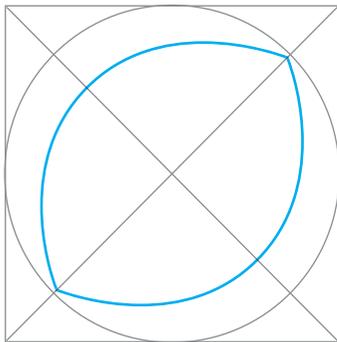


Learn Offset Turning



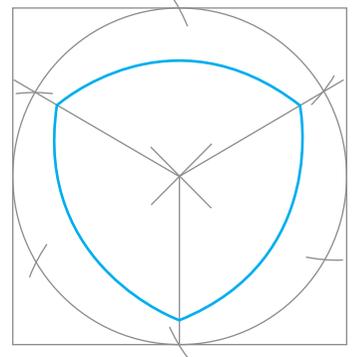
ELLIPTICAL

TRIANGULAR



By mounting a workpiece off-center on the lathe you can turn a partially rounded piece; mount it off-center a second time to shape a mating arc and give it an elliptical cross-section.

Mount the workpiece off-center three times and you can generate a triangular part.



Mount the workpiece off-center to create elliptical and triangular parts on the lathe

BY BETH IRELAND

I began exploring offset turning 25 years ago when I was asked to make some cabriole legs. As a turner, I figured there had to be a way to make them on a lathe. Sure enough, in an old woodworking manual I learned about offset turning, mounting a workpiece off-center so only a portion is cut on each rotation. Since then, I've experimented extensively with this powerful technique, which lets you shape parts in almost any geometry you can draw. The stool in the photo opposite, made by a student of mine, has off-center-turned front legs that are elliptical in cross-section, and a back leg that is triangular. This article shows how

LAY OUT THE ELLIPSE



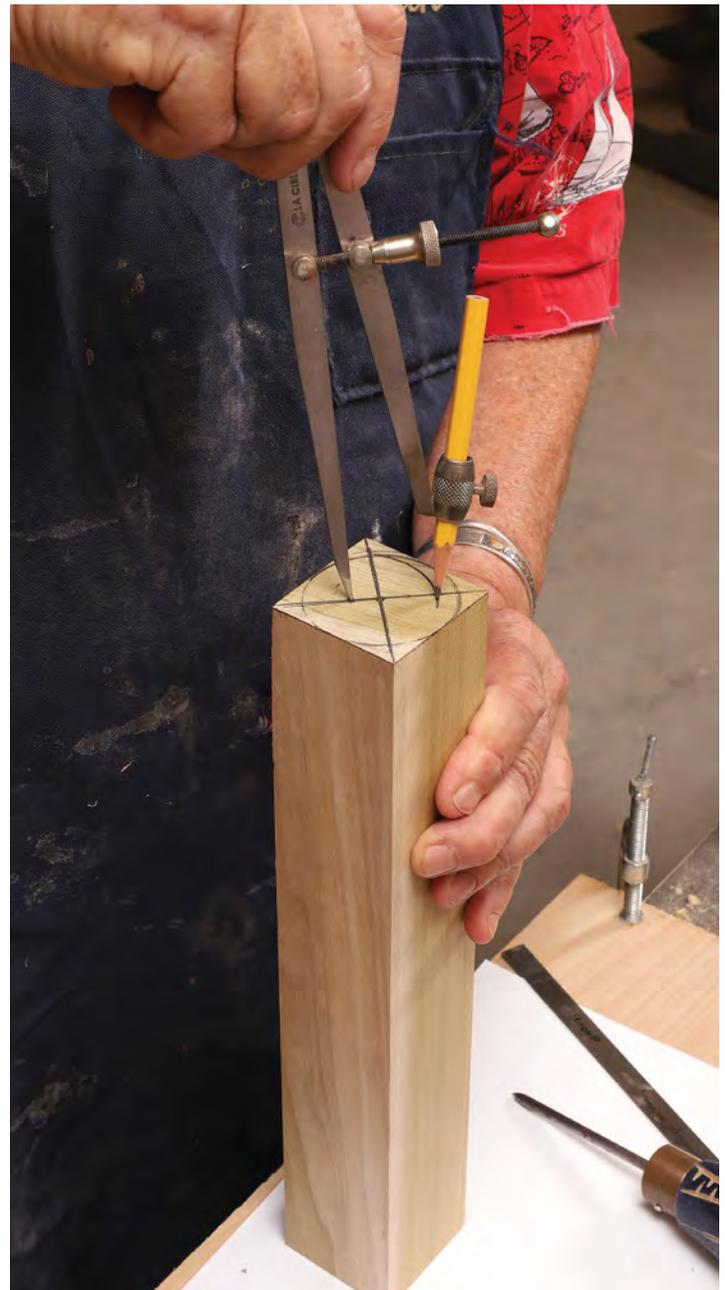
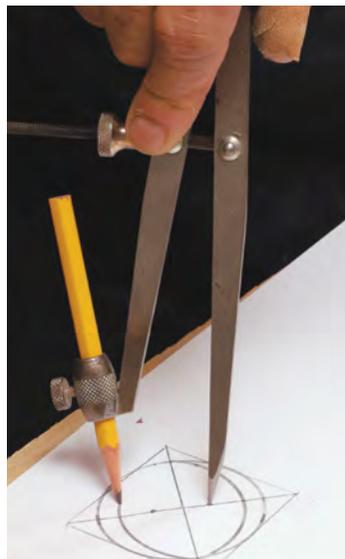
Start with the square. After carefully milling the blank square, Ireland traces it onto paper.



