

LessonTitle: Solids of Revolution		Geo 5.7
Utah State Core Standard and Indicators Geometry Standards 4.2 Process Standards 1-5		
Summary		
In this lesson, students first rotate two dimensional figures across the x and y axes and compare areas. Then they rotate two dimensional figures around the y axis to create 3 dimensional figures. They compare volume and surface areas.		
Enduring Understanding	Essential Questions	
When we rotate two dimensional figures with the same dimensions to create three-dimensional solids, the resulting volumes differ.	Why do the volumes of three-dimensional figures differ when you exchange the base with the height?	
Skill Focus	Vocabulary Focus	
<ul style="list-style-type: none"> • Rotation • Volume • Surface Area 		
Assessment		
Materials: Sheet of construction paper, modeling clay, ruler, straws, 10 to 15 index cards per group		
Launch		
Explore		
Summarize		
Apply		

Directions: Follow the directions on the sheet.

Solutions PART II

	Volume
1	75π
2	45π
3	105π
4	75π
6	25π
7	15π

Geo 5.7

Solids of Revolution

Supplies: A sheet of construction paper, modeling clay, ruler, straw, 10 to 15 index cards for each group.

Part I: Two dimensional rotation.

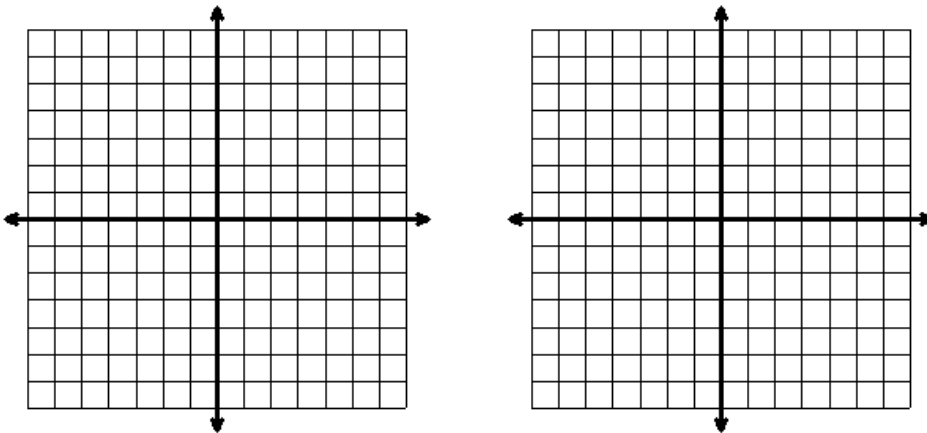
1) First practice rotating a two dimensional shape across the x and y axes.

a) Plot the points A (0,0), B(0,3) C(5,0), D(5,3) below . Name the shape _____
 What is the area? _____

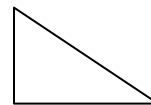
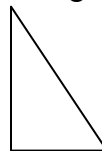
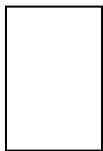
Reflect this figure across the y-axis. What are the coordinates of the new vertices?
 A' (0,0), B'(,), C'(,), D'(,) What is the area? _____

b) Plot the points A' (1,0), B'(6,0), C'(1,3) below. Name the shape _____
 What is the area? _____

Reflect this figure across the x-axis. What are the coordinates of the new vertices?
 A' (0,0), B'(,), C'(,) What is the area? _____



2) What are the areas for the following shapes? The second rectangle is the first rectangle rotated 90 degrees. The triangles are cut from the 3x5 card, cut diagonally.



Part II: Three-dimensional rotation

Plane figures that are rotated around an axis in space generate solids of revolution. Use the shapes you were given and the straw to rotate them to generate a solid.

Directions:

- Fold the construction paper in half (hot-dog style). Open up the paper and draw a horizontal line through the center. Mark off one-inch units (make the tic marks big). This is the x-axis. Lay it flat on the table.
- Spread a small portion (about the size of the top of the can) of modeling clay at the origin.
- Insert a straw at the origin perpendicular to the x axis to represent the y-axis.

1) Place the “rectangles” (index cards) so that the 5-inch side is in the modeling clay (x-axis) and the 3-inch side is up against the straw. Imagine (or place cards in the clay to visualize) that you are rotating the card around the straw.

Sketch of revolved figure	Height _____ Radius _____ Volume _____ Surface Area _____ (show work)
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2) Place the “rectangles” (index cards) so that the 3-inch side is in the modeling clay (x-axis) and the 5-inch side is up against the straw. Predict whether the volume of the solid created by the rotated card will be...

...less than, more than or the same... as the volume of the solid in #1 above.

Sketch of revolved figure	Height _____ Radius _____ Volume _____ Surface Area _____ (show work)
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3) Explain your findings.

3) Place the “rectangles” (index cards) so that the 5-inch side is in the modeling clay (x-axis) and the 3-inch side is **one inch away** from the straw (the y-axis).

Sketch of revolved figure	Height _____ Radius _____ Volume _____ Surface Area _____ (show work)
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4) Place the “rectangles” (index cards) so that the 3-inch side is in the modeling clay (x-axis) and the 5-inch side is one inch away from the straw. Make a prediction comparing the two volumes. _____

Sketch of revolved figure	Height _____ Radius _____ Volume _____ Surface Area _____ (show work)
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5) Explain your findings.

6) Place the “triangle” (index card cut diagonally) so that the 5-inch side is in the modeling clay (x-axis) and the 3-inch side is up against the straw. Imagine (or place cards in the clay to visualize) that you are rotating the card around the straw.

Sketch of revolved figure	Height _____ Radius _____ Volume _____ Surface Area _____ (show work)
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7) Place the “triangle” (index card cut diagonally) so that the 3-inch side is in the modeling clay (x-axis) and the 5-inch side is up against the straw. Predict whether the volume of the solid created by the rotated card will be...

...less than, more than or the same... as the volume of the solid in #1 above.

Sketch of revolved figure	Height _____ Radius _____ Volume _____ Surface Area _____ (show work)
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8) Explain your findings.

9) For each of the shapes below, describe the solid formed when this shape is rotated about the y-axis.

Shape Rotated	Solids Generated	Write the formulas (with numbers included) for finding the volumes. For the half circle and square use 3 as the base and the height. For the trapezoid, use 2 and 4 as the bases and 3 as the height.
Half Circle		
Square		
Right Trapezoid		

Write your comments.