

# Challenge Problems

## 13.5

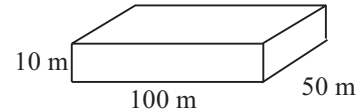
NAME \_\_\_\_\_

Module 13 Perimeter, Area, and Volume  
Lesson 5 Volume: Prisms, Cylinders, and Spheres

### Set 1

1

The length of guttering needed on this building equals the perimeter of the roof. The area that needs paint equals the lateral area. The volume that needs air conditioning equals the volume. Find the perimeter, lateral area, and volume of the building.



2

How many different rectangular prisms can be built out of 24 cubic blocks? Explain.

### Set 2

1

How many marbles with a diameter of 25 millimeters fit into a cylindrical tube with a height of 30 centimeters?

2

What is the smallest cubical box that fits around a volleyball with a circumference of 26 inches?

## Possible Answers

### Set 1

1. The perimeter of the roof is 300 meters.      $P = 2l + 2w$   
                                                                  $P = 2 \times 100 \text{ m} + 2 \times 50 \text{ m}$   
                                                                  $P = 300 \text{ m}$

The lateral surface area is  $3000^2 \text{ m}$ .      $L = 2lh + 2wh$   
                                                                  $L = 2(100 \text{ m} \times 10 \text{ m}) + 2(50 \text{ m} \times 10 \text{ m})$   
                                                                  $L = 2,000 \text{ m}^2 + 1,000 \text{ m}^2$   
                                                                  $L = 3,000 \text{ m}^2$

The volume of the building is  $50,000^2 \text{ m}$ .      $V = Bh$   
                                                                  $V = (100 \text{ m} \times 50 \text{ m}) \times 10 \text{ m}$   
                                                                  $V = 50,000 \text{ m}^3$

2. The rectangular prism should have a volume of 24 cubic units. The volume of a prism equals length times width times height. Find all sets of three whole number factors that have a product of 24.

- $24 \times 1 \times 1$
- $12 \times 2 \times 1$
- $8 \times 3 \times 1$
- $6 \times 4 \times 1$
- $6 \times 2 \times 2$
- $4 \times 3 \times 2$

There are six possible rectangular prisms.

### Set 2

1. Convert 30 centimeters to millimeters. The height of the tube is 300 millimeters. Divide the height of the tube by the diameter of the marbles to find the number of marbles that fit into the tube. Twelve marbles will fit in the tube (provided that they can only be stacked vertically). Since the diameter of the cylinder is unknown, the question cannot be answered with certainty.
2. Circumference equals pi times diameter. Divide the circumference by pi to get the diameter, about 8.28 inches. This diameter is the length of a side of the cube which will fit the volleyball. The box is a cube with side length 8.28 inches.