

Surface Area and Volume of Cylinders

Purpose

Students will develop and practice finding surface area and volume of cylinders.

Materials

For the teacher: can with a label to remove and use, cardboard cylinder, scissors, 4-5 unit blocks, chalk, chalkboard

For each student: copy of Black Line Master (BLM) *Surface Area and Volume of Cylinders*, scissors, pencil, tape

Activity

A. Class Activity

1. Use the can and cardboard cylinder to review the concepts of surface area and volume.
2. Cut the label off the can and lay it flat. Explain that the rectangle makes up part of the surface area of the cylinder (or can).
3. Discuss the dimensions of the label with students. [The length of the rectangle is equal to the circumference of the can. The width of the rectangle is equal to the height of the can.]
4. Ask students to explain how the area of the rectangle should be computed. [$A = l \times w$]
5. Have students compute the area of the label. Write the result, in square units, on the board.
6. Say: "In order to find the surface area of the cylinder, we need to find the areas of all its individual faces. How many other faces are left? [2] What are the shape of these faces? [circles]"
7. Have students measure the radius of one circle. Ask students to find the area that circle. Stress to students that the two circles have the same area, so there is no need to measure the other.
8. Have the students compute the surface area by adding the three individual areas together.
9. Draw a cylinder on the board and say the radius is 7 cm and the height is 5 cm and ask the students to find the surface area. Use $\frac{22}{7}$ for π . [Area = 528 cm²] Remind students to express the solution in square units.
10. Ask for a volunteer to measure the dimensions of the cylinder. Cut the cylinder apart, if necessary, to measure the dimensions. Have students compute the surface area.
11. Tell students they are going to find the volume of the cylinder. Reassemble the cylinder, if cut apart.

(continued)

EXTENDING
THE



ACTIVITY

Have students attempt to find the volume and surface area of a triangular prism using the ideas presented in this activity. Ask students to describe in their math journals how the volume and surface area is computed. Encourage them to find an object in the shape of a triangular prism in the classroom or at home. Have students measure the prism to compute the volume and surface area.

INCORPORATING



TECHNOLOGY

Have students visit www.aaamath.com/geo.html. Ask them to click on surface area or volume of cylinders and use the interactive tool for extra practice.

Standards Links
6.5.1, 6.5.7

Activity (continued)


12. Explain to students that volume is the number of cubic units needed to occupy the space inside the cylinder.
13. Cut the cylinder so that the cut section has the same height as the unit blocks.
14. Tell students that the volume of this section would be the number of cubes it would take to fill its space. Ask students to imagine we are able to bend and mold the cubes to fit inside the section.
15. Pass the cylindrical section and blocks around the room. Allow students to estimate the volume by placing as many cubes as possible into the section.
16. Remind students that the area of the circular base is $\pi \times r \times r$.
17. Have students measure the radius and compute the area of the base. Ask students to explain how knowing the area of the base helps in finding the volume. Prompt students for the correct response that knowing the area of the base tells us how many units it takes to cover that space.
18. Ask students to use the formula for the area of a circle to find how many cubes are needed to fill the section. Remind students that volume is expressed in cubed units.
19. Explain to students that in order to find the volume for the entire cylinder, we stack these unit sections one on top of each other. Ask students to approximate the number of unit sections we would need to fill the original cylinder. Ask: "What is the volume of the cylinder?"
20. Tell the students that the volume of a cylinder is the area of its base multiplied by the height.


B. Individual Activity


Distribute one copy of the BLM *Surface Area and Volume of Cylinders* to each student. Allow students time to complete activity and discuss results with the class.


Classroom Assessment**Basic Concepts and Processes**

During the activity and when reviewing the BLM, discuss the following questions with your students to gauge their understanding of the Standard Indicator:

