Lesson 18: Determining Surface Area of Three-Dimensional Figures

Classwork

Opening Exercise

a. What three-dimensional figure will the net create?

b. Measure (in inches) and label each side of the figure.

c. Calculate the area of each face, and record this value inside the corresponding rectangle.

d. How did we compute the surface area of solid figures in previous lessons?

e. Write an expression to show how we can calculate the surface area of the figure above.

f. What does each part of the expression represent?

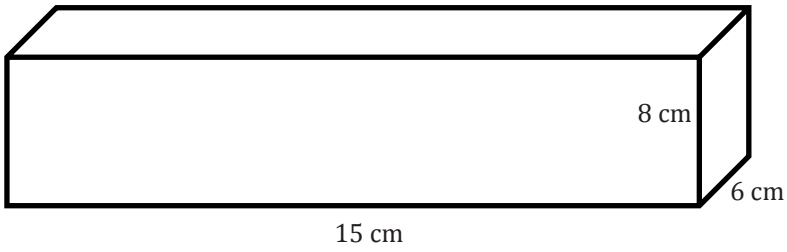
g. What is the surface area of the figure?

Example 1

Fold the net used in the Opening Exercise to make a rectangular prism. Have the two faces with the largest area be the bases of the prism. Fill in the second row of the table below.

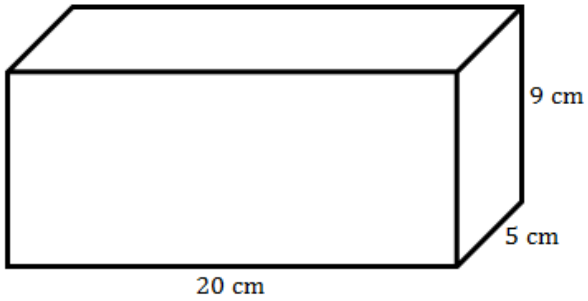
Area of Top (base)	Area of Bottom (base)	Area of Front	Area of Back	Area of Left Side	Area of Right Side

Examine the rectangular prism below. Complete the table.



Area of Top (base)	Area of Bottom (base)	Area of Front	Area of Back	Area of Left Side	Area of Right Side

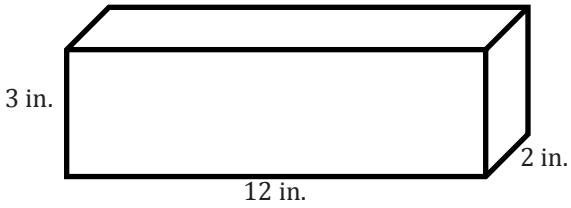
Example 2



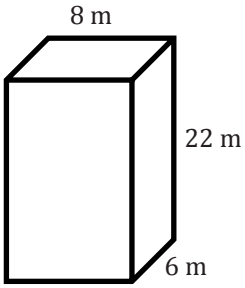
Exercises 1–3

1. Calculate the surface area of each of the rectangular prisms below.

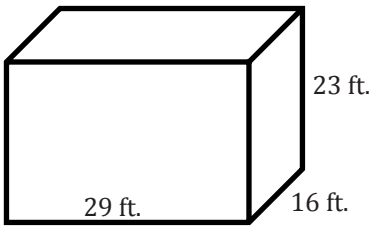
a.



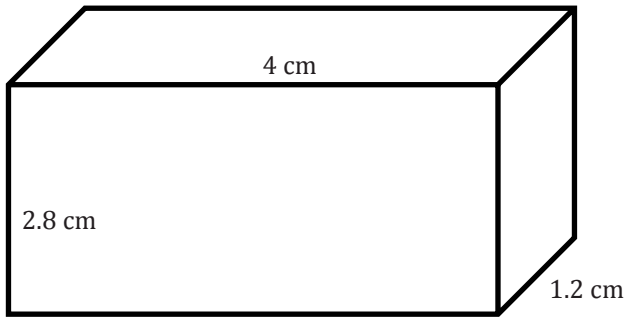
b.



