Spheres, Cylinders, and Rectangular Prisms

Objectives
To guide the identification of spheres, cylinders, and rectangular prisms; and to facilitate the investigation of their characteristics.

Advance Preparation
Place a ball (sphere), a can (cylinder), and a box (rectangular prism) near the Math Message. For Part 1, write the words sphere, cylinder, rectangular prism, and other on index cards. Display models of a sphere, a cylinder, and a rectangular prism and label each with its name. Be prepared to add some of your objects to the Shapes Museum. For the optional Enrichment activity in Part 3, gather a variety of 3-dimensional shapes. You may wish to make a poster by enlarging and laminating Math Masters, page 210.

Key Concepts and Skills
- Count the flat faces and corners on solid figures. [Number and Numeration Goal 2]
- Identify and describe solid figures; identify the flat faces and corners on solid figures. [Geometry Goal 1]
- Compose solid shapes. [Geometry Goal 1]

Key Activities
Children learn the names of three 3-dimensional shapes—sphere, cylinder, and rectangular prism—and discuss their characteristics. Children classify items brought from home to start a Shapes Museum and construct cylinders and rectangular prisms.

Ongoing Assessment: Recognizing Student Achievement
Use Mental Math and Reflexes. [Number and Numeration Goal 3]

Key Vocabulary
sphere ● cylinder ● rectangular prism ● surface ● face

Materials
Home Link 7-4
Math Masters, p. 210 (optional); p. 212A
base-10 blocks (longs and cubes) ● slate ● ball, can, and box ● 3" by 5" index cards ● items for the Shapes Museum ● scissors ● tape ● per small group: 20 twist-ties and 4 each of 8" straws, 6" straws, and 4" straws

Playing Coin Exchange
My Reference Book, pp. 128 and 129 per partnership: tool-kit coins, 2 dice
Children practice exchanging coins with equivalent values.

Math Boxes 7-5
Math Journal 2, p. 145
Children practice and maintain skills through Math Box problems.

Home Link 7-5
Math Masters, p. 211
Children practice and maintain skills through Home Link activities.

Comparing Plane Shapes and Solid Figures
per partnership: 3-dimensional shapes, rectangular prism, cylinder
Children compare 2- and 3-dimensional shapes.

Sorting Shapes by Their Faces
Math Masters, p. 212
3-dimensional shapes
Children sort 3-dimensional objects by the shapes of their faces.

Describing Shapes
Children describe shapes in the Shapes Museum.

Getting Started

Mental Math and Reflexes ★
Display sets of base-10 blocks on the overhead or draw them on the board. Have children write the value of each set on their slates.

Suggestions:
○ 3 longs and 5 cubes 35
○ 4 longs and 11 cubes 51
○ 1 flat, 2 longs, and 16 cubes 136

Math Message
Which of these objects can roll?

Home Link 7•4 Follow-Up
Review polygons. Briefly discuss what is necessary for a shape to be a polygon.

Ongoing Assessment: Recognizing Student Achievement
Use Mental Math and Reflexes to assess children’s ability to name numbers represented by base-10 blocks. Children are making adequate progress if they are able to answer the first and second questions correctly. Some children may be able to correctly answer the third question, as well.

[Number and Numeration Goal 3]

1 Teaching the Lesson

Math Message Follow-Up
Ask a child to try to roll the ball, the can, and the box. Have children share their observations.

Tell children that today they will learn about the shapes of objects in their world.

Discussing the Characteristics of Spheres, Cylinders, and Rectangular Prisms
Ask children how they would describe the ball, the can, and the box. Expect answers such as the following:

● The ball is round and smooth.
● The ball has no flat sides.
● The can has a curved side and two flat sides.
● The flat sides of the can are circles.
● The can will sit on either of its flat sides.
● All of the sides of the box are flat.
Begin to use formal names for these shapes. Tell children that the ball is an example of a **sphere**, the can is an example of a **cylinder**, and the box is an example of a **rectangular prism**. Explain that the outside or “skin” of any of these 3-dimensional shapes is called its **surface**.

Ask someone to point to the flat sides of the rectangular prism and the cylinder. Say that these sides are sometimes called **faces**.

**NOTE** For most children, it will take repeated exposures before these geometric terms become part of their working vocabulary.

How many flat faces does each shape have? The sphere has 0 flat faces; the rectangular prism has 6; the cylinder has 2. Point to each face as the class counts them together. What are the shapes of the flat faces? All of the flat faces of the rectangular prism are rectangles. (Squares are special rectangles.) The flat faces of the cylinder are circles.

Point to a corner of the rectangular prism. Explain that a corner is a point at which at least three flat faces meet. A cylinder does not have any corners because its flat faces do not meet. How many corners does the rectangular prism have? 8 corners. Point to each corner as the class counts.