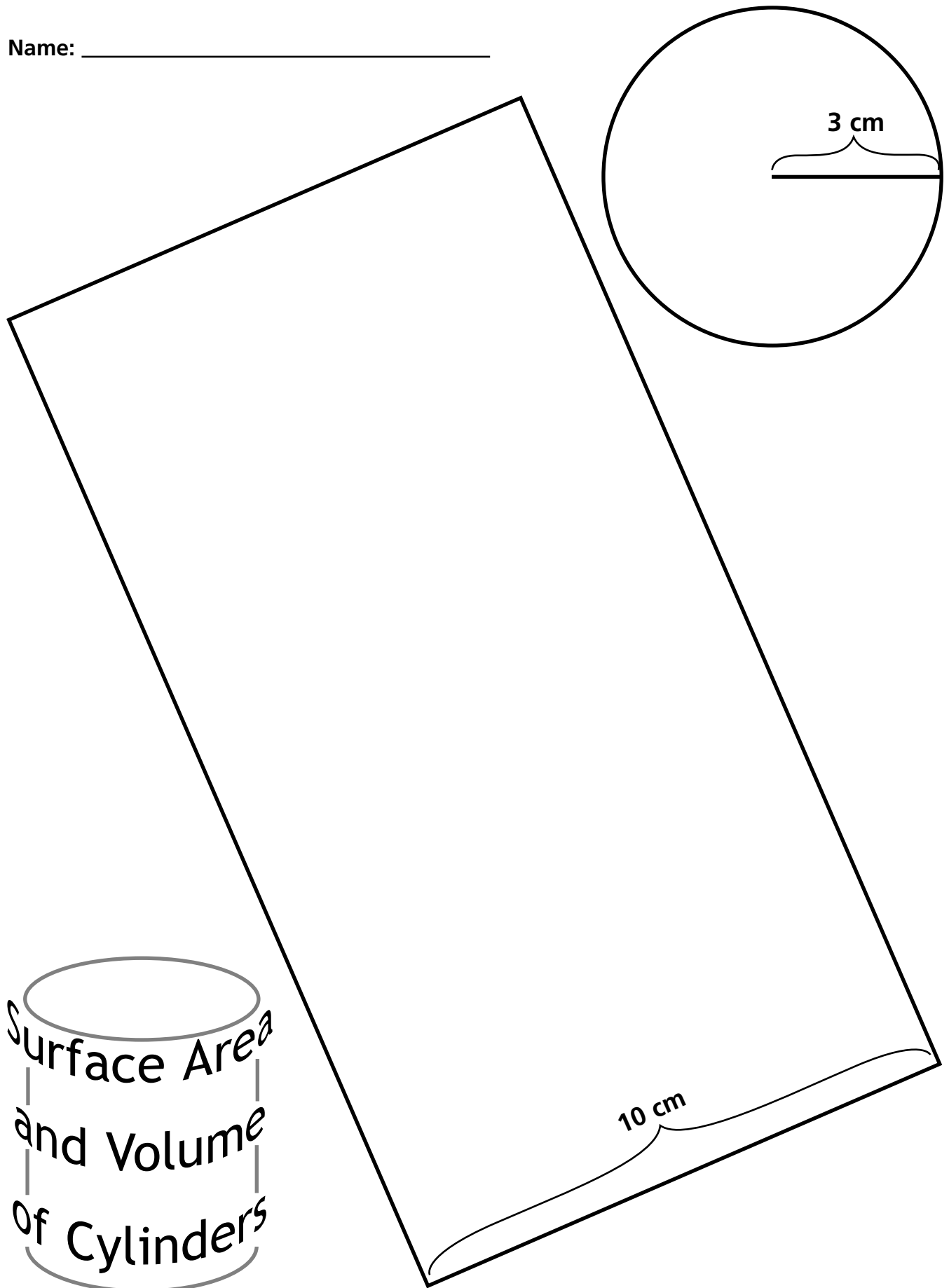
 What different shapes are the faces of a cylinder?

 How do you find the area of each face?

 What is the volume of a cylinder whose base has area of 12.56 cm^2 and whose height is 10 cm?

 Explain how you found your answer.

Name: _____



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Teacher Directions

Distribute one copy of the BLM *Surface Area and Volume of Cylinders* to each student. Describe the pictures on the BLM as the parts that students will put together to make a cylinder.

Have students cut out the object on the BLM and assemble the cylinder.

Tell students to find the measures of the height of the cylinder and the radius of the circle. Have the students use these measures to find the surface area and volume of the cylinder. Direct students to use 3.14 as the value of pi.

Remind students that surface area is expressed in square units and volume is expressed in cubed units.

Answer Key

Surface Area

$$\begin{aligned} &(6 \times 3.14 \times 10) + (3.14 \times 3 \times 3) + (3.14 \times 3 \times 3) \\ &= 188.4 + 28.26 + 28.26 \\ &S = 244.92 \text{ cm}^2 \end{aligned}$$

Volume

$$\begin{aligned} &3.14 \times 3 \times 3 \times 10 \\ &= 282.6 \text{ cm}^3 \end{aligned}$$