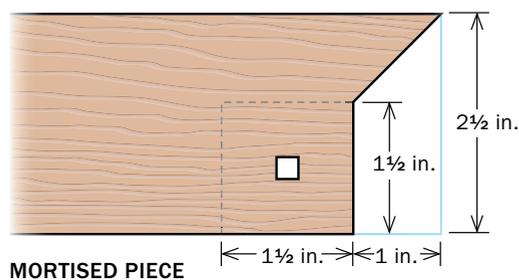
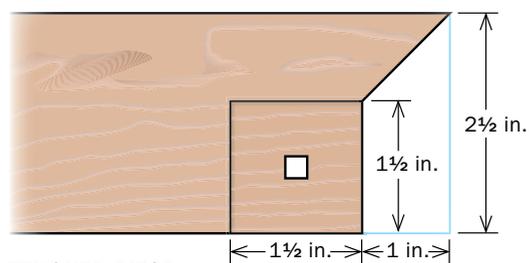
### A simple jig for cutting the tenon

While milling the wood for the joint, mill an extra piece to the same thickness. This piece should be about 2 in. wide and at least 14 in. long, with parallel sides. Then, cut two pieces of 3/4-in.-thick Baltic-birch plywood about 6 in. wide and as long as the piece of scrap. The plywood should come from the same sheet for consistent thickness.

Now screw the two pieces of plywood to the scrap, leaving the scrap protruding about 1/16 in. on one side. After laying out the joint (see photos, below),

### Five layout steps

Lay out both pieces that form the joint at the same time. Use the same settings on a marking gauge to ensure a tight-fitting joint.



**Lay out the miters.** Draw a 45° line from the outside corner of both pieces (1). Where the 45° line meets the inside edge on the piece to be tenoned, mark the tenon's shoulder with a 1½-in.-long line parallel to the end (2).

**Set a marking gauge to 1 in.** Scribe a line from the tenon's shoulder line to the end of the board (3). On the board to be mortised, use the same setting to scribe a line parallel to the end of the board (4).

## Use a jig to rout the tenon

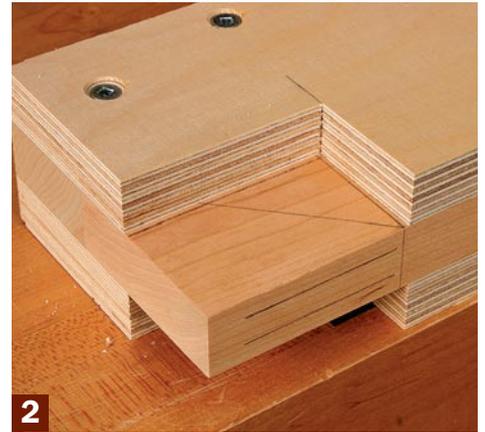
insert a piece of your project wood into the jig and mark the width on the jig.

Remove the workpiece, and rip the jig to this width with the protruding edge of the scrap running against the fence. Flip the jig and trim the scrap overhang. Finally, cut one end of the jig square.

You now need to cut away one corner of the jig to guide the router when cutting the tenon. You can either equip the router with a bushing guide or use a top-bearing straight bit. I use a bushing with an outside diameter of  $\frac{3}{8}$  in. to guide my  $\frac{1}{2}$ -in.-dia. spiral upcut bit, so I have to make the opening  $\frac{1}{16}$  in. larger than the tenon. On the jig, I mark two lines using a square; the first  $1\frac{1}{16}$  in. from the open side of the jig, and the second  $2\frac{9}{16}$  in. back from the squared-off end. The extra inch is removed when the miter is cut. With the bearing-guided bit (Freud #16-520), the dimensions would be  $1\frac{1}{2}$  in. by



**1** **Lay out the jig.** Create a tenoning jig by sandwicheing a piece of wood the same thickness as the workpieces between two pieces of plywood. Then mark the corner to be cut away.



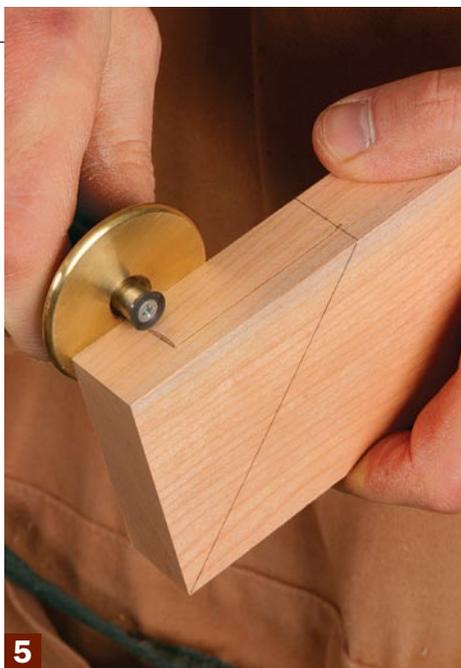
**2** **Bushing or bearing?** For a bushing guide, the opening in the jig must be slightly larger than the tenon (above). For a bearing-guided bit, the opening should match the tenon.



