You found the square of a number. You’ll use formulas to find perimeter and area. So you can find measurements, such as poster areas in Ex. 28.

**In the Real World**

**Carnival** A carnival is going to be held in your school’s parking lot. How much rope is needed to enclose the carnival? To answer this question, you can find the carnival’s perimeter.

The **perimeter** of a figure is the distance around the figure. Perimeter is measured in linear units such as feet, inches, or meters.

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**Perimeter of a Rectangle**

**Words** Perimeter = 2 \cdot \text{length} + 2 \cdot \text{width}

**Algebra** \[ P = 2l + 2w \]

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**Example 1** Finding the Perimeter of a Rectangle

To answer the real-world question above, find the perimeter.

\[
P = 2l + 2w \\
= 2 \cdot 200 + 2 \cdot 100 \\
= 400 + 200 \\
= 600
\]

**ANSWER** The amount of rope needed to enclose the carnival is 600 feet.

**Your turn now** Find the perimeter of the rectangle described.

1. length = 9 m, width = 5 m
2. length = 20 in., width = 12 in.
**Area** The **area** of a figure is the amount of surface the figure covers. Area is measured in square units such as square feet (ft$^2$) or square meters (m$^2$).

**Example 2** Finding the Area of a Rectangle

Find the area of the carnival shown at the top of page 61.

\[ A = lw \]

Write the formula for area of a rectangle.

\[ A = 200 \cdot 100 \]

Substitute 200 for \( l \) and 100 for \( w \).

\[ A = 20,000 \]

Multiply.

**Answer** The area of the carnival is 20,000 square feet.

**Squares** A square is a rectangle that has four sides with the same length. You can use the following formulas for a square with side length \( s \).

- **Perimeter** of square: \( P = 4s \)
- **Area** of square: \( A = s^2 \)

**Example 3** Perimeter and Area of a Square

Find the perimeter and the area of a 50 yard by 50 yard corral.

\[ P = 4s \]

\[ A = s^2 \]

\[ P = 4 \cdot 50 \]

\[ A = 50^2 \]

\[ P = 200 \]

\[ A = 2500 \]

**Answer** The perimeter is 200 yards. The area is 2500 square yards.

**Your turn now** Tell whether to find the **perimeter** or the **area** to help you decide how much of the item to buy. Then find the measurement.

3. tiles to cover a 9 ft by 9 ft floor

4. fence for a 6 m by 7 m garden
Lesson 2.2    Perimeter and Area

1. Vocabulary
   The _?_ of a rectangle is the sum of twice its length and twice its width. The _?_ of a rectangle is the product of its length and its width.

2. 3. 4. Guided Problem Solving
   - You plan to use 64 feet of fencing to form a square pen for your dog. How long will each side be?
   - Decide whether 64 feet is the perimeter or the area of the pen.
   - Write an equation to represent this situation.
   - Solve the equation to find the length of each side of the pen.

3. Getting Ready to Practice
   - **Example 4** Solving for an Unknown Dimension
     Algebra
     - Write and solve an equation to find the width of a rectangle whose area is 195 square centimeters and whose length is 15 centimeters.
     - **Formula:** \(A = lw\)
     - **Substitute:** \(195 = 15w\)
     - **Equation:** \(w = 195 \div 15\)
     - **Calculate:** \(w = 13\)
     - **Answer:** The width of the rectangle is 13 centimeters.

   - **Your Turn Now** Write and solve an equation to find the length.
     - 5. Area of rectangle = 91 in.\(^2\), width = 7 in., length = _?_
     - 6. Perimeter of square = 132 cm, side length = _?_

2.2 Exercises
More Practice, p. 709

Getting Ready to Practice

1. Vocabulary
   - The _?_ of a rectangle is the sum of twice its length and twice its width. The _?_ of a rectangle is the product of its length and its width.