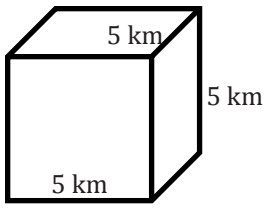
c.



d.



2. Calculate the surface area of the cube.



3. All the edges of a cube have the same length. Tony claims that the formula $SA = 6s^2$, where s is the length of each side of the cube, can be used to calculate the surface area of a cube.

   a. Use the dimensions from the cube in Problem 2 to determine if Tony's formula is correct.

   b. Why does this formula work for cubes?

   c. Becca does not want to try to remember two formulas for surface area, so she is only going to remember the formula for a cube. Is this a good idea? Why or why not?

Lesson Summary

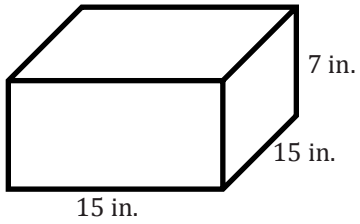
Surface Area Formula for a Rectangular Prism: $SA = 2lw + 2lh + 2wh$

Surface Area Formula for a Cube: $SA = 6s^2$

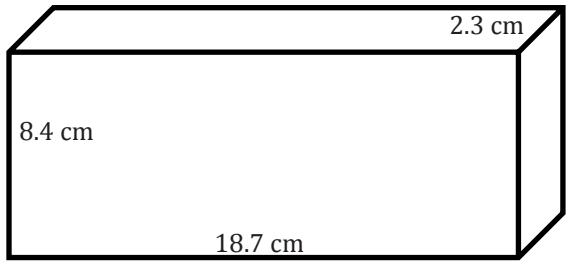
Problem Set

Calculate the surface area of each figure below. Figures are not drawn to scale.

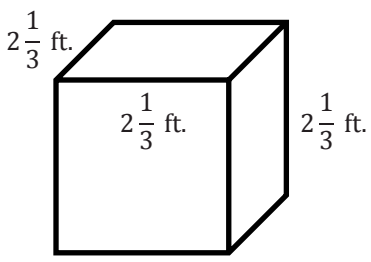
1.



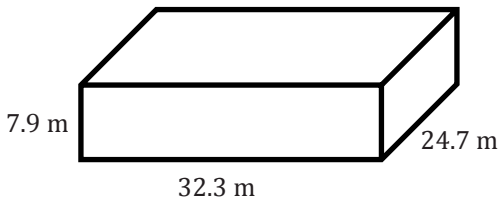
2.



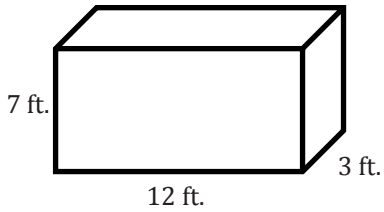
3.



4.



5. Write a numerical expression to show how to calculate the surface area of the rectangular prism. Explain each part of the expression.



6. When Louie was calculating the surface area for Problem 4, he identified the following:

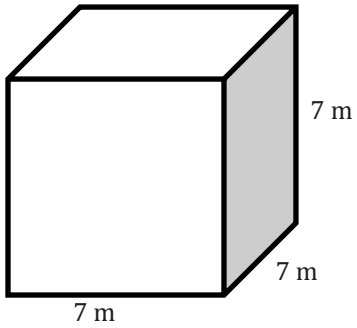
$$\text{length} = 24.7 \text{ m}, \text{ width} = 32.3 \text{ m}, \text{ and height} = 7.9 \text{ m}.$$

However, when Rocko was calculating the surface area for the same problem, he identified the following:

$$\text{length} = 32.3 \text{ m}, \text{ width} = 24.7 \text{ m}, \text{ and height} = 7.9 \text{ m}.$$

Would Louie and Rocko get the same answer? Why or why not?

7. Examine the figure below.



a. What is the most specific name of the three-dimensional shape?

b. Write two different expressions for the surface area.

c. Explain how these two expressions are equivalent.