

3D Engineering for Middle and High School



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Making a Water Turbine

- 1.) Launch Google SketchUp. Click the “Start using SketchUp” button at the lower right.
- 2.) Select the model of the worker and hit the delete key.
- 3.) Click the down arrow beside the Rectangle Tool on the toolbar at the top of the screen and select the Circle Tool from the drop-down menu.
- 4.) Along the green and red axes, with the blue axis perpendicular, make a circle with a $5/16$ ” radius. You will have to zoom in with the scroll wheel a considerable amount to measure a circle this small. To make a circle, click the mouse where you want the center of the circle to be, and drag outward until you reach the desired radius. The radius measure is at the bottom right corner of the screen. Note that Google SketchUp measures in $1/16$ ” increments.
- 5.) At the center of the circle you just made, draw another circle, this time with a radius of $1/8$ ”. Note that this does not make a perfect circle, but a many-sided polygon that approximates one. That said, click the down arrow beside the Arc Tool and select the 2-point Arc Tool. Using the 2-point Arc Tool, click on one of the vertices of the sides of the smaller circle, and the vertex on the other end of the side. Measure an arc toward the center of the circle measuring $1/16$ ”. The measurement of the line will be in the same place as the radius measurement from step 4, in the lower right of the screen. Do this same thing for the side directly opposite.
- 6.) Select the Line Tool. From the center of the circle, draw lines directly out to the edge of the circle, representing the blades of the turbine. From the edge of the circle where the lines went out to, draw another line away from the circle into space, measuring $5/8$ ”. The measurement of the line will be in the same place as the radius measurement from step 4, in the lower right of the screen. Make sure that the line you’re drawing turns pink and flashes “extend edge” as you’re drawing it – this indicates that you are drawing a straight line, extending from the line you drew at the beginning of this step. If you made one of your initial lines along the red or green axes, your line will be red or green instead. *Make sure the line is never blue.*
- 7.) Select the 2-point Arc Tool. Click the point where one of the lines drawn in step six meets the inner circle, as well as the very edge of the line you drew out in space. Make an arc measuring $3/16$ ”. Do this for all the blades you made, and make sure the arcs all point in the same direction (clockwise or counterclockwise).

- 8.) Select the Select Tool. Delete all extra lines you made, so that you're left with just the outline of the turbine. Select the space in the middle of the turbine and delete that as well, so that there is a hole in the middle.
- 9.) Select the Push/Pull Tool. Pull up on the turbine so that it has a height of 1/2".
- 10.) Click the down arrow next to the Circle Tool and select the Rectangle Tool. On the rectangular face of each of the blades, make a rectangle. Make sure the rectangle is toward the left slightly.
- 11.) Select the Push/Pull Tool. Push inward on the rectangle so that it hollows out a 1/16" hole in the middle of the rectangular face of the blade.