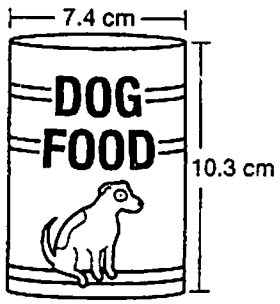
Name _____ Date _____ Class _____

SKILL 18: PROBLEM SOLVING: Choosing Between Surface Area and Volume

When solving word problems involving surface area and volume, it is important to ask yourself if you are filling up or covering the solid.

Example

A can of dog food has diameter 7.4 cm and height 10.3 cm. How much metal was used to make the can?



Read The diameter of the can is 7.4 cm, and the height is 10.3 cm.

Plan You are asked how much metal it would take to make the can, not how much it takes to fill the can. So, find the surface area.

Solve Find the surface area. The radius of the can is 3.7 cm.

Areas of 2 congruent circular bases:

$$2 \times \text{area of 1 circle} = 2 \times \pi \times r^2$$
$$\approx 2 \times 3.14 \times 3.7^2$$
$$= 85.9732 \text{ cm}^2$$

Area of curved side of the can:

$$\text{circumference of base} \times \text{height} = 2 \times \pi \times r \times h$$
$$\approx 2 \times 3.14 \times 3.7 \times 10.3$$
$$= 239.3308 \text{ cm}^2$$

Add the areas: $85.9732 \text{ cm}^2 + 239.3308 \text{ cm}^2 = 325.304 \text{ cm}^2$

It takes about 325.3 cm^2 of metal to make the can.

Look Back See whether your answer makes sense. The areas of both circular bases and the area of the curved side were used. The multiplication and addition are correct. So, the answer seems to be the correct surface area.

Guided Practice

1. The tunnel on Yerba Buena Island near San Francisco, California, is about 78 ft wide, 56 ft tall, and 540 ft long. Find the amount of air in the tunnel by assuming that the tunnel has the shape of a rectangular prism.

   a. Will you find surface area or volume? _____

   b. What dimensions are you given?

   _____

   c. What equation for rectangular prisms can you use? _____

   d. What is the amount of air in the tunnel? _____

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SKILL 18: Practice

1. Juan is wrapping a box that contains a surprise gift for his mother. The box is 9 in. long, 7 in. wide, and 3 in. tall. How much wrapping paper will he use if he cuts paper to exactly fit the sides of the box? _____

2. At a winter festival, a city hires local artists to make ice sculptures. One artist started with a block of ice 6 ft tall, 3 ft wide, and 3 ft long. She chipped away $\frac{1}{3}$ of the ice to make a polar bear. How much ice was in the polar bear itself? _____

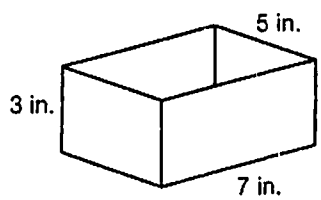
3. A pool for water lilies has the shape of a rectangular prism 10 ft long, 4 ft wide, and 4 ft deep. How much water can the pool hold? _____

4. A box of shredded wheat cereal measures 7 in. by 10 in. by 2 in. How much cardboard is used for the box? (Assume no overlap.) _____

5. Doreen has a large sandbox that holds twice the amount of sand that her small sandbox will hold. The small sandbox is 3 ft by $2\frac{1}{2}$ ft by 1 ft. How much sand can the large sandbox hold when filled level to the top? _____

6. A stick of butter is shaped like a rectangular prism. The stick of butter is 5 in. long, $1\frac{1}{2}$ in. wide, and $1\frac{1}{2}$ in. thick. How much butter does the stick contain? _____

7. A rectangular box with no top is 7 in. long, 5 in. wide, and 3 in. deep. If Hector paints the outside of the box (sides and bottom) with gold paint, what is the measure of what he will paint?



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TEST PREP

8. An aquarium is 3 ft long, $1\frac{1}{2}$ ft wide, and 2 ft deep. How much water can the aquarium hold? *Skill 18*

   A $13\frac{1}{2}$ ft^3 **C** 9 ft^3

   B 27 ft^3 **D** $4\frac{1}{2}$ ft^3

9. What is the volume of a rectangular prism that is 2 in. by 4 in. by 6 in.? *Skill 17*

   F 44 in^3 **H** 80 in^3

   G 48 in^3 **J** 88 in^3