


Grade 8 Mathematics

Measurement: Lesson 8

Read aloud to the students the material that is printed in **boldface type** inside the boxes. Information in regular type inside the boxes and all information outside the boxes should **not** be read to students. Possible student responses are included in parentheses after the questions.

NOTE: The directions read to students may depend on the available materials. Read only those parts of the lesson that apply to the materials you are using.

Any directions that ask you to do something, such as to turn to a page or to hand out materials to students, will have an arrow symbol () by them.

Purpose of Lesson 8:

- In this lesson, the tutor and the students will
 - ✓ find the surface area and volume of cylinders.

Equipment/Materials Needed:

- Copies of Student Sheets 98 and 99
- Paper and pencils
- Chalkboard
- Calculators

Preparations before beginning Lesson 8:

- Run one copy of Student Sheets 98 and 99 for each student.
- Have paper and pencils available.
- Borrow calculators from one of the teachers.
- Lessons 5, 6, and 7 of Measurement should be completed before covering this lesson.

Lesson 8: Measurement

Say:

In Lesson 6 of Measurement, you learned to find the circumference and area of circles. In Lesson 5 of Measurement, you learned to find the surface area of rectangular solids. In Lesson 7 of Measurement, you learned to find the volume of rectangular solids. In this lesson, you will put those ideas together to find the surface area and volume of cylinders.

 Give students Student Sheet 98.

Say:

Sometimes solid figures have faces that are not polygons, so they are not polyhedrons or prisms. One such shape is a *cylinder*. The bases of cylinders are circles. If you cut apart a cylinder and flatten it out, it would look like the picture on Student Sheet 98. The two bases are circles and the side unrolls to form a rectangle. The length of that rectangle can be found by finding which measurement of the cylinder? (It is the circumference of the cylinder or the circumference of the bases.)

 Have students work the problems on Student Sheet 98.

Answers:

1. 28.26 sq. cm; 28.26 sq. cm
2. 18.84 cm; 18.84 cm
3. The circumference is the length of rectangle C.
4. $18.84 \text{ cm} \times 6 \text{ cm}$; 113.04 sq. cm
5. height

Say:

You found the areas of Circle A, Circle B, and Rectangle C. To find the surface area of the cylinder, you add the three areas. What is the surface area of the cylinder? (169.56 sq. cm)

 Give students Student Sheet 99 Part A.

Answers:

1. There is a two in $2\pi \cdot r^2$ because you are finding the area of two circles: the top one and the bottom one. There is a two in $2\pi r \cdot h$ because $2\pi r$ or πd is the formula for the circumference of a circle. In the problem on Student Sheet 98, you found the areas of the two bases and then the area of the rectangle. The area of the rectangle was the same as finding the circumference times the height.
2. 836 sq. cm or 835 sq. cm (depending on whether you use 3.14 or $22/7$)
3. 1100 sq. m or 1099 sq. m (depending on whether you use 3.14 or $22/7$)
4. 70.65 sq. inches

Say:

The *volume* of a cylinder is the amount of space inside the cylinder. Volume is measured in cubic units. To find the volume of a cylinder, multiply the area of the base times the height. The formula for the volume of a cylinder on the reference sheet is $V = p \cdot r^2 \cdot h$. What is $p \cdot r^2$? (the area of the base of the cylinder)


 Give students Part B of Student Sheet 99.

Answers:

