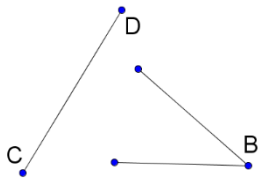
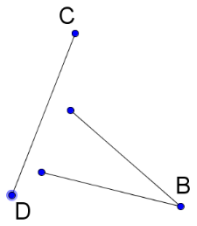
Construction Junction, What's your Function?

For each task, complete the construction and write directions on how you did it. Explain how you know it works.

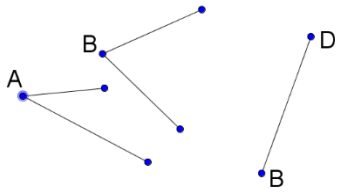
1. Construct an isosceles triangle *ABC*, given base angle *B* and the altitude *CD* to one of its legs.



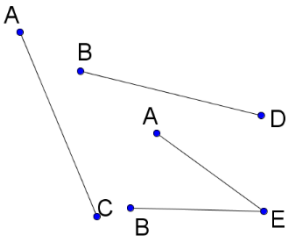
2. Construct a right triangle ABC, given angle *B*, one of its acute angles, and *CD*, the altitude to the hypotenuse.



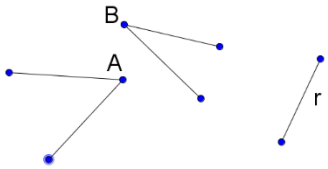
3. Construct a triangle *ABC*, given two if its angles, *A* and *B*, and the angle bisector to the angle *B*.



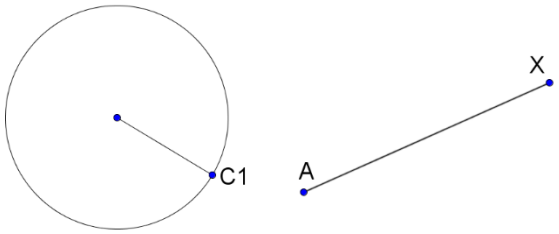
4. Construct a parallelogram *ABCD*, given the diagonals *AC* and *BC* and $\angle AEB$ between the diagonals, where *E* is the intersection of the diagonals.



5. Construct a triangle *ABC*, given the angles *A* and *B* and the radius of the circle inscribed in the triangle.



6. Given a circle C_1 and lines *AX* and *AY*, that are tangent to the circle at points *X* and *Y*. Construct a circle C_2 that is tangent to the circle C_1 and to the lines *AX* and *AY*.

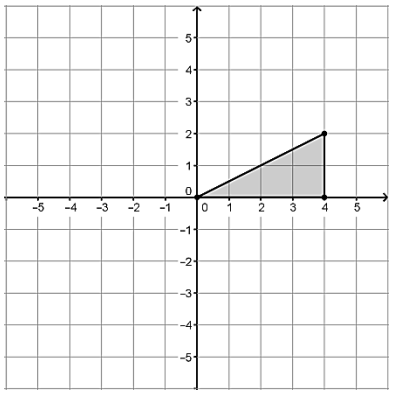


Just Keep Spinning: Bridging Geometry to Calculus

This series of three tasks is based on parts of Module 5, Secondary Mathematics III, by the Mathematics Vision Project, Utah State Office of Education, 2014.

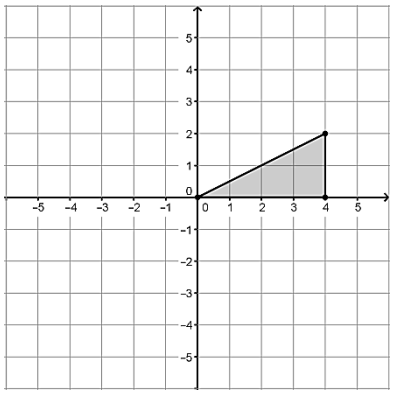
Suppose the right triangle shown below is rotating rapidly about the *x*-axis. Like a spinning ice-skater or a spinning toy, a solid image would be formed by the blur of the rotating triangle.

1. Draw and describe the solid of revolution formed by rotating this triangle about the *x*-axis.



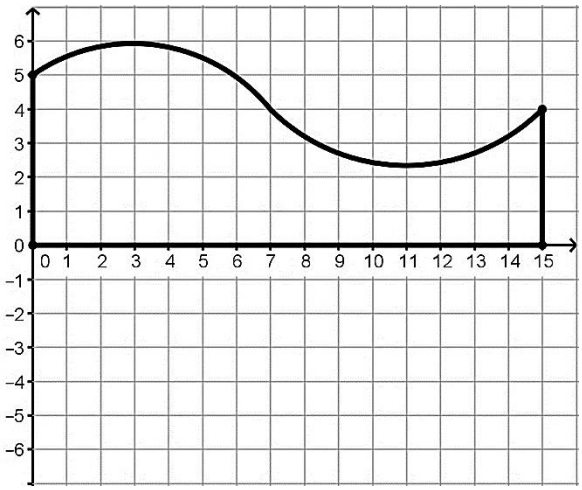
2. Find the volume of the solid formed. What is the name of this shape?

