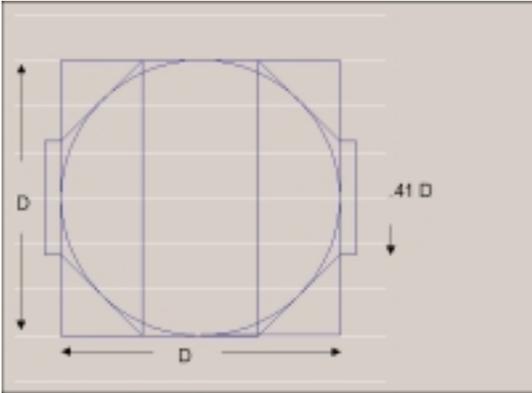


Geometry of Turning a Sphere

Al Hockenbery - Intermediate Woodturning

With practice a reasonable sphere can be turned by eye. However the following steps will enable you to turn a sphere while gaining the discipline and skills to turn a by eye alone. The most common error in turning sphere is making one cut below what should be the final surface of the sphere you are trying to turn. Once this happens you have to re-turn the whole surface down to or below this cut.

The process is to start with a cylinder, then make a series of straight cuts that intersect the surface of the sphere you are turning.



The diagram at the left is a cross section of the sphere in progress. It is an octagon around a circle. The face of the octagon has a length of $2R \cdot \tan(22.5 \text{ deg})$.

Or $D \cdot \tan(22.5)$

Where R is the Radius of the sphere and D the Diameter

.414 is the Tangent of 22.5 degrees .



1. From square stock like a 3x3, cut a blank that is 1/2-1" longer than it is square, find the centers, and mount it on the lathe.

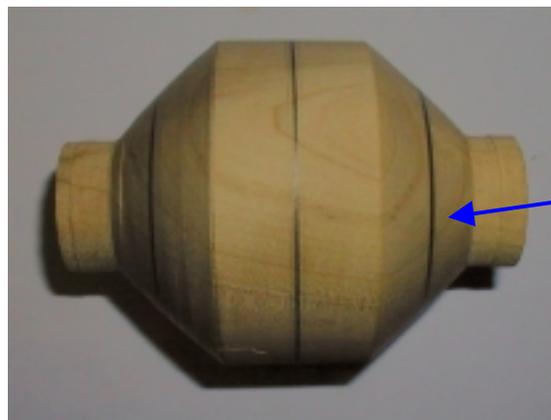


2. Turn the cylinder to desired diameter, mark the diameter length on the cylinder and the center.

This centerline will be on the surface of the sphere.

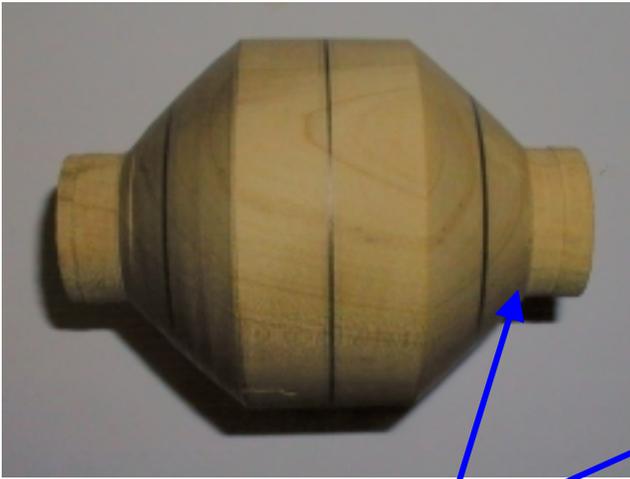


3 Part in on each end of the cylinder to create a tenon that is .41 of the desired diameter. Mark the two lines on the cylinder .41D apart centered about the centerline.

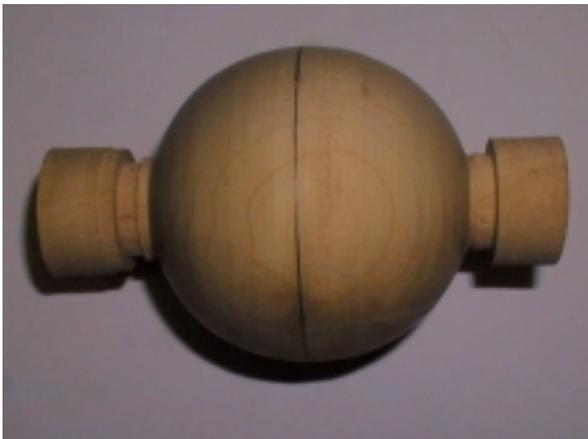


Cutting from these last two lines to the edge of the tenon, remove wood from the line on each end to the tenon making two flats.

Mark the centers of the flats. These lines are on the surface of the sphere.



Part in a bit at each end of the sphere. Mark the centers between the 3 lines on the surface of the sphere and the corners where flats meet. These are orange lines on the right above. Then cut the corners off establishing flats between these lines. The centers of these flats will be on the surface of the sphere. Note: the photo on the left has the cross section of an 8-sided figure and the photo on the right has the cross section of a 16 sided figure.



Visualize the sphere in the 16-sided figure and cut the surface taking care not to cut below any surface line.

Lay a small circle of plastic or wood on the surface of the sphere. When you have a sphere it will contact the surface evenly. It will rise up on high spots. Turn these high spots away carefully and you will end up with a sphere like the one on the left.



Using a cup of wood mounted at the headstock and a wooden pin over the live center press the ball into the cup. You can now turn off the stubs using light cuts with a bowl gouge cutting from the centers at each side up toward the middle of the tenon. As the ball rotates you see the outline of the sphere. Once you get close to sphere with cutting switch to scraping.

You may choose to cut the ends off with a handsaw. Note: it is extremely dangerous to cut these with any type of power saw.

