Q As a carpenter, I occasionally need to create elliptical shapes for things such as door transoms. I've tried the nails-and-string method, but driving nails isn't always an option. Is there another method I could try?

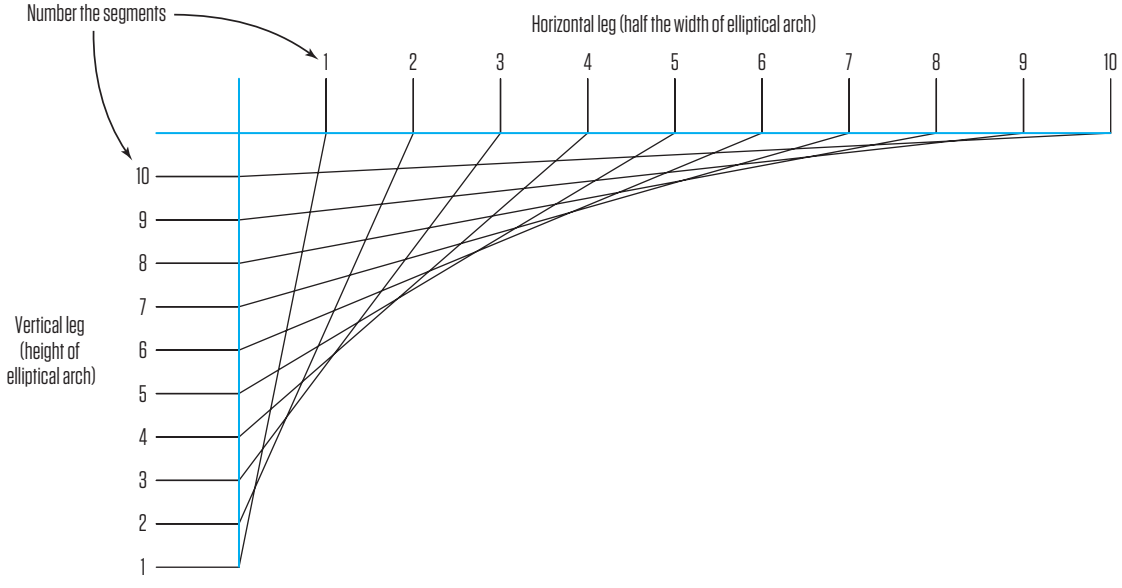
A Mike Patterson, owner of Patterson Builders and Remodelers, in Gaithersburg, Md., responds: I can never seem to remember the nails-and-string method, so I use a technique that I learned back in Cub Scouts that uses a series of straight lines to make an elliptical shape.

I first establish the height and width of the elliptical shape I need (which for a door transom with an elliptical arch would actually be just half of an ellipse). I lay out the elliptical shape on a piece of cardboard, plywood, or whatever works for the size I need, typically drawing only half of the arch, and then reversing that piece to trace the other half.

To create the ellipse, I start by drawing an "L" shape, where the vertical leg equals the height of the elliptical arch, and the horizontal leg represents half of the ellipse's width. Next, I divide each of those lines into the same number of segments. The more segments I use, the more accurate the shape will be (see illustration, below). Then I number the segments "1" through whatever number of segments I've decided to use. On the horizontal leg, the numbering begins at the mark closest to the intersection of the two lines. On the vertical leg, though, I start the numbering at the mark farthest from the intersection.

I connect the same numbers on the two legs—1 on the vertical leg to 1 on the horizontal leg, 2 to 2, and so on—with straight lines. Joining the points creates something that looks like a spider web, with the straight lines intersecting and overlapping to form short straight segments of the ellipse's circumference. With a pencil, I fair the segments into an elliptical curve, and then cut out the shape. I use this pattern to mark one side of the arch and simply flip it over to mark the other side.

Making an Ellipse (Straight-Line Method)



Q When mixing concrete for post footings, my crew always disagrees about what makes for stronger concrete: a looser, more soupy mixture or a drier, stiffer mix. Who is right and why?

A Bill Palmer Jr., an engineer and the editor-in-chief of *Concrete Construction*, a sister publication of *JLC*, responds: The strength of the concrete is inversely related to the amount of water in the mix—essentially, drier mixes are stronger and wetter mixes are weaker. If you add 30% more water than what is recommended, you will reduce the concrete's compressive strength by about 40%. But compressive strength is seldom an issue with concrete for footings. Typically the load is spread out on the footing and is seldom high enough to exceed the strength of the concrete—even if you are using a wet mix.

For successful footings, always properly compact the soil under the footing. It's a good practice to dig the hole a little deeper than required, then add a few inches of gravel or crushed stone and compact it thoroughly with a piece of lumber before placing the concrete.

A more common problem with footings is improperly consolidating the concrete. A dry, stiff mix can be difficult to consolidate well, and a poor job can result in voids and honeycombing in the concrete. Those defects can cause the concrete to crack, which compromises the strength of the footing. Regardless of the mix you use, it's a good idea to consolidate the mixture with a piece of rebar or a trowel as you fill the form.

Bottom line: I always recommend a mix that allows for easy placement and consolidation of the concrete, but that isn't too soupy. It may seem a bit obvious, but for best results, just follow the manufacturer's mixing instructions on the bag, which typically call for 3 quarts of water for an 80-pound bag of concrete mix.

Q In a kitchen I'm building for a client, the dishwasher drain line would need to pass through a drawer cabinet to connect to the sink drain. The waste line for the sink passes under the floor directly below the dishwasher. Is there any problem with running the dishwasher drain directly into the waste line?

A Mike Casey, a licensed plumbing contractor and co-author of *Code Check Plumbing*, responds: Whenever possible, it is always best practice to connect the dishwasher drain hose to the kitchen sink drain. Most drawer cabinets have a 3-inch to 4-inch space below the drawers, or space at the back of the cabinet behind the drawers, where the hose can be located.

Nothing in the code specifically prohibits you from connecting a dishwasher drain directly into a waste pipe below the floor, but doing so creates many potential problems. First, the drain line should always have a high loop (at least 20 inches above the finished floor) to prevent waste water from backing into the dishwasher, so you would need to loop the drain hose over the dishwasher and back down to the waste line. Second, the drain must connect to a proper fitting with a trap that prevents sewer gases from backing into the dishwasher. This trap arrangement already exists at the kitchen sink, but it would need to be duplicated if you made a separate connection directly into the waste line. Finally, when a drain connects to a waste line below a point that is 20 inches from the kitchen floor, an air-gap device—which must be installed above the rim of the sink—is required for the drain.

So again, while there is nothing in the code that says you can't run the drain directly into the waste line, it is almost always easier and certainly less complicated to connect the dishwasher drain hose to the drain at the kitchen sink.