

## 6-2

# Area of a Parallelogram

© CONTENT STANDARDS

7.G.6

### What You'll Learn

To find the area of a parallelogram and to relate perimeter and area

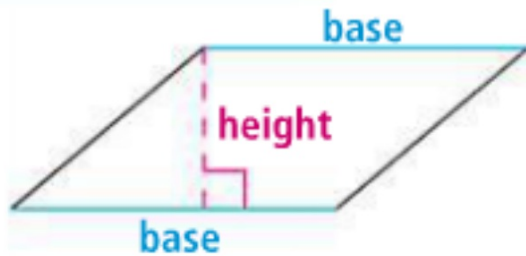
🔊 **New Vocabulary** height of a parallelogram, base of a parallelogram

### Why Learn This?

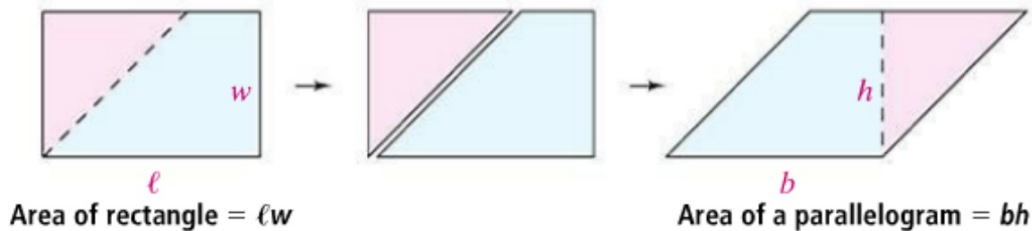
The floor plan of the building at the right is in the shape of a parallelogram. You can calculate the area of the parallelogram to determine how much office space is available on a given floor of the building.



The **height of a parallelogram** is the length of a perpendicular segment connecting one **base of a parallelogram** to the other.

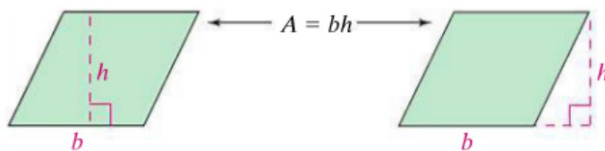


The diagram below relates the formula for the area of a rectangle to the formula for the area of a parallelogram.



**KEY CONCEPTS** Area of a Parallelogram

The area of a parallelogram is equal to the product of any base  $b$  and the corresponding height  $h$ .



**EXAMPLE****Finding the Area of a Parallelogram**

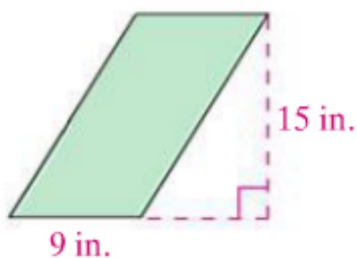
- 1 Find the area of the parallelogram.

$$A = bh \quad \leftarrow \text{Use the area formula.}$$

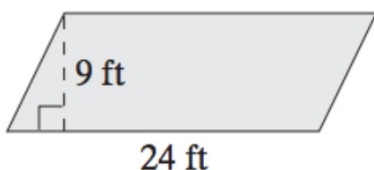
$$= (9)(15) \quad \leftarrow \text{Substitute.}$$

$$= 135 \quad \leftarrow \text{Simplify.}$$

The area is 135 in.<sup>2</sup>.

**Examples**

- 1 **Finding the Area of a Parallelogram** Find the area of the parallelogram.



$$A = \boxed{\phantom{00}} \boxed{\phantom{00}} \quad \leftarrow \text{Use the area formula.}$$

$$= (\boxed{\phantom{00}})(\boxed{\phantom{00}}) \quad \leftarrow \text{Substitute.}$$

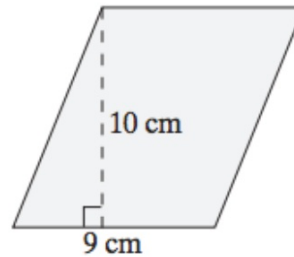
$$= \boxed{\phantom{0000}} \quad \leftarrow \text{Simplify.}$$

The area is  $\boxed{\phantom{000}}$  ft<sup>2</sup>.

Table talk and solve this problem.

### Quick Check

1. Find the area of the parallelogram.



You can also use lengths of the sides of a rectangle to find perimeter.

#### Vocabulary Tip

The perimeter of a figure is the distance around the figure.



### EXAMPLE Relating Perimeter and Area

2 **Multiple Choice** Melinda wants to plant a rectangular garden and put a fence around it. She has 34 ft of fencing and she wants the area of her garden to be as big as possible. Which dimensions should she use?

