Name_____ Date _____

9.4 Solids of Revolution

For use with Exploration 9.4

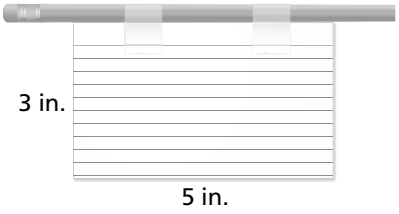
Essential Question How can you create a solid of revolution?

A **solid of revolution** is a three-dimensional figure that is formed by rotating a two-dimensional shape around an axis.

1 EXPLORATION: Creating Solids of Revolution

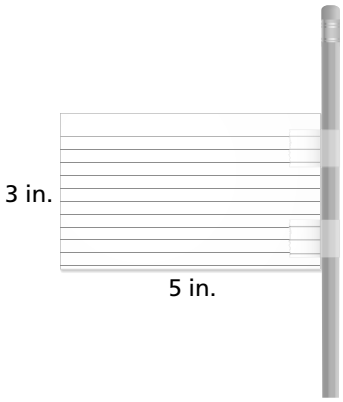
Go to *BigIdeasMath.com* for an interactive tool to investigate this exploration.

Work with a partner. Tape the 5-inch side of a 3-inch by 5-inch index card to a pencil, as shown.



a. Rotate the pencil. What type of solid is produced by the rotating index card? What are its dimensions?

b. Tape the 3-inch side of the index card to the pencil. Rotate the pencil. What type of solid is produced by the rotating index card? What are its dimensions?



c. Do the solids in parts (a) and (b) have the same surface area? the same volume? Justify your answers.

d. Cut the index card in half along its diagonal. Tape the 5-inch leg of the triangle formed to a pencil. Rotate the pencil. What type of solid is produced? What are its dimensions?

e. Tape the 3-inch leg to a pencil. Rotate the pencil. What type of solid is produced? What are its dimensions?

f. Do the solids in parts (d) and (e) have the same surface area? the same volume? Justify your answers.

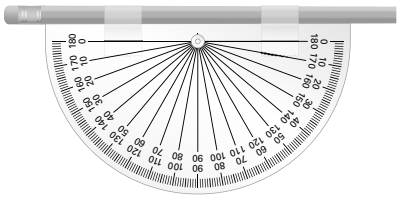
Name _____ Date _____

9.4 Solids of Revolution (continued)

2 EXPLORATION: Creating Solids of Revolution

Go to *BigIdeasMath.com* for an interactive tool to investigate this exploration.

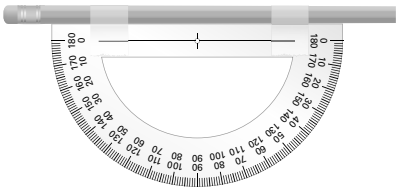
Work with a partner. Tape the straight side of a protractor, similar to the one at the right, to a pencil, as shown.



a. Rotate the pencil. What type of solid is produced by the rotating protractor? What are its dimensions?

b. Find the surface area and volume of the solid produced in part (a).

c. Tape the straight side of a protractor, similar to the one at the right, to a pencil, as shown. Rotate the pencil. Is the solid produced by this rotating protractor different from the solid in part (a)? Explain. Draw a diagram to support your answer.



b. Describe a method you might use to approximate the volume of the solid in part (c).

Communicate Your Answer

3. How can you create a solid of revolution?

4. Give some examples of real-life objects that are solids of revolution.

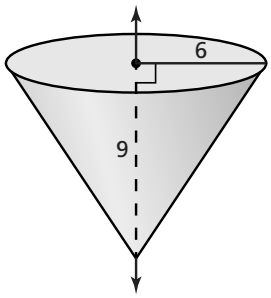
Name_____ Date _____

9.4 Practice

For use after Lesson 9.4

Notes:

Worked-Out Examples



Example #1

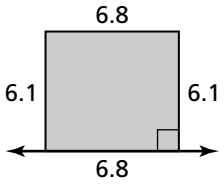
Sketch the solid of revolution. Then identify and describe the solid.

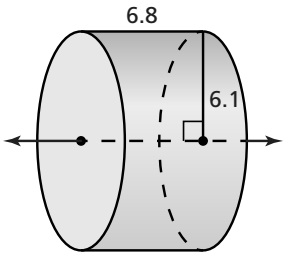
A right triangle with legs of lengths 6 and 9 rotated around its longer leg.

The solid produced is a cone with a height of 9 units and a base radius of 6 units.

Example #2

Sketch and describe the solid produced by rotating the figure around the given axis. Then find its surface area and volume.





The solid is a cylinder with a height of 6.8 units and a base radius of 6.1 units.