Circle in the square. Find the centerpoint by drawing diagonal lines from the square's corners, then draw the largest circle that will fit in the square.



A pair of arcs. Mark two offset points along the same diagonal line, placing them equidistant from the center. Then set the compass and draw a pair of mating arcs.

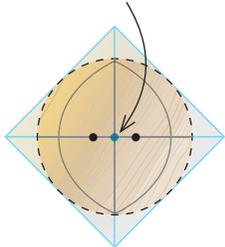


Transfer time. Transfer your layout to both ends of the workpiece: Draw the diagonals, then use dividers to transfer the offset points, and deepen those points with an awl. Draw the arcs with a compass.

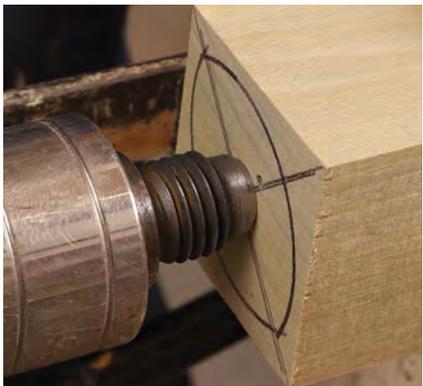
Turn the ellipse

1. START WITH A CYLINDER

Blank mounted on centerpoints to turn a cylinder.



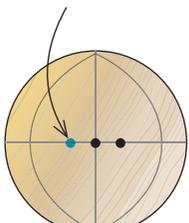
END VIEW



Turn the part round. Mount the blank on its centerpoints and turn a cylinder. You can offset-turn an ellipse directly from a square blank, but turning the part round first lets you do some helpful layout and makes the offset turning easier.

2. REMOUNT ON FIRST SET OF OFFSET POINTS AND TURN AN ARC

Cylinder mounted on first set of offset points.



END VIEW

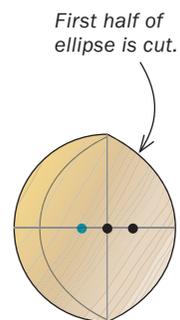


Mark and remount. Using the tool rest as a straightedge, run two lines the length of the cylinder to connect the diagonal without offset points on one end of the blank to the same diagonal on the other end. Then remount the workpiece to one set of offset points.

Helpful hashmarks. With the lathe still off, rotate the workpiece by hand and draw vertical guidelines on the half of the cylinder closest to the tool rest. Stretching from one horizontal line to the other, these lines will disappear as you turn, letting you gauge your progress.



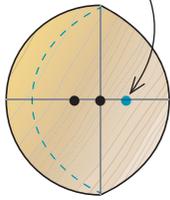
Turn an arc. Using a roughing gouge and a wide, comfortable stance, sway side to side while feeding the tool forward gradually until chips begin to fly. Keep cutting until the vertical lines are gone and just the horizontal lines remain.