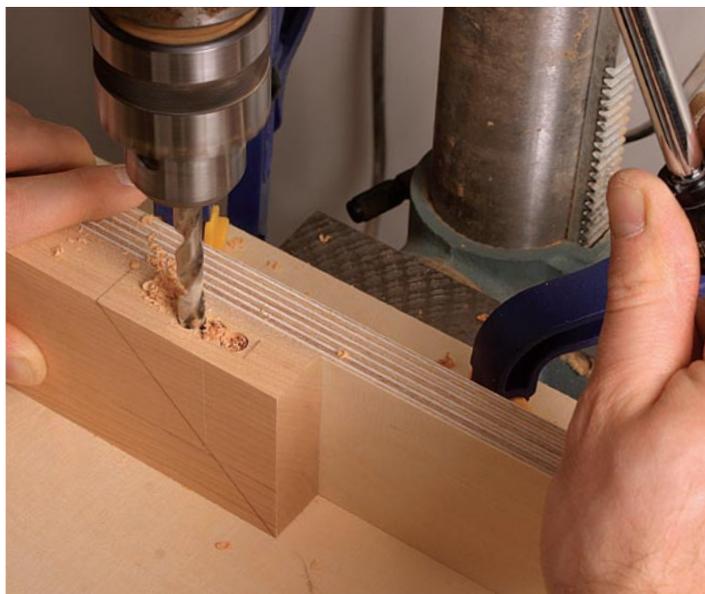
**3** **Cut the tenon.** Cut down to the layout line in stages. When the first cheek is cut, flip the jig and workpiece over and cut the other.



**4** **Square up the corners.** Use a chisel to square the rounded corners left by the router bit. Work carefully, as this will be a visible part of the joint.



**5** **Lay out the mortise and tenon.** Working off both faces, center and mark the mortise (above), then use the same setting to mark the cheeks of the tenon.



## Cut the mortise

**Your choice.** With the joint laid out, cut the mortise using whatever method works best for you.

## Cut the ends and miters

**Measure once, cut twice.** With the blade at the same height for both cuts, define the edge of the mortise and tenon on both pieces (right). Jensen uses a stop on his miter gauge to ensure uniformity.



**Safety first.** Before cutting the miter, remove most of the waste on the bandsaw to prevent the piece from catching on the tablesaw blade.



**Miter the tenoned piece first.** Sneak up on the right blade extension (height). It's OK if you nick the tenon a bit as this will be invisible later.



**Matching miter.** With the blade now set at the correct height, cut the matching part of the miter on the mortised piece.

$2\frac{1}{2}$  in. Cut the opening on the tablesaw using a tenoning jig and a crosscut sled.

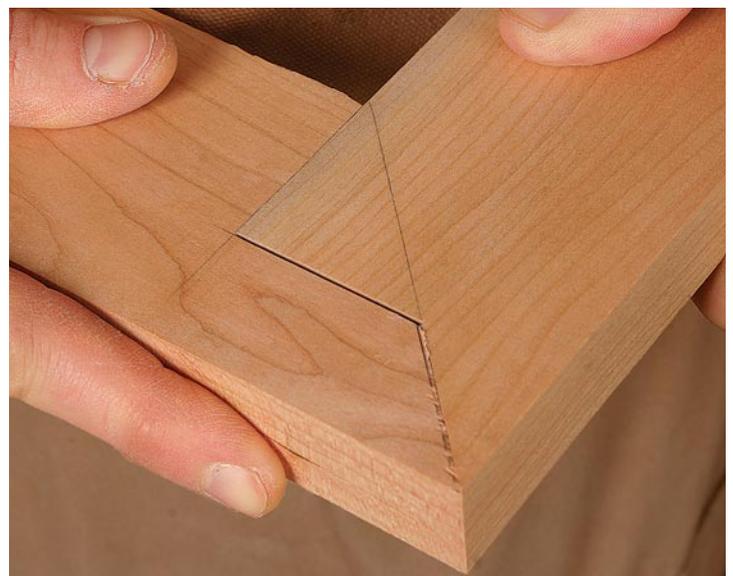
### Cut the tenon, then the miter

Insert the piece to be tenoned into the jig, making sure the end is flush, and clamp the assembly to the workbench. I only remove  $\frac{1}{16}$  in. or so with each pass.