3. What would this figure look like if the triangle rotates rapidly about the *y*-axis? Draw and describe the solid of revolution formed by rotating this triangle about the *y*-axis.



4. Find the volume of the solid formed.

5. What about the following two-dimensional figure? In the blank space below, draw and describe the solid of revolution formed by rotating this figure about the *x*-axis.

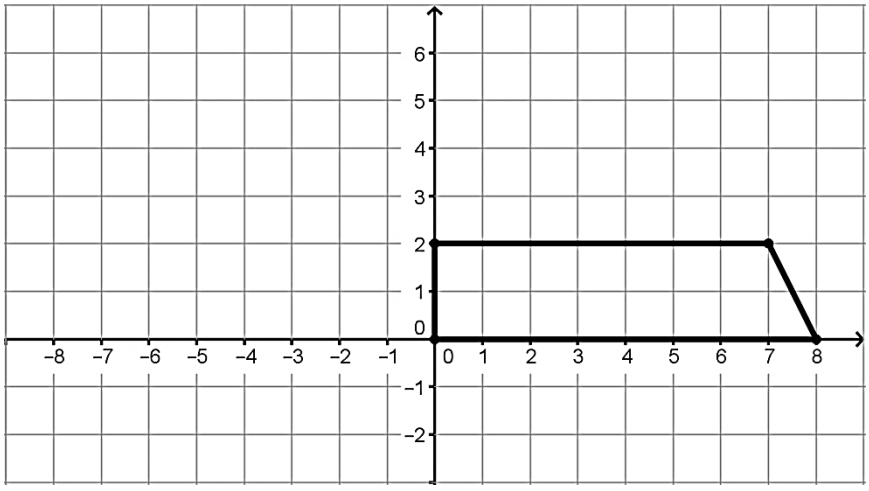


6. If the solid you drew in question 5 was cut by a plane that contains the axis of rotation, what would the cross section look like? Draw the cross section in the space below.

7. Draw some cross sections of the solid of revolution formed by the figure in question 5 if the planes cutting the solid are perpendicular to the x-axis and parallel to the y-axis. Draw the cross sections when the intersecting planes are located at $x = 5$, $x = 10$ and $x = 15$.

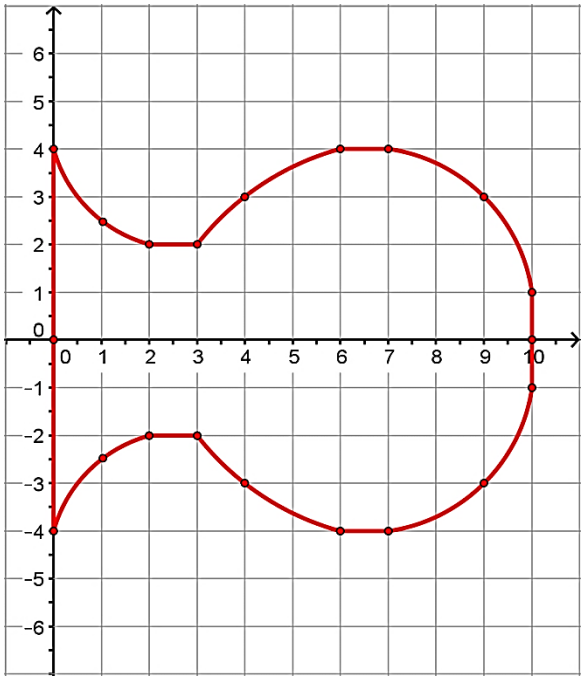
8. Draw a sketch of the three-dimensional object formed by rotating the trapezoid about the y-axis.

9. Find the volume of the object formed. Explain how you used the diagram to help you find the volume.



10. This shape is called a Frustrum of a Cone. Try to find a general equation to always be able to compute its volume?

11. The following diagram shows the cross section of a flower vase. Approximate the volume of the vase by using line segments to approximate the curved edges. Show the line segments you used to approximate the figure on the diagram.



