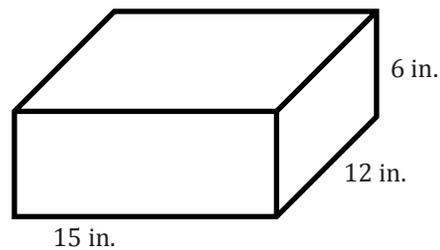


## Lesson 19: Surface Area and Volume in the Real World

### Classwork

#### Opening Exercise

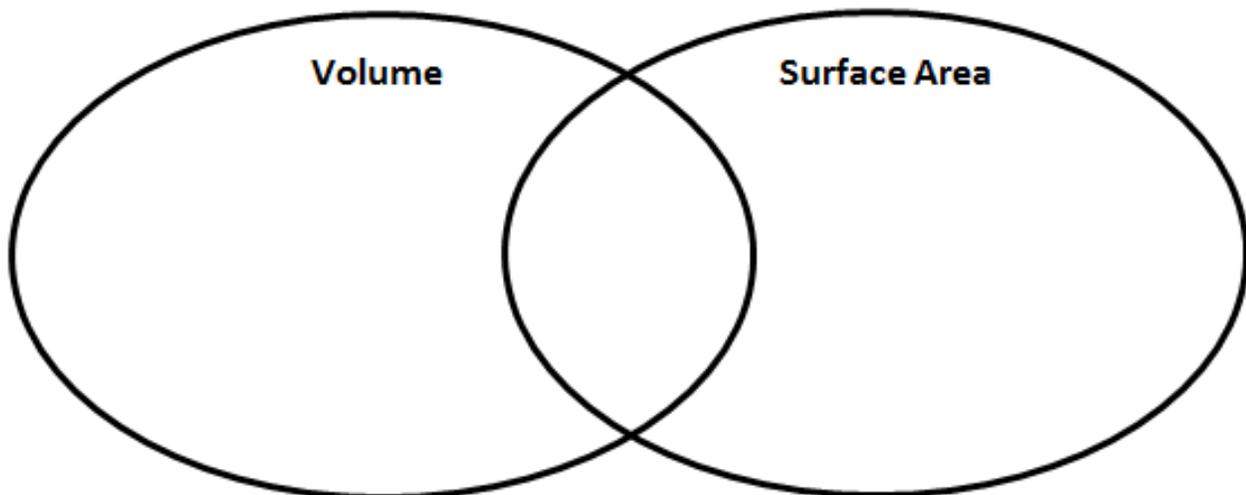
A box needs to be painted. How many square inches will need to be painted to cover every surface?



A juice box is 4 in. tall, 1 in. wide, and 2 in. long. How much juice fits inside the juice box?

How did you decide how to solve each problem?

#### Discussion



**Example 1**

Vincent put logs in the shape of a rectangular prism. He built this rectangular prism of logs outside his house. However, it is supposed to snow, and Vincent wants to buy a cover so the logs will stay dry. If the pile of logs creates a rectangular prism with these measurements:

33 cm long, 12 cm wide, and 48 cm high,

what is the minimum amount of material needed to make a cover for the wood pile?

**Exercises 1–6**

Use your knowledge of volume and surface area to answer each problem.

1. Quincy Place wants to add a pool to the neighborhood. When determining the budget, Quincy Place determined that it would also be able to install a baby pool that required less than 15 cubic feet of water. Quincy Place has three different models of a baby pool to choose from.

Choice One: 5 feet  $\times$  5 feet  $\times$  1 foot

Choice Two: 4 feet  $\times$  3 feet  $\times$  1 foot

Choice Three: 4 feet  $\times$  2 feet  $\times$  2 feet

Which of these choices is best for the baby pool? Why are the others not good choices?