Leave a  $\frac{1}{2}$ -in.-wide strip at the end of the board to avoid going too close to the end of the jig and tipping the router. Remember, this section will be removed later when cutting the miter.

After you have reached full depth, unclamp the jig and flip it over, making sure the workpiece stays aligned with the end of the jig, and cut the other side of the tenon. To check the fit, I open up the end of the mortised section on the bandsaw, staying a good distance from where the final end of the mortise will be. When done, remove the workpiece from the jig and use a chisel to square up the rounded corner on each side.

Now measure back  $1\frac{1}{2}$  in. from the shoulder and mark the tenon to length. At the tablesaw, raise the blade to just under



**Getting close.** If your joint isn't perfect the first time, you may need to trim one of the miters to get a tight joint.

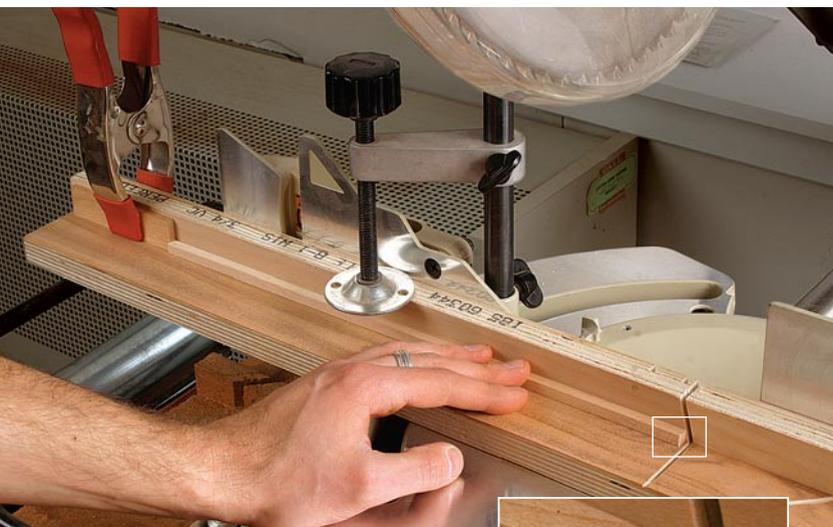
## Pin the joint

**A square hole.** After the joint has been glued and allowed to dry, drill a ¼-in.-dia. through-hole on the drill press and then square up the hole from both sides using a chisel.



way through the joint, this one does. At the drill press, drill a ¼-in.-dia. through-hole for the pin; then square up the sides with a ¼-in. chisel.

Cut a ¼-in.-square strip of wood at the tablesaw, then take the strip to the miter saw and tilt the blade 15°. Using a stop block, make four cuts, revolving the strip 90° after each cut, to leave a four-sided pyramid on the end of the pin. Cut the pin about ¼ in. longer than the thickness of the joint, and bevel the non-pyramid end with sandpaper so it doesn't get hung up when you drive it into the hole. Place a little glue in the hole, and gently drive the pin into place. I use a piece of softwood to protect the top of the pyramid. Stop when the base of the pyramid is flush with the top of the workpiece. When dry, cut off the excess from the back with a flush-cutting saw. □



**A pyramid peg.** To cut the four-sided pyramid on the top of the ¼-in.-square rod, use a stop block on the miter saw and tilt the blade 15°.



**Soften the blow.** Use a piece of softwood to prevent damage to the pyramid-shaped peg when inserting it into the joint.

1½ in. and cut to this line. With the blade at the same height, make the same cut on the mortised piece 1 in. from the end.

Before cutting the miter, use a combination square to check that the 45° miter line still meets the shoulder of the tenon at the inside edge. If you cut the tenon a little deep, redraw the miter line. You'll simply make the workpiece a little shorter.

After removing the majority of the waste at the bandsaw, tilt the tablesaw blade to 45°. I cut the tenon miter first, sneaking up to the line. If the blade ends up slightly high, I'll be cutting into the tenon, which is hidden in the completed joint, unlike the shoulders of the mortised section. With the blade set to the correct height, I can now cut the miter on the mortised board.

### A wooden pin locks the joint

Cut a groove for the fixed or floating panel that goes in the frame. Now sand all the parts, insert the panel, and glue the joints together. Although most wooden pins don't go all the

**Display the joint.** The kane tsugi can be used either vertically as on the doors of this bookcase, or horizontally as on a tabletop (photo, p. 90). The panel inside the frame can be fixed or floating.