- (A) Length of 9 ft and width of 8 ft
- (B) Length of 10 ft and width of 7 ft
- (C) Length of 12 ft and width of 6 ft
- (D) Length of 14 ft and width of 5 ft

Since all answer choices give the length  $\ell$  and width  $w$ , you can calculate both the perimeter  $2\ell + 2w$  and the area  $\ell \times w$ .

Perimeter	Area
$2(9) + 2(8) = 34$ ✓	$9 \times 8 = 72$ ← Perimeter is correct; find the area.
$2(10) + 2(7) = 34$ ✓	$10 \times 7 = 70$ ← Perimeter is correct; the area in choice A is greater.
$2(12) + 2(6) = 36$ ✗	← Perimeter is greater than 34 ft.
$2(14) + 2(5) = 38$ ✗	← Perimeter is greater than 34 ft.

The rectangle with a length of 9 ft and a width of 8 ft will have the correct perimeter and the greatest area. The answer is A.

**2 Relating Perimeter and Area** Jacob wants to fence in a rectangular dog run in his back yard. He has 46 feet of fencing and wants the dog run to be as large as possible. Which dimensions should he use?

- A. length of 9 ft and width of 14 ft      B. length of 10 ft and width of 14 ft  
 C. length of 11 ft and width of 12 ft      D. length of 12 ft and width of 12 ft

Since all answer choices give the length  $l$  and the width  $w$ , you can calculate both the perimeter  $2l + 2w$ , and the area  $l \times w$ .

**Perimeter**

$$2(9) + 2(14) = 46$$

$$2(10) + 2(14) = 48$$

$$2(11) + 2(12) = 46$$

$$2(12) + 2(12) = 48$$

**Area**

$$9 \times 14 = 126$$

$$11 \times 12 = 132$$

← Perimeter is correct; find the area.

← Perimeter is greater than 46 ft.

← Perimeter is correct; the area in choice A is **smaller**.

← Perimeter is greater than 46 ft.

The rectangle with a length of **11** ft and a width of **12** ft will have the correct perimeter and the greatest area. The correct answer is choice **C**.



## Check Your Understanding

2.

3.

1. **Vocabulary** What kind of angle is formed by perpendicular lines?

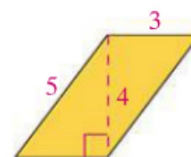
**Two parallelograms have a base and a height that are equal. Tell whether each statement is true or false. Explain your answer.**

- The two parallelograms must be congruent.
- The areas of the two parallelograms are equal.

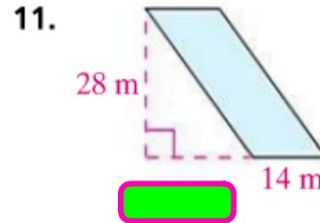
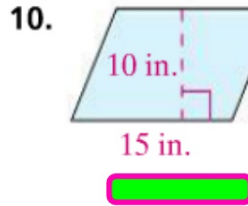
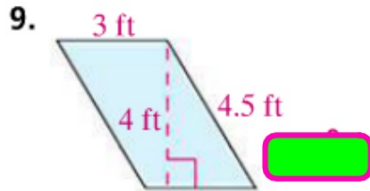
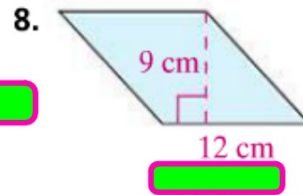
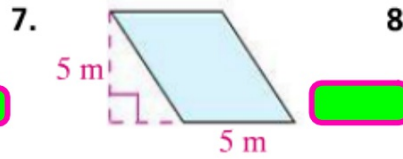
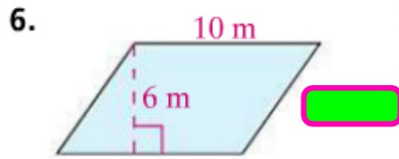
**Use the parallelogram at the right. Fill in the blank.**

4. The area is  $A = (3)(\square)$ .

5. The perimeter is  $P = 2(\square) + 2(5)$ .



**A** Find the area of each parallelogram.



Find each area for base  $b$  and height  $h$  of a parallelogram.

12.  $b = 14$  in.  
 $h = 6$  in.

13.  $b = 25$  mi  
 $h = 25$  mi

14.  $h = 40$  cm  
 $b = 0.5$  cm

15.  $h = 1,000$  m  
 $b = 20$  m

16. A rectangular fish pond is  $21 \text{ ft}^2$  in area. If the owner can surround the pond with a 20-foot fence, what are the dimensions of the pond?