12. Describe and carry out a strategy that will improve your approximation for the volume of the vase.

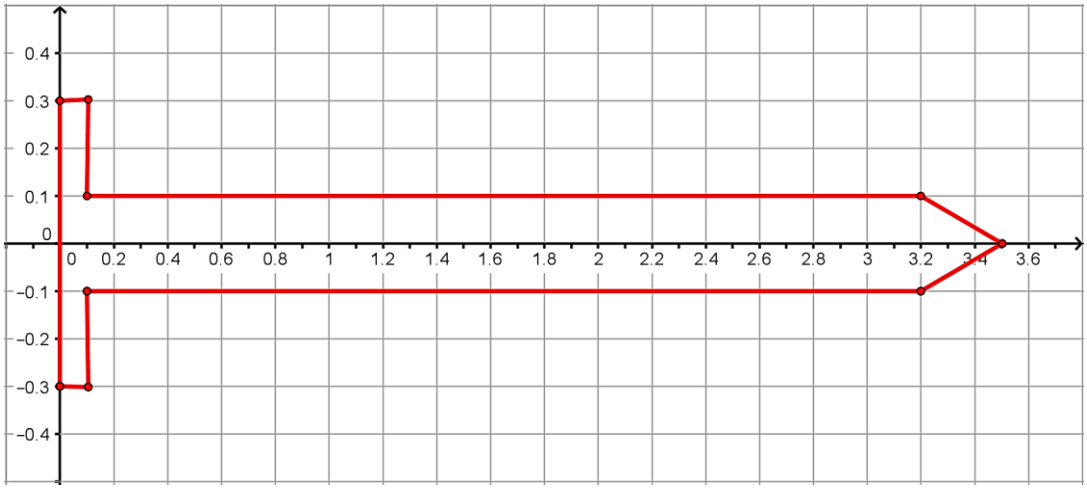
13. Tatiana is helping her father purchase supplies for a deck he is building in their backyard. Based on her measurements for the area of the deck, she has determined that they will need to purchase 24 decking planks. These planks will be attached to the framing joists with 16d nails.

(Tatiana thinks it is strange that these nails are referred to as "16 penny nails" and wonders where that way of naming nails comes from. After doing some research, Tatiana has found that in the late 1700's in England, the size of a nail was designated by the price of purchasing one hundred nails of that size. She doubts that her dad will be able to buy one hundred 16d nails for 16 pennies.)

Nails are sold by the pound at the local hardware store, so Tatiana needs to figure out how many pounds of 16d nails to tell her father to buy. She has gathered the following information:

- The deck requires 24 planks of wood
- Each plank requires 9 nails to attach it to the framing joists
- 16d nails are made of steel that has a density of approximately 4.57 oz/in^3
- There are 16 ounces in a pound

Tatiana has also found the following drawing of a cross section of a 16d nail. She knows she can use this drawing to help her find the volume of the nail, treating it as a solid of revolution. (Note: The scale on the *x*- and *y*-axis is in inches.)



A. Devise a plan for finding the volume of the nail based on the given drawing. Describe your plan in words, and then show the computations that support your work.

B. Devise a plan for finding the number of pounds of 16d nails Tatiana's father should buy. Describe your plan in words, and then show the computations that support your work.

Volume Project

You and a partner will be creating a 3D model based on the idea of Volumes by Revolution. The solid will be created by revolving your region about the x-axis. You will be approximating the Volume of a Solid by Revolution by decomposing the solid into cross sections. The project will have you approximate the volume by finding the volume of the 40 Cross Sections. You will be measuring and cutting 40 cross sections made from 3/16" thick Foam Board (found at most craft stores as well as stores like Rite Aid, Michaels, Staples, etc.). You will also need to approximate the area between your function and the x-axis from (0,7.5) using familiar polygons.

To earn an A on this project: type your work, decorate your project along a fun theme, or many other ideas. You are expected to show all work and formulas used.

There will be time in class most days to work on the project but you should work on this project as part of your homework as well. Please Print the Rubric (this is due the day of the Gallery Walk).

The region that you will be revolving around the x-axis will be your choice, created using desmos. Your region should be made using a piecewise function containing at least 3 non-linear functions.

Names:_____

Function:_____

Items	Points
Full size 2-D graph of region and its approximated area using familiar polygons.	/5
Half Revolution Model (is it constructed appropriately, correctly, to scale?)	/10
Data: 1. Volume of the solid (full revolution) using 40 cylinders. 2. Volume of the solid (full revolution) using 40 frustums.	/10
Creativity along the theme	/10
Organization (make information easy to see)	/10
Gallery Walk feedback given	/5
Total *****This will have the same weight as a quiz******	**/50**