## What You'll Learn

To solve problems involving areas of parallelograms, triangles, and complex figures

🔊 **New Vocabulary** area, base of a parallelogram, height of a parallelogram, base of a triangle, height of a triangle
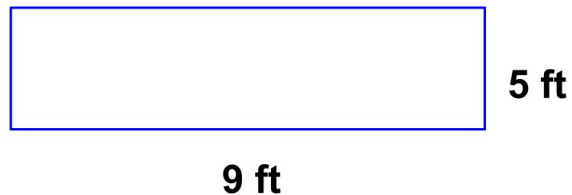
## Why Learn This?

Conservation groups purchase land to protect wildlife. The value of the land depends in part on its area.

You remember that area is the number of square units inside of a two-dimensional shape.

Think about finding area of a rectangle. You multiply the length times the width.

5 ft

9 ft

In the rectangle shows above, you would find its area by multiplying 9 x 5, which equals 45. It's label would be square feet, so the area of that rectangle is 45 sq ft. or 45 $ft^2$ . The exponent of 2 represents squared.

The word length can also be changed to base, and the word width can be changed to height.

The **area** of a figure is the number of square units it contains. To find the area of a parallelogram, multiply the base by the height. Any side can be considered the **base of a parallelogram.** The **height of a parallelogram** is the perpendicular distance between opposite bases.

**Area of a Parallelogram**

$A = b \times h$
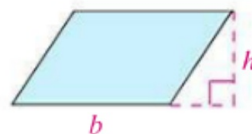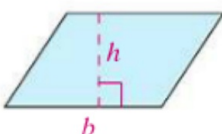
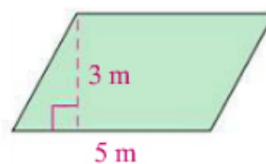**EXAMPLE** **Finding the Area of a Parallelogram**

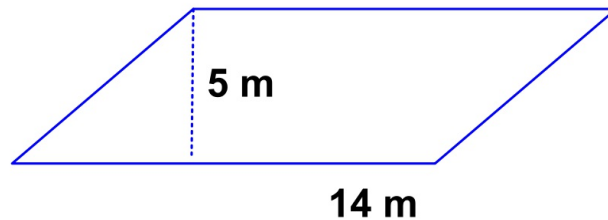**1** **Gridded Response** Find the area of the parallelogram.

$A = b \times h$ ← Use the formula for the area of a parallelogram.

$= 5 \times 3$ ← Substitute 5 for $b$ and 3 for $h$.

$= 15$ ← Simplify.

3 m

5 m

The area of the parallelogram is 15 m².

1. Find the area of a parallelogram with $b = 14$ m and $h = 5$ m.

5 m

14 m

Any side of a triangle can be the **base of a triangle.** The **height of a triangle** is the length of the perpendicular segment from a vertex to the base opposite that vertex.

The diagram at the right shows that the area of a triangle is half of the area of a parallelogram with the same base length and height, or

$A = \frac{1}{2}b \times h.$

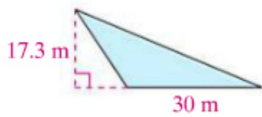10 km
30 km
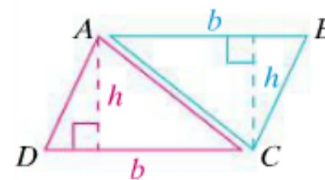
## EXAMPLE  Finding the Area of a Triangle

**2** **Conservation** A conservation group plans to buy a triangular plot of land shown at the left. What is the area of the plot?

$$A = \frac{1}{2}b \times h \qquad \leftarrow \text{Use the formula for the area of a triangle.}$$

$$= \frac{1}{2} \times 30 \times 10 \qquad \leftarrow \text{Substitute 30 for } b \text{ and 10 for } h.$$

$$= 150 \qquad\qquad \leftarrow \text{Simplify.}$$
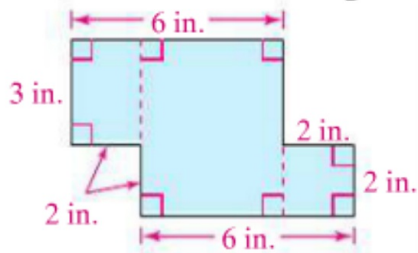
The area of the plot is 150 km².



17.3 m
30 m

## ✓ Quick Check

**2.** The obtuse triangle at the left has a base of 30 m and a height of 17.3 m. Find the triangle's area. ▮

**3** Find the area of the figure.

6 in.

3 in.

2 in.

2 in.

2 in.

6 in.

Split the polygon into two
← rectangles and a square, as
shown by the dashed lines.

Area of smaller rectangle: $3 \times 2$, or 6 in.$^2$

Area of larger rectangle: $4 \times 5$, or 20 in.$^2$

Area of square: $2 \times 2$, or 4 in.$^2$

Find the area
of each polygon.

The total area is $6 + 20 + 4$, or 30 in.$^2$.

