

# TOPIC 8

## Solve Problems Involving Surface Area and Volume

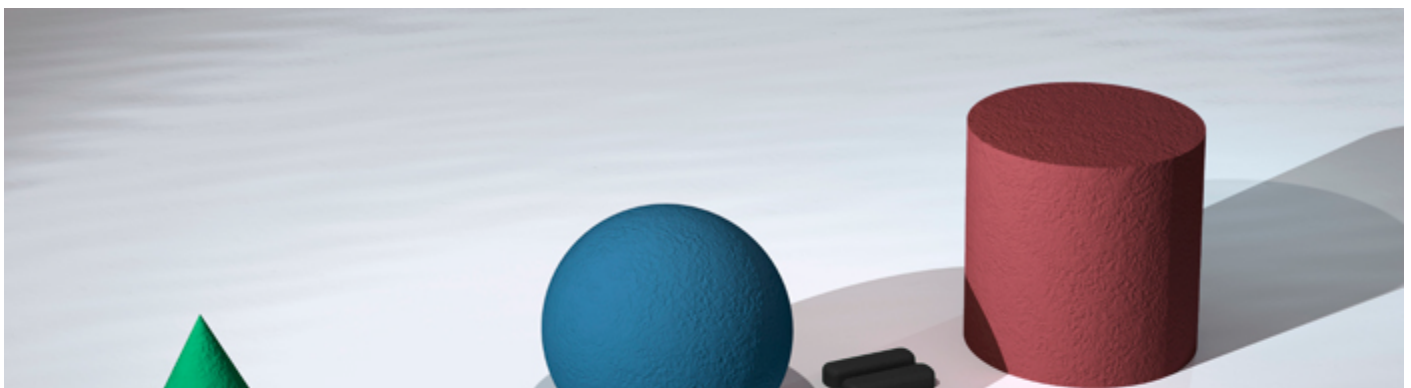
In this topic, students learn how to find the surface area and volume of cylinders, cones, and spheres.

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### CONNECT THE MATH

Cylinders, cones, and spheres all have a relationship to circles. Cones and cylinders both have circular bases, and we describe their base using the radius of that circle. The radius of a sphere is the distance from the center of the sphere to any point on the outer surface. If you cut a sphere into two equal parts, each part will have a circular surface.

When a cylinder, cone, and sphere have the same radius and height the relationships between the volume of each figure is constant. The cone has  $\frac{1}{3}$  the volume of cylinder, and the sphere has  $\frac{2}{3}$  the volume of the cylinder. This idea was published by Archimedes over 2000 years ago in his work *On the Sphere and Cylinder*, which showed that the ratio of the volume of a sphere to its circumscribed cylinder is 2 to 3.





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## LESSON 8-1

### Find Surface Area of Three-Dimensional Figures

Determining surface areas of cylinders, cones, and spheres is an extension of finding the areas of rectangles, squares, triangles, and circles and also the surface areas of right prisms.

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#### LESSON OBJECTIVE

- Calculate the surface areas of cylinders, cones, and spheres.

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#### HOW CAN YOU HELP WITH HOMEWORK

##### Review Lesson Content

Watch and share these video tutorials with your student:

- [How Do You Find the Lateral and Surface Areas of a Cylinder?](#)
- [How Do You Find the Lateral and Surface Areas of a Cone?](#)

##### Review Key Vocabulary

Review key vocabulary from this lesson in your student's glossary:

- [cone](#)
- [cylinder](#)
- [sphere](#)

You can use these search terms and phrases to help your student find additional help online:

- finding the surface area of a cylinder
- finding the surface area of a cone
- finding the surface area of a sphere

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## LESSON 8-2

### Find Volume of Cylinders

Determining the volume of a cylinder is an extension of finding the volume of a rectangular prism. The volume of a rectangular prism is the area of its base multiplied by its height. Similarly, the volume of a cylinder is equal to the area of its base multiplied by its height.

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#### LESSON OBJECTIVES

- Identify and use the correct formula to calculate the volume of a cylinder.
- Recognize the relationship between the formulas for the volume of a rectangular prism and the volume of a cylinder.

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#### HOW CAN YOU HELP WITH HOMEWORK

##### Review Lesson Content

Watch and share these video tutorials with your student:

- [What is the Formula for the Volume of a Cylinder?](#)
- [How Do You Find the Volume of a Cylinder?](#)

You can use these search terms and phrases to help your student find additional help online:

- relating volumes of rectangular prisms and cylinders
- finding an unknown measure
- solving problems involving volume of a cylinder

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## LESSON 8-3

### Find Volume of Cones

The volume of a cone is  $\frac{1}{3}$  of the volume of a cylinder with the same radius and height. Students will examine this relationship and use it to determine the volume of any cone.

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#### LESSON OBJECTIVES

- Find the volume of a cone.
- Recognize the relationship between volume of a cylinder and volume of a cone.

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#### HOW CAN YOU HELP WITH HOMEWORK

##### Review Lesson Content

Watch and share these video tutorials with your student:

- [What is the Formula for the Volume of a Cone?](#)

- [How Do You Find the Volume of a Cone?](#)

You can use these search terms and phrases to help your student find additional help online:

- find the volume of a cone
- applying the Pythagorean Theorem to solve volume problems
- find the volume of a cone given the circumference of the base

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## LESSON 8-4

### Find Volume of Spheres

The volumes of a sphere and cone are proportionally related. The volume of a sphere of radius  $r$  is twice the volume of a cone with height  $2r$  and radius  $r$ . From this relationship, the formula for the volume of a sphere can be deduced.

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#### LESSON OBJECTIVES

- Calculate the volume of a sphere.
- Recognize the relationship between the formula for the volume of a cone and the volume of a sphere.

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#### HOW CAN YOU HELP WITH HOMEWORK

##### Review Lesson Content

Watch and share these video tutorials with your student:

- [What is the Formula for the Volume of a Sphere?](#)
- [How Do You Find the Volume of a Sphere?](#)

## Review Key Vocabulary

Review key vocabulary from this lesson in your student's glossary:

- [composite figure](#)

You can use these search terms and phrases to help your student find additional help online:

- relating volumes of cones and spheres
- finding the volume of a sphere given the surface area
- finding the volume of a composite figure