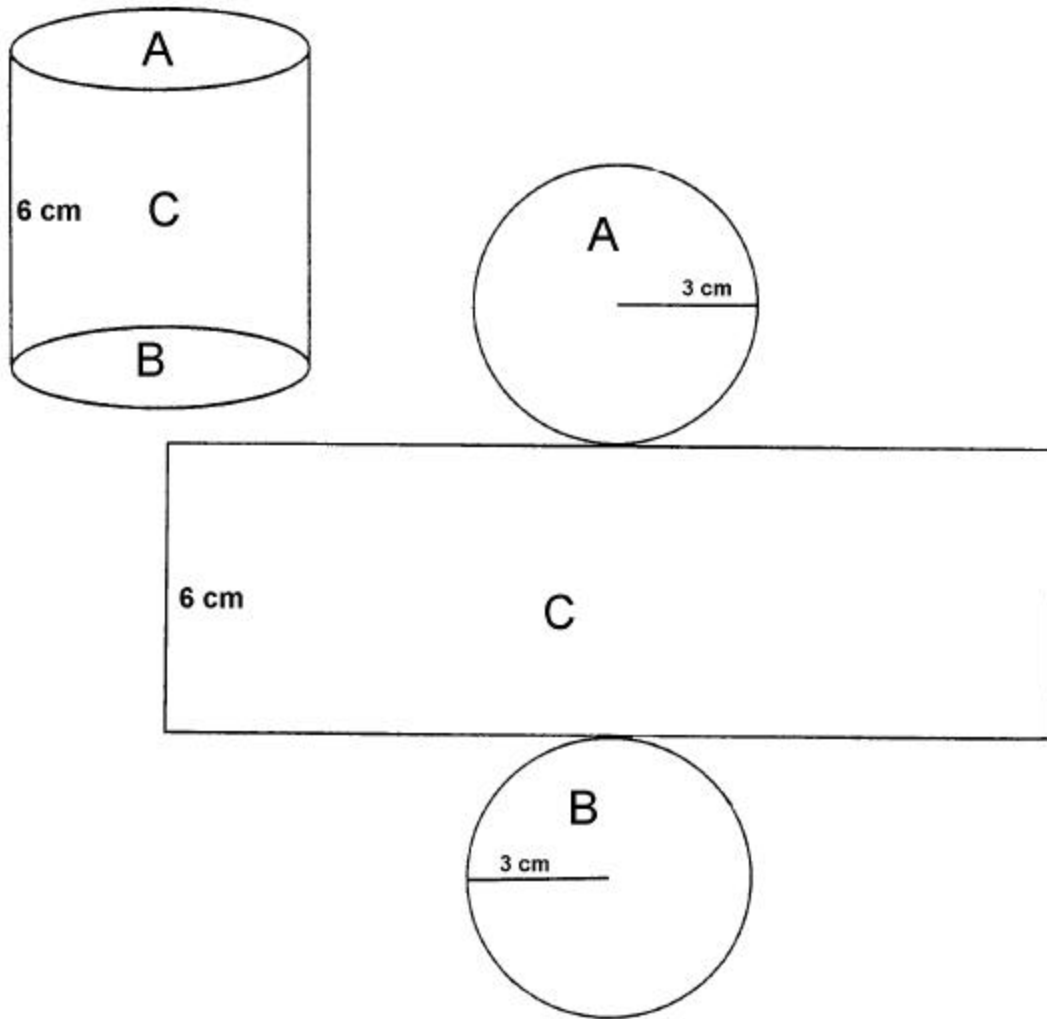
5. 2772 cu. m or 2769 cu. m (depending on whether you use 3.14 or $22/7$)
6. 42.39 cu. in.

Say:

Remember that, if you forget either of these formulas when taking the test, both formulas are on the reference sheet; but you do need to know how to use the formulas.

 Have one student summarize today's lesson. Finding surface area is useful when you want to cover a package. Finding volume gives you the amount of space inside.

Student Sheet 98 (Measurement: Lesson 8)

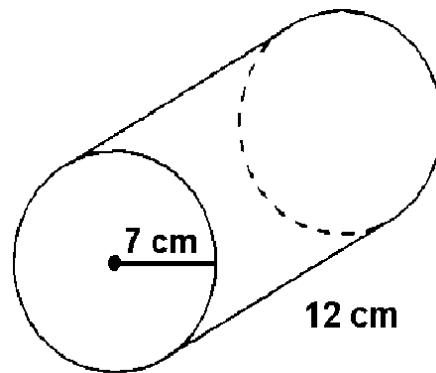


1. What is the area of Circle A? What is the area of a Circle B?
Use $\pi = 3.14$.
2. What is the circumference of Circle A? What is the circumference of Circle B? Use $\pi = 3.14$.
3. Why were you asked to find the circumference?
4. What are the length and width of Rectangle C? What is the area of Rectangle C?
5. What is another name for the length that measures 6 cm in the cylinder?

Student Sheet 99 (Measurement: Lesson 8)

Part A

1. On the Reference Sheet, the formula for the surface area of a cylinder is $SA = 2 \pi \cdot r^2 + 2 \pi \cdot r \cdot h$. Why is it two times $\pi \cdot r^2$? Why is it two times $\pi \cdot r \cdot h$?



2. A birthday present has been packaged in the tube above. How much paper is needed to wrap the present? (Ignore any overlap. Use $\pi = 22/7$ or 3.14.)
3. Mr. Borden built for his farm a silo that is in the shape of a cylinder. If the radius is 7 meters and the height is 18 meters, what is the approximate surface area of the silo?
4. How much metal was used to make a soda can that has a radius of 1.5 inches and a height of 6 inches? Use $\pi = 3.14$.

Part B

5. If Mr. Borden, from Problem 3 above, stores grain inside the silo, how many cubic feet of grain can be stored?
6. How much soda does the can in Problem 4 hold?