2. Find the perimeter and the area of the rectangle or square.
   - 2. \(6 \text{ m} \quad 3 \text{ m}\)
   - 3. \(7 \text{ ft} \quad 2 \text{ ft}\)
   - 4. \(10 \text{ in.} \quad 10 \text{ in.}\)

5. Guided Problem Solving
   - You plan to use 64 feet of fencing to form a square pen for your dog. How long will each side be?
   - Decide whether 64 feet is the perimeter or the area of the pen.
   - Write an equation to represent this situation.
   - Solve the equation to find the length of each side of the pen.
Practice and Problem Solving

Tell whether the measure could represent a perimeter or an area.
6. 15 yd
7. 10 in.$^2$
8. 56 cm$^2$

Find the perimeter and the area of the rectangle or square.
9. 
10.
11.

12. a square that is 15 cm by 15 cm
13. a rectangle that is 19 ft by 17 ft

Home Improvement Tell whether you would use perimeter or area to help you decide how much of the item to buy.
14. fringe for the edges of a rug
15. paint for a ceiling
16. carpeting to cover a floor
17. lace to trim the edges of a pillow

18. Find the Error Describe and correct the error in the solution.

Gymnastics The mat at the right is used for performing gymnastics floor routines. The gymnast must stay within the white lines.
19. How much space does the gymnast have to perform in?
20. What is the length of tape needed to mark off the white lines?

Algebra Write and solve an equation to find the unknown dimension.
21. Area of rectangle = 42 in.$^2$, width = 3 in., length = ?
22. Area of rectangle = 132 m$^2$, length = 12 m, width = ?
23. Perimeter of square = 100 ft, side length = ?
24. Perimeter of square = 56 cm, side length = ?
25. A square has a side length of 8 inches. A rectangle has a length of 16 inches and a width of 8 inches. Compare the areas of the figures.
26. **Writing** Find both the perimeter and area of a 5 inch by 5 inch square using the formulas for a square and for a rectangle. Compare the results.

27. **Estimation** You are fertilizing a lawn that is 32 feet by 50 feet. Your bag of fertilizer will cover 1500 square feet. Do you have enough? Explain.

28. **Movie Posters** At one time, 14 inch by 22 inch movie posters were made with a blank rectangle at the top for printing dates and locations. Collectors often find these posters with the blank rectangle trimmed off to form a 14 inch by 17 inch poster. How much area was trimmed off?

29. **Describe** Describe two different rectangles with a perimeter of 16.

30. **Challenge** Your rectangular property is 42 yards long and covers 1302 square yards of land. How much fencing is needed to enclose it?

Each figure below is made of rectangles and squares. Find its area.

31. \[
\begin{array}{c}
\text{6 ft} \\
\hline
\text{6 ft} \\
\hline
\text{12 ft} \\
\end{array}
\]

32. \[
\begin{array}{c}
\text{8 m} \\
\hline
\text{8 m} \\
\hline
\text{4 m} \\
\hline
\text{12 m}
\end{array}
\]

**Mixed Review**

Find the value of the power. *(Lesson 1.3)*

33. \(4^3\) 34. \(3^5\) 35. \(10^3\) 36. \(6^4\)

Find the length of the segment to the nearest centimeter. *(Lesson 2.1)*

37. \[
\begin{array}{c}
\hline
\text{6 ft} \\
\hline
\text{2 ft}
\end{array}
\]

38. \[
\begin{array}{c}
\hline
\text{8 m} \\
\hline
\text{4 m}
\end{array}
\]

**Basic Skills** Use front-end estimation to estimate the sum.

39. \(254 + 503 + 739\) 40. \(127 + 182 + 569\)

**Test-Taking Practice**

41. **Short Response** Use estimation to decide which figure has a greater area, a square that is 87 inches by 87 inches or a rectangle that is 198 inches by 61 inches. Explain your reasoning.

42. **Multiple Choice** How much trim do you need if you want to sew trim along each edge of a 54 inch by 102 inch tablecloth?
   
   A. 156 in.  
   B. 312 in.  
   C. 312 in.\(^2\)  
   D. 5508 in.\(^2\)