**NOTE** Two-dimensional shapes, such as squares and circles, have length and width. They exist entirely in a plane, such as a flat sheet of paper. Three-dimensional shapes are often represented in 2-dimensional drawings, but actual 3-dimensional objects always extend out of the plane because they have length, width, and height. Furthermore, 2-dimensional shapes are the faces of 3-dimensional shapes.

**Adjusting the Activity**

Have children model the words **curve** and **flat** as attributes of surfaces. They model the word **curve** by holding their arms in front of them as though they were holding a large ball. They model the word **flat** by placing their hands on a table or desk.

**Art Link** Show children pictures of uniquely shaped skyscrapers. Have them use solid figures to make models of those skyscrapers. Then ask children to identify and label the different solid figures that they used.

**Starting a Shapes Museum with a Display of 3-Dimensional Objects**

Review museums as places to collect, organize, and label objects. Tell children that they are going to start a Shapes Museum. Help children place objects they brought from home in the museum next to the correct labels. For now, have children put all shapes that are not spheres, cylinders, or rectangular prisms into the “other” category. Add some of your own items to the museum.

Children will have fun looking for other shapes that approximate spheres, cylinders, and rectangular prisms. Actual shapes are often “close, but not quite” the ideal 3-dimensional shapes; for example, books are “almost” rectangular prisms. Encourage children to notice the shapes of objects they see at school and at home. Tell them that they will continue to add to the Shapes Museum tomorrow.
Making Cylinders and Rectangular Prisms

(Math Masters, p. 212A)

Tell children that they will be making cylinders and rectangular prisms. For the cylinders, give each group scissors, tape, and one copy of Math Masters, page 212A on construction paper. For the rectangular prisms, provide straws and twist-ties. Begin by modeling how to make a cylinder:

1. Cut out the cylinder template from Math Masters, page 212A. Make sure the circles remain connected to the rectangle.
2. Fold the rectangle into a tube. The circles should be at the top and bottom of the tube.
3. Tape the tube together by taping the tab on one edge of the rectangle to the inside of the other edge of the rectangle.
4. Fold the tabs on each circle and tape them to the top and bottom of the tube to make a cylinder.

Next demonstrate how to make a rectangular prism, reminding children how they constructed polygons in Lesson 7-4.

1. Make two rectangles using the 4” and 6” straws and twist-ties.
2. Have two children hold the rectangles while you anchor a new twist-tie around each corner of each rectangle.
3. Connect a corner of one rectangle to a corner of the other by inserting the anchor twist-ties into both ends of an 8” straw. Continue until four 8” straws connect all four corners of the two rectangles, making a rectangular prism.

Assist children as they construct these solids. When children are finished, have them add their shapes to the Shapes Museum.

2 Ongoing Learning & Practice

Playing Coin Exchange

(My Reference Book, pp. 128 and 129)

Children make coin exchanges. For instructions, see Lesson 6-10.

Math Boxes 7-5

(Math Journal 2, p. 145)

Mixed Practice Math Boxes in this lesson are paired with Math Boxes in Lesson 7-7. The skills in Problem 4 preview Unit 8 content.

Writing/Reasoning Have children write, draw, or verbalize an answer to this question: What is a polygon? A reasonable answer should include features of a polygon: straight sides, corners, and a closed shape.

Writing/Reasoning prompt:

A polygon is a shape that can’t cross or curve or can’t have two polygons together.

One child’s work in response to the Writing/Reasoning prompt.
Home Link Master

**Home Link 7.5**

*(Math Masters, p. 211)*

**Home Connection** Children cut out a fifth set of Fact Triangles to continue their fact practice at home.

### Differentiation Options

#### READINESS

**Comparing Plane Shapes and Solid Figures**

5–15 Min

To explore the relationships between plane shapes and solid figures, children trace faces of selected geometric solids. Have children label one side of a sheet of paper “Rectangular Prism” and the other side “Cylinder.” They work with a partner to trace the flat surfaces, or faces, of both shapes on the appropriate side of the paper. They do not have to trace identical faces more than once. Have them discuss the results of their tracing. For example: *I traced rectangles when I drew the sides of the box.*

#### ENRICHMENT

**Sorting Shapes by Their Faces**

5–15 Min

*(Math Masters, p. 212)*

To explore the characteristics of solid figures, have children record the faces of shapes from the Shapes Museum. They name or draw the shape they have chosen and write an X in the table corresponding to the shape of the faces.

When children have completed *Math Masters*, page 212, have them sort the objects into 3 groups by the shapes of the objects’ faces.

#### ELL SUPPORT

**Describing Shapes**

5–15 Min

To provide language support for geometry, have children look at the Shapes Museum and describe some of the shapes. Encourage children to use vocabulary related to plane shapes and solid figures such as side, corner, surface, flat, face, circle, triangle, square, sphere, cylinder, and rectangular prism.
Cylinder Template