

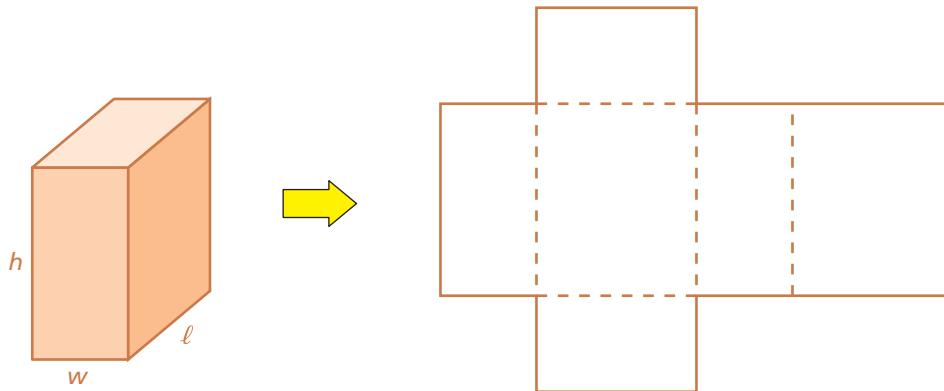
Essential Question

How can you find the surface area of a prism?

1

ACTIVITY: Surface Area of a Rectangular Prism

Work with a partner. Copy the net for a rectangular prism. Label each side as h , w , or ℓ . Then use your drawing to write a formula for the surface area of a rectangular prism.

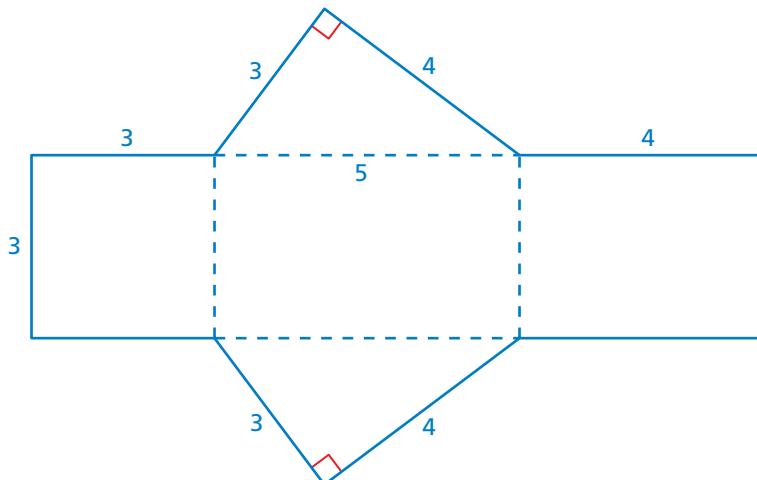


2

ACTIVITY: Surface Area of a Triangular Prism

Work with a partner.

- a. Find the surface area of the solid shown by the net. Copy the net, cut it out, and fold it to form a solid. Identify the solid.



- b. Which of the surfaces of the solid are bases? Why?

3

ACTIVITY: Forming Rectangular Prisms

Math Practice**Construct Arguments**

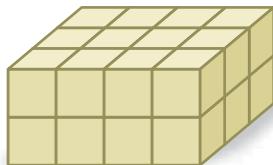
What method did you use to find the surface area of the rectangular prism? Explain.

Work with a partner.

- Use 24 one-inch cubes to form a rectangular prism that has the given dimensions.
- Draw each prism.
- Find the surface area of each prism.