END VIEW

3. REMOUNT ON SECOND SET OF OFFSET POINTS TO COMPLETE THE ELLIPSE

Cylinder mounted on second set of offset points.



END VIEW

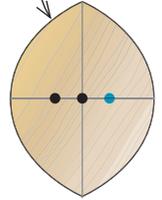


Remount and remark. Move the blank to pinch the other set of offset points between the headstock and tailstock centers. Then draw a series of vertical guidelines on the side you'll cut next.



Two arcs meet. After you have cut with the centers in the second set of offset points, the two opposing arcs will meet.

Second half of ellipse is cut.



END VIEW

to turn elliptical and triangular parts and also tapered versions of them. With this technique, there's no telling what you can make; another student of mine carved an Inuit bear using offset turning!

Layout is foundational in offset turning

Start an ellipse by laying it out on paper. You won't be making a true ellipse, rather two mating arcs. After tracing your square workpiece, draw lines from corner to corner of the square and draw a circle within the square. Place both offset points along one of the diagonal lines, equidistant from the center. The closer to the center you place the offset points, the rounder the resulting ellipse; the farther from the center, the skinnier the ellipse. With the layout finished, transfer it to both ends of the workpiece.

An ellipse on the lathe

You could mount your square blank off-center and begin cutting the ellipse right away, but it simplifies things to first mount the

blank on its centerpoints and turn it to a cylinder. Then stop the lathe and rotate the piece by hand until the diagonal layout line that doesn't have the offset points on it aligns with the top edge of the tool rest. Now use the tool rest as a straightedge and draw a line from one end of the cylinder to the other. Draw another line on the opposite side of the cylinder.

Remount the workpiece using one of the pairs of offset points. Turn the cylinder by hand (it will now rotate eccentrically) and adjust the tool rest so there is never less than a $\frac{1}{8}$ -in. gap between it and the work. On the side of the cylinder that comes closest to the tool rest, draw a series of vertical pencil lines from one horizontal line to the other. These will show as the piece is spinning. When they disappear and you reach the horizontal lines, the first arc is finished. Remount the workpiece on the second pair of offset points and repeat the process.

What I've described here is the simplest type of offset arrangement. There's much more to explore. Leaving one end centered

Tapering an ellipse

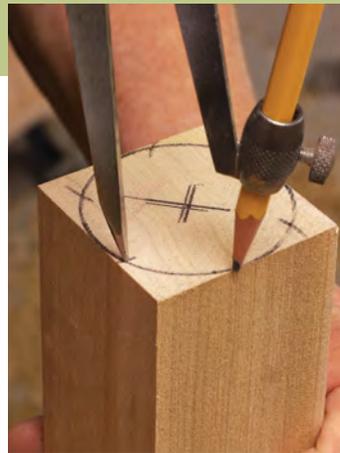
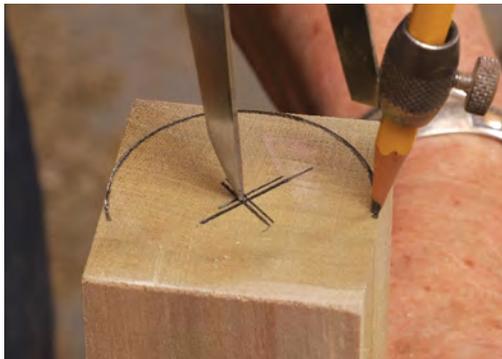
To make an elliptical part that tapers from end to end, begin by laying out the large ellipse on one end of the blank and the smaller one on the other end. Mount the part on center and turn a cylinder. Then taper the cylinder. (For details on tapering a cylinder, see "Mastering the Cylinder," *FWW* #296.) Next, remount the workpiece to the first set of offset points and, with the tool rest still angled, cut the first arc of the ellipse. Then remount to the second set of offset points and cut the second arc.



Turn a triangle

TRIANGULAR LAYOUT

Crisscross. After doing her layout on paper, Ireland transfers it to one end of the blank. Start by making short marks where the diagonals cross, and use them as a centerpoint to draw the largest possible circle.