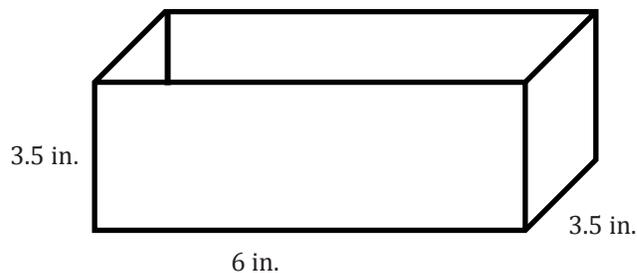
2. A packaging firm has been hired to create a box for baby blocks. The firm was hired because it could save money by creating a box using the least amount of material. The packaging firm knows that the volume of the box must be  $18 \text{ cm}^3$ .
- What are possible dimensions for the box if the volume must be exactly  $18 \text{ cm}^3$ ?
  - Which set of dimensions should the packaging firm choose in order to use the least amount of material? Explain.
3. A gift has the dimensions of  $50 \text{ cm} \times 35 \text{ cm} \times 5 \text{ cm}$ . You have wrapping paper with dimensions of  $75 \text{ cm} \times 60 \text{ cm}$ . Do you have enough wrapping paper to wrap the gift? Why or why not?
4. Tony bought a flat rate box from the post office to send a gift to his mother for Mother's Day. The dimensions of the medium size box are  $14 \text{ inches} \times 12 \text{ inches} \times 3.5 \text{ inches}$ . What is the volume of the largest gift he can send to his mother?

5. A cereal company wants to change the shape of its cereal box in order to attract the attention of shoppers. The original cereal box has dimensions of 8 inches  $\times$  3 inches  $\times$  11 inches. The new box the cereal company is thinking of would have dimensions of 10 inches  $\times$  10 inches  $\times$  3 inches.

a. Which box holds more cereal?

b. Which box requires more material to make?

6. Cinema theaters created a new popcorn box in the shape of a rectangular prism. The new popcorn box has a length of 6 inches, a width of 3.5 inches, and a height of 3.5 inches but does not include a lid.



a. How much material is needed to create the box?

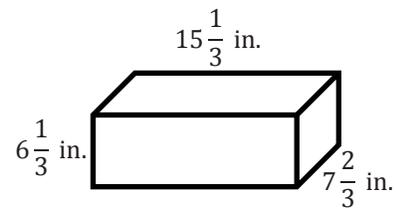
b. How much popcorn does the box hold?

**Problem Set**

Solve each problem below.

- Dante built a wooden, cubic toy box for his son. Each side of the box measures 2 feet.
  - How many square feet of wood did he use to build the box?
  - How many cubic feet of toys will the box hold?
- A company that manufactures gift boxes wants to know how many different sized boxes having a volume of 50 cubic centimeters it can make if the dimensions must be whole centimeters.
  - List all the possible whole number dimensions for the box.
  - Which possibility requires the least amount of material to make?
  - Which box would you recommend the company use? Why?

- A rectangular box of rice is shown below. How many cubic inches of rice can fit inside?



- The Mars Cereal Company has two different cereal boxes for Mars Cereal. The large box is 8 inches wide, 11 inches high, and 3 inches deep. The small box is 6 inches wide, 10 inches high, and 2.5 inches deep.
  - How much more cardboard is needed to make the large box than the small box?
  - How much more cereal does the large box hold than the small box?
- A swimming pool is 8 meters long, 6 meters wide, and 2 meters deep. The water-resistant paint needed for the pool costs \$6 per square meter. How much will it cost to paint the pool?
  - How many faces of the pool do you have to paint?
  - How much paint (in square meters) do you need to paint the pool?
  - How much will it cost to paint the pool?
- Sam is in charge of filling a rectangular hole with cement. The hole is 9 feet long, 3 feet wide, and 2 feet deep. How much cement will Sam need?

7. The volume of Box D subtracted from the volume of Box C is 23.14 cubic centimeters. Box D has a volume of 10.115 cubic centimeters.
- Let  $C$  be the volume of Box C in cubic centimeters. Write an equation that could be used to determine the volume of Box C.
  - Solve the equation to determine the volume of Box C.
  - The volume of Box C is one-tenth the volume another box, Box E. Let  $E$  represent the volume of Box E in cubic centimeters. Write an equation that could be used to determine the volume of Box E, using the result from part (b).
  - Solve the equation to determine the volume of Box E.