a. $4 \times 3 \times 2$

Drawing*Surface Area*
 in.²

b. $1 \times 1 \times 24$

c. $1 \times 2 \times 12$

d. $1 \times 3 \times 8$

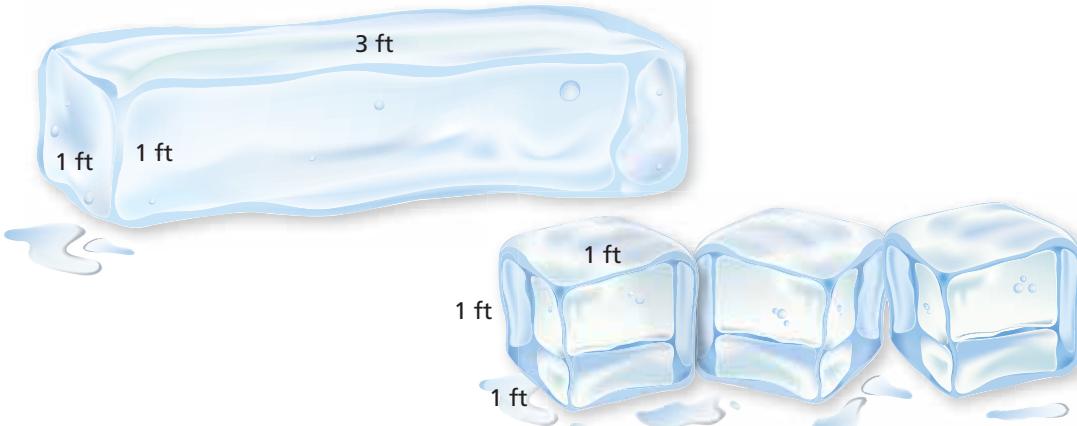
e. $1 \times 4 \times 6$

f. $2 \times 2 \times 6$

g. $2 \times 4 \times 3$

What Is Your Answer?

4. Use your formula from Activity 1 to verify your results in Activity 3.
5. **IN YOUR OWN WORDS** How can you find the surface area of a prism?
6. **REASONING** When comparing ice blocks with the same volume, the ice with the greater surface area will melt faster. Which will melt faster, the bigger block or the three smaller blocks? Explain your reasoning.

**Practice**

Use what you learned about the surface areas of rectangular prisms to complete Exercises 4–6 on page 359.

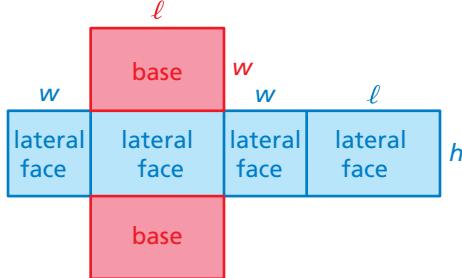
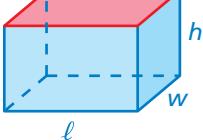
Key Vocabulary

 lateral surface area,
 p. 358


Key Idea

Surface Area of a Rectangular Prism

Words The surface area S of a rectangular prism is the sum of the areas of the bases and the lateral faces.



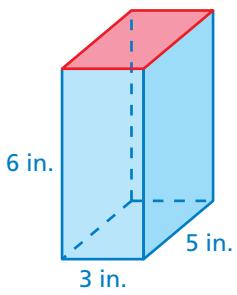
$$\text{Algebra} \quad S = 2\ell w + 2\ell h + 2wh$$

↑ Areas of bases ↑ Areas of lateral faces

EXAMPLE

1

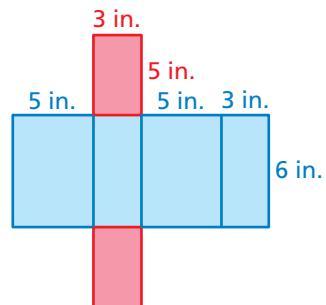
Finding the Surface Area of a Rectangular Prism



Find the surface area of the prism.

Draw a net.

$$\begin{aligned}
 S &= 2\ell w + 2\ell h + 2wh \\
 &= 2(3)(5) + 2(3)(6) + 2(5)(6) \\
 &= 30 + 36 + 60 \\
 &= 126
 \end{aligned}$$



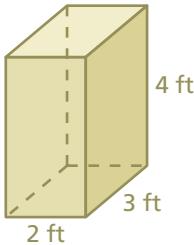
The surface area is 126 square inches.



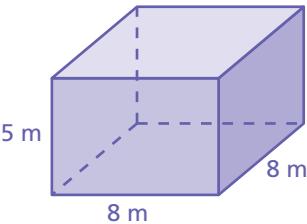
On Your Own

Find the surface area of the prism.

1.



2.


 Now You're Ready
 Exercises 7–9



Key Idea

Surface Area of a Prism

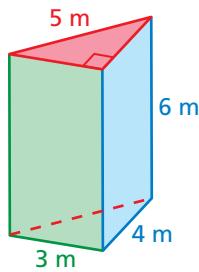
The surface area S of any prism is the sum of the areas of the bases and the lateral faces.

$$S = \text{areas of bases} + \text{areas of lateral faces}$$

EXAMPLE

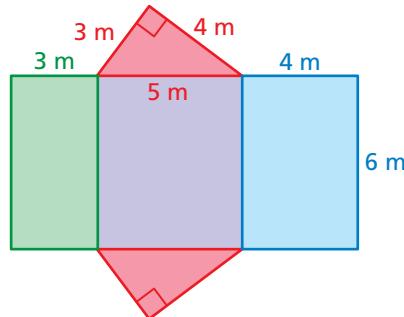
2

Finding the Surface Area of a Triangular Prism



Find the surface area of the prism.