Surface area: $S = 2\pi r^2 + 2\pi rh$

$= 2\pi(6.1)^2 + 2\pi(6.1)(6.8)$

$= 157.38\pi$

≈ 494.42

Volume: $V = \pi r^2 h$

$= \pi(6.1)^2(6.8)$

$= 253.028\pi$

≈ 794.91

The cylinder has a surface area of about 494.42 square units and a volume of about 794.91 cubic units.

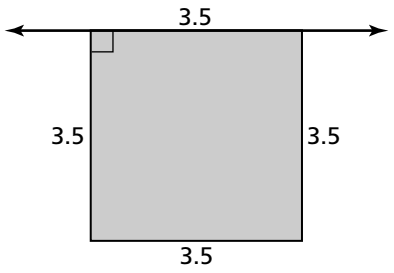
Name _____ Date _____

9.4 Practice (continued)

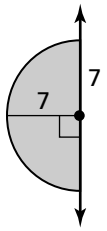
Practice A

In Exercises 1–4, sketch the solid produced by rotating the figure around the given axis. Then identify and describe the solid.

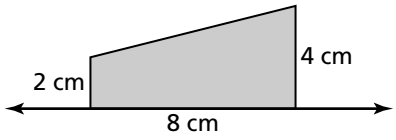
1.



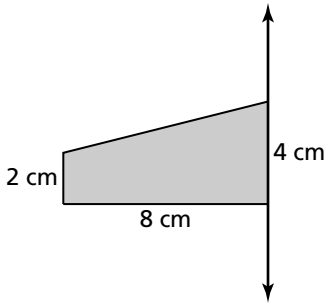
2.



3.



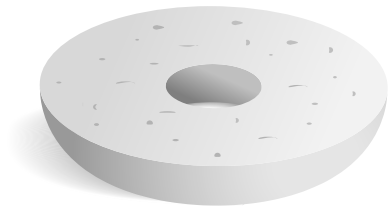
4.



In Exercises 5–8, sketch a two-dimensional shape and an axis of revolution that forms the object shown.

5.

6.



Name_____ Date _____

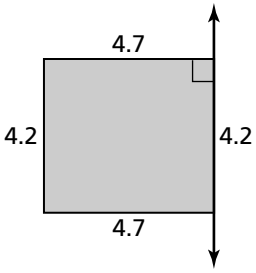
9.4 Practice (continued)

7.

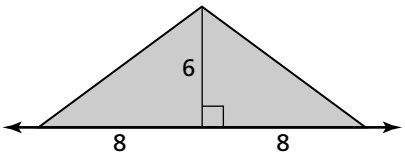
8.

In Exercises 9 and 10, sketch and describe the solid produced by rotating the figure around the given axis. Then find its surface area and volume.

9.



10.



In Exercises 11 and 12, sketch and describe the solid that is produced when the region enclosed by the given equations is rotated around the given axis. Then find the volume of the solid.

11. $x = 0, y = 0, y = -x + 4$; y-axis

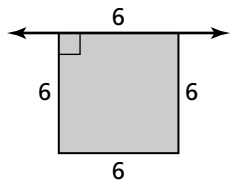
12. $x = 6, y = 0, y = 2x$; x-axis

Name_____ Date _____

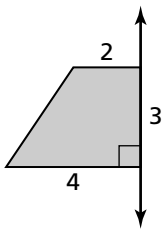
Practice B

In Exercises 1–3, sketch the solid produced by rotating the figure around the given axis. Then identify and describe the solid.

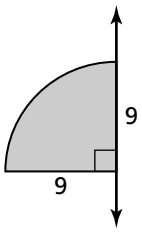
1.



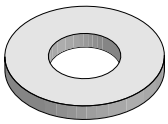
2.



3.



4. Sketch a two-dimensional shape and an axis of revolution that forms the object shown.



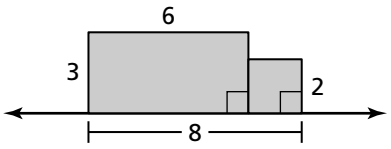
In Exercises 5–7, sketch and describe the solid that is produced when the region enclosed by the given equations is rotated around the given axis. Then find the volume of the solid.

5. $x = 0,\ y = 0,\ y = 2x + 4$; x-axis

6. $x = 0,\ y = 0,\ y = -\frac{1}{3}x + 2$; y-axis

7. $x = 5,\ y = 0,\ y = x$; x-axis

8. Sketch the composite solid produced by rotating the composite figure around the given axis. Then describe the composite solid.



9. Your friend says when you rotate the figure shown around either the x-axis or the y-axis, the resulting solid is the same size and shape. Is your friend correct?