Radius trick. With the compass still set to the circle's radius, walk it around the perimeter making six equally spaced marks. Then connect every other mark to the centerpoint.

1. TURN A CYLINDER AND MARK THE OFFSET POINTS



A cylinder to start. Turn the workpiece to a cylinder, stopping at the circle you drew on the end. Then carry the three radial lines down the cylinder and reproduce them on the other end.

while the other end is offset, you can create a piece that transitions from round at one end to elliptical at the other. I use offset turning to create necks for guitars, legs for furniture, and a wide range of vessels and boxes. The possibilities are endless.

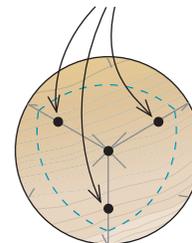
Turning a triangle

Offset turning a triangle is actually easier than turning an ellipse, though the layout is a little more complex. On paper, draw a circle that represents the biggest cylinder you can get from the blank. Divide the circle into three equal sections. You can do this by keeping the compass set to the circle's radius. Stick the point of the compass anywhere on the circle and make a short pencil mark across it; move the compass point to the cross-mark and continue on around the circle. This will give you six almost perfect divisions. From every other point draw a line to the center. Use dividers to mark your offset points along those three lines. As before, swing the arcs from those offset points.



Mark the offsets. Using dividers, mark the offset points along each of the three radial lines. Do the same on the other end of the workpiece.

Offset points, equidistant from the center, marked on each of the three radial lines.



END VIEW

2,3,4. REMOUNT ON EACH SET OF OFFSET POINTS AND TURN THE ARCS

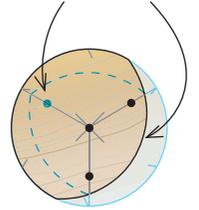
More marking.

After mounting the workpiece using one of the pairs of offset points, draw vertical guidelines on the side of the part nearest the tool rest.

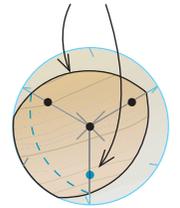


Side one. As you did with the ellipse, extend the roughing gouge gradually until chips appear. Keep your forefinger in the hollow of the tool rest to control depth of cut. Use the vertical guidelines to gauge your progress.

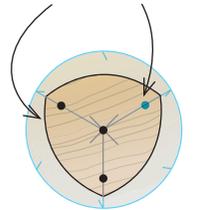
First set of offset points creates first arc.



Second set of offset points creates second arc.



Third set of offset points creates third arc.



Then transfer the layout to one end of the workpiece.

Mount the workpiece at its centerpoints and turn it to a cylinder. Then, using the tool rest as a straightedge, carry all three axis lines to the opposite end of the workpiece. Take the piece off the lathe and complete the layout on the second end, using the three axis lines to orient it.

Now mount the workpiece using one pair of the offset points, turn the piece by hand, and put a series of vertical pencil lines in the section that comes closest to the tool rest. With a roughing gouge, turn until the vertical lines disappear and you hit the horizontal lines. Repeat this on all three sides.

Here, too, the possible variations are amazing. Mount one end at the centerpoint and the other end at the offset points to create a part that goes from round to triangular. Mismatch the offset points at the two ends and you can turn a spiral. The beauty of this technique is how quickly you can achieve a sophisticated look with no setup and no jigs. Grab your scraps and have fun! □



The completed part. After remounting the part off-center twice more and cutting the second and third arcs, the triangle is complete. With the lathe off you can use sandpaper on a hard block to straighten or sharpen the arrises between the arcs.

Beth Ireland turns in St. Petersburg, Fla., and teaches around the country.

How to taper a triangle

Making a part that is both triangular in cross-section and tapers end-to-end is much like making a tapered elliptical part. Draw two layouts on paper and transfer the large one to one end of the blank. Turn the blank to a cylinder. Draw three horizontal lines along the length of the cylinder corresponding to the three radial lines of the layout. Remove the cylinder from the lathe and use the three horizontal lines to orient the small layout on the other end of the part. Remount the cylinder on its centerpoints and turn it to a taper. Then, with the tool rest still angled, remount the part to each of the three pairs of offset points in turn to create the tapered triangle.