Draw a net.



Remember



The area A of a triangle with base b and height h is $A = \frac{1}{2}bh$.

Area of a Base

$$\text{Red base: } \frac{1}{2} \cdot 3 \cdot 4 = 6$$

Areas of Lateral Faces

$$\text{Green lateral face: } 3 \cdot 6 = 18$$

$$\text{Purple lateral face: } 5 \cdot 6 = 30$$

$$\text{Blue lateral face: } 4 \cdot 6 = 24$$

Add the areas of the bases and the lateral faces.

$$S = \text{areas of bases} + \text{areas of lateral faces}$$

$$= 6 + 6 + 18 + 30 + 24$$

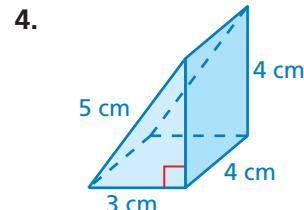
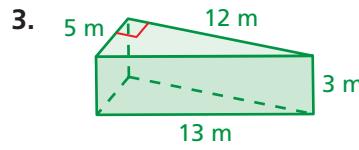
$$= 84$$

There are two identical bases. Count the area twice.

∴ The surface area is 84 square meters.

On Your Own

Find the surface area of the prism.



Now You're Ready

Exercises 10–12

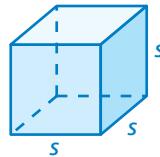
Remember



A cube has 6 congruent square faces.

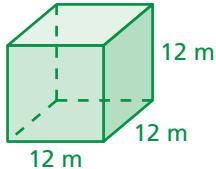
When all the edges of a rectangular prism have the same length s , the rectangular prism is a cube. The formula for the surface area of a cube is

$$S = 6s^2. \quad \text{Formula for surface area of a cube}$$



EXAMPLE 3

Finding the Surface Area of a Cube



Find the surface area of the cube.

$$\begin{aligned} S &= 6s^2 \\ &= 6(12)^2 \\ &= 864 \end{aligned}$$

Write formula for surface area of a cube.

Substitute 12 for s .

Simplify.

The surface area of the cube is 864 square meters.

The **lateral surface area** of a prism is the sum of the areas of the lateral faces.

EXAMPLE 4

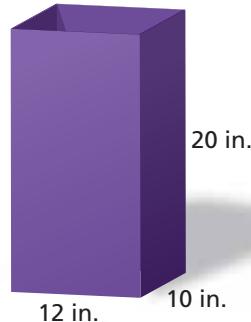
Real-Life Application



The outsides of purple traps are coated with glue to catch emerald ash borers. You make your own trap in the shape of a rectangular prism with an open top and bottom. What is the surface area that you need to coat with glue?

Find the lateral surface area.

$$\begin{aligned} S &= 2\ell h + 2wh && \text{Do not include the areas of the bases in the formula.} \\ &= 2(12)(20) + 2(10)(20) && \text{Substitute.} \\ &= 480 + 400 && \text{Multiply.} \\ &= 880 && \text{Add.} \end{aligned}$$



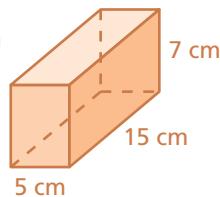
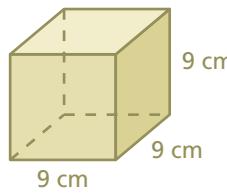
So, you need to coat 880 square inches with glue.

On Your Own

Now You're Ready

Exercises 13–15

5. Which prism has the greater surface area?
6. **WHAT IF?** In Example 4, both the length and the width of your trap are 12 inches. What is the surface area that you need to coat with glue?



9.1 Exercises

Check It Out
Help with Homework
BigIdeasMath  .com



Vocabulary and Concept Check

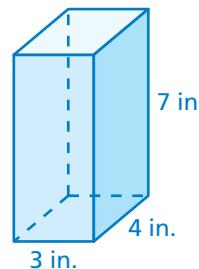
- VOCABULARY** Describe two ways to find the surface area of a rectangular prism.
- WRITING** Compare and contrast a rectangular prism to a cube.
- DIFFERENT WORDS, SAME QUESTION** Which is different? Find “both” answers.