6 m

2 m

2 m

m

3 m

4 m      3 m
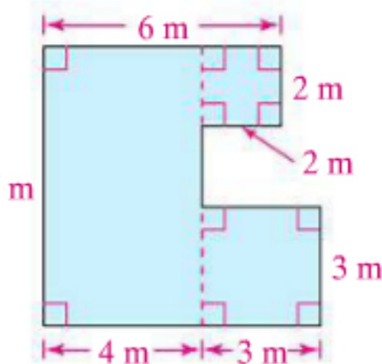
**✓ Quick Check**

● **3.** Find the area of the figure at the left.

**Let's practice finding area working as table groups.**

## 8-1 • Guided Problem Solving

**GPS** Student Page 278, Exercise 19:

**Algebra** A parallelogram has an area of 66 in.² and a base length of 5 inches. What is the height of the parallelogram?

**Understand**

1. What are you being asked to find?
_____

2. What information are you given?
_____
_____
_____

**Plan and Carry Out**

3. Write the formula you will use to find the area of a parallelogram.
_____

4. Substitute the values you know into the formula.
_____

5. What operation do you use to find the height?
_____

6. What is the height of the parallelogram?
_____

**Check**

7. Check your answer. Explain your method.
_____
_____

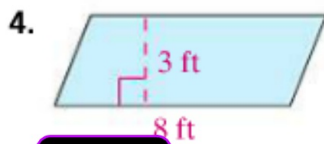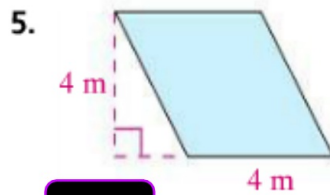**Solve Another Problem**

8. A parallelogram has an area of 96 cm² and a height of 4 cm. What is the base length of the parallelogram?
_____

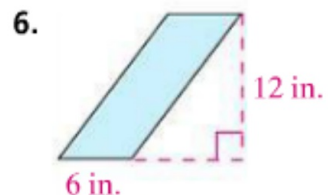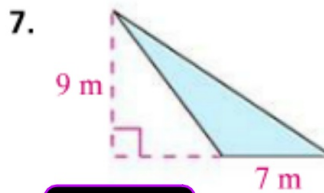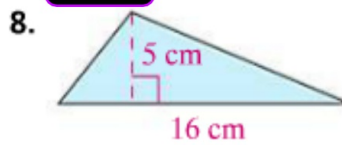# Ⓐ Find the area of each parallelogram or triangle.

**4.**



3 ft
8 ft

**5.**



4 m
4 m

**6.**



12 in.
6 in.

**7.**



9 m
7 m

**8.**



5 cm
16 cm

**9.**



11 yd
18 yd

# Find the area of each complex figure.

**11.**



6 ft 3 ft
9 ft
7 ft
7 ft
6 ft 6 ft

**12.**



3 m
8 m
4 m
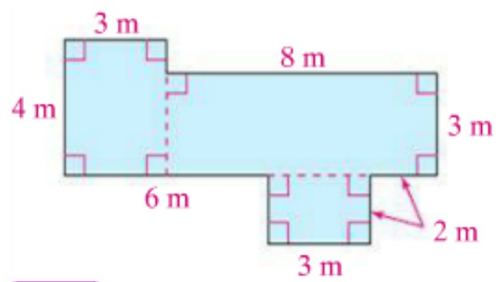3 m
6 m
2 m
3 m
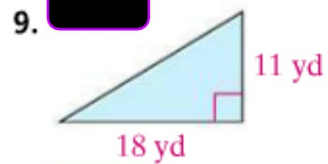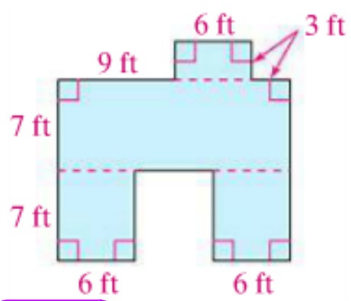
**You have an assignment worksheet, due tomorrow.**

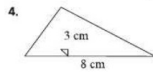**You have time to begin working on it now.**

## Practice 8-1

Areas of Parallelograms and Triangles

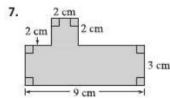**Find the area of each parallelogram.**

1.

4 m
7 m

2.

8 in.
5 in.

3.

3 cm
6 cm

_____   _____   _____
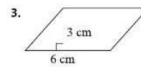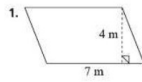
**Find the area of each triangle.**

4.

3 cm
8 cm

5.

8 mm
6 mm

6.

3 ft
4 ft

_____   _____   _____

**Find the area of each complex figure.**

7.

2 cm
2 cm    2 cm
3 cm
9 cm

8.

7 m
3 cm
2 cm
3 cm
2 cm
11 m

9.

5 in.
4 in.
2 in.
1 in.
3 in.
5 in.

_____   _____   _____
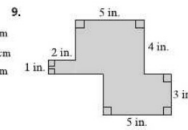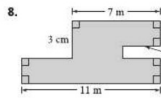
10. Draw and label a triangle and a parallelogram that each have an area of 20 square units.

**Tell whether each statement is *true* or *false*.**

11. A parallelogram and triangle can have the same base and area. _____

12. Two triangles that have the same base always have the same area. _____

13. Any obtuse triangle has a greater area than any acute triangle. _____