Find the surface area of the prism.

Find the area of the net of the prism.

Find the area of the bases of the prism.

Find the sum of the areas of the bases and the lateral faces of the prism.



Practice and Problem Solving

Use one-inch cubes to form a rectangular prism that has the given dimensions. Then find the surface area of the prism.

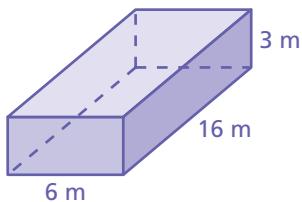
4. $1 \times 2 \times 3$

5. $3 \times 4 \times 1$

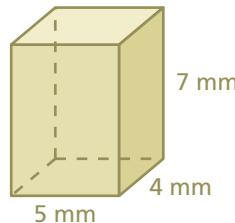
6. $2 \times 3 \times 2$

Find the surface area of the prism.

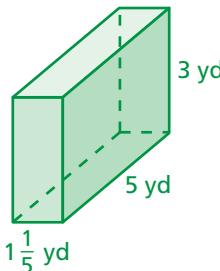
1 7.



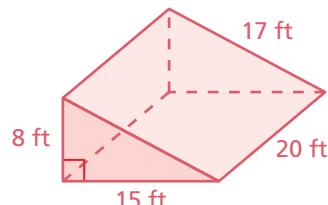
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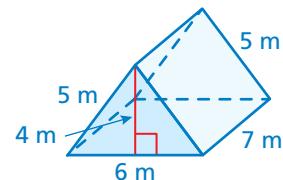
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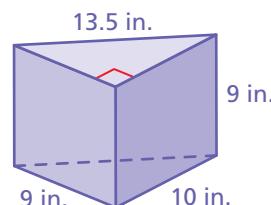
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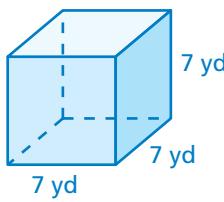
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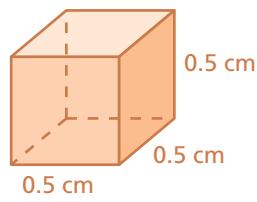
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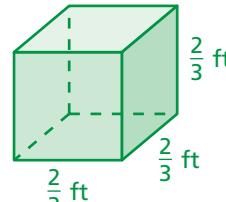
3 13.



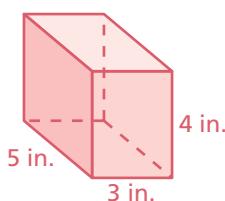
14.



15.



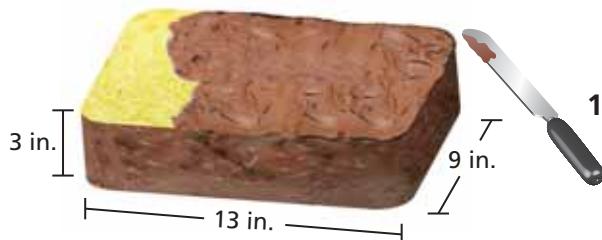
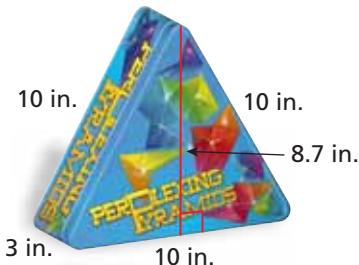
- 16. ERROR ANALYSIS** Describe and correct the error in finding the surface area of the prism.



$$\begin{aligned} S &= 2(5)(3) + 2(3)(4) + 2(5)(3) \\ &= 30 + 24 + 30 \\ &= 84 \text{ in.}^2 \end{aligned}$$

- 17. GAME** Find the surface area of the tin game case.

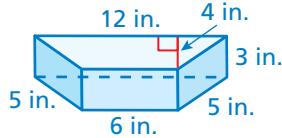
- 18. WRAPPING PAPER** A cube-shaped gift is 11 centimeters long. What is the least amount of wrapping paper you need to wrap the gift?



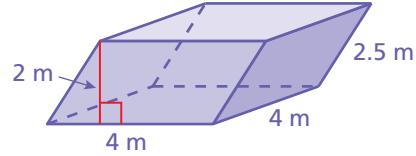
- 19. FROSTING** One can of frosting covers about 280 square inches. Is one can of frosting enough to frost the cake? Explain.

Find the surface area of the prism.

20.



21.



- 22. OPEN-ENDED** Draw and label a rectangular prism that has a surface area of 158 square yards.

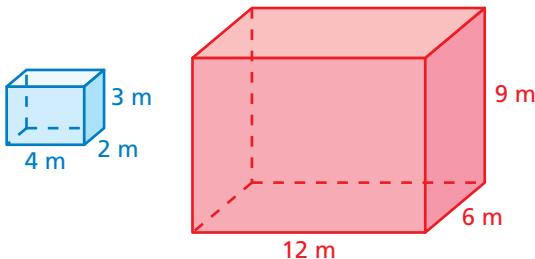
- 23. LABEL** A label that wraps around a box of golf balls covers 75% of its lateral surface area. What is the value of x ?



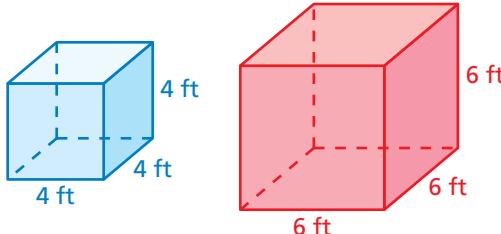
- 24. BREAD** Fifty percent of the surface area of the bread is crust. What is the height h ?

Compare the dimensions of the prisms. How many times greater is the surface area of the red prism than the surface area of the blue prism?

25.

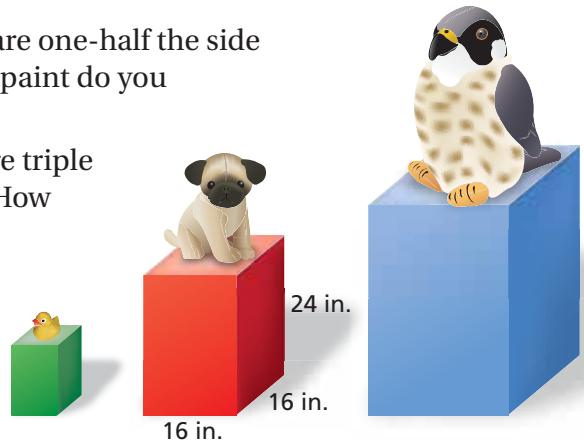


26.



27. **STRUCTURE** You are painting the prize pedestals shown (including the bottoms). You need 0.5 pint of paint to paint the red pedestal.

- The side lengths of the green pedestal are one-half the side lengths of the red pedestal. How much paint do you need to paint the green pedestal?
- The side lengths of the blue pedestal are triple the side lengths of the green pedestal. How much paint do you need to paint the blue pedestal?
- Compare the ratio of paint amounts to the ratio of side lengths for the green and red pedestals. Repeat for the green and blue pedestals. What do you notice?



28. **Number Sense** A keychain-sized Rubik's Cube® is made up of small cubes. Each small cube has a surface area of 1.5 square inches.
- What is the side length of each small cube?
 - What is the surface area of the entire Rubik's Cube®?

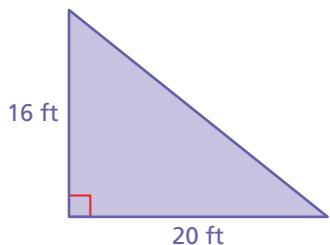


Fair Game Review

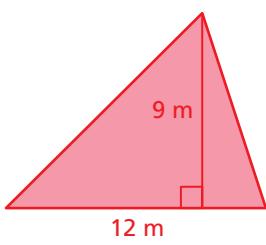
What you learned in previous grades & lessons

Find the area of the triangle (*Skills Review Handbook*)

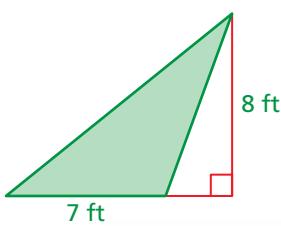
29.



30.



31.



32. **MULTIPLE CHOICE** What is the circumference of the basketball?

Use 3.14 for π . (*Section 8.1*)

(A) 14.13 in.

(B) 28.26 in.

(C) 56.52 in.

(D) 254.34 in.

