

# Lesson 5

## Area of a Triangle

**Objective** Find the area of a triangle.

### Learn About It

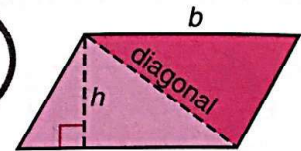
On their schoolyard, a sixth-grade class marks off a parallelogram-shaped garden with a base of 20 feet and a height of 6 feet. The garden is divided into two congruent triangles. One triangular part is a butterfly garden. What is its area?



Find the area of a triangle.

**STEP 1** Use a diagonal to divide the parallelogram into two congruent triangles.

The area of each triangle is one half the area of the parallelogram.



**STEP 2** Find a formula for the area of a triangle.

**2** Let  $b$  = base  
Let  $h$  = perpendicular height  
 $A$  of the parallelogram =  $bh$   
 $A$  of the triangle =  $\frac{1}{2}bh$

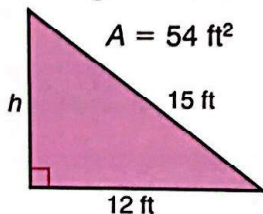
**STEP 3** Find the area of the triangular garden.

$$\begin{aligned} A &= \frac{1}{2}bh \\ &= \frac{1}{2}(20 \times 6) \\ &= \frac{1}{2}(120) \\ &= 60 \text{ ft}^2 \end{aligned}$$

**Solution:** The area of the triangular butterfly garden is 60 square feet.

### Another Example

Find the Height of a Triangle

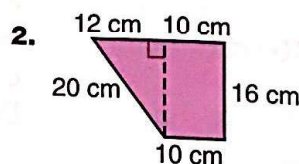
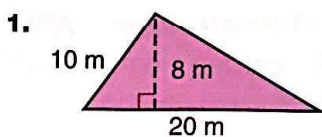


$$\begin{aligned} A &= \frac{1}{2}bh \\ 54 &= \frac{1}{2}(12h) \\ 54 &= 6h \\ 9 &= h \end{aligned}$$

The height is 9 feet.

### Guided Practice

Find the area of each figure.



### Ask Yourself

- Did I use the correct formula?
- Did I use the correct values for  $b$ ,  $h$ , and  $A$ ?



Find the missing measure for each triangle.

3.  $A = \square$   
 $b = 20 \text{ ft}$   
 $h = 12 \text{ ft}$

4.  $A = 28 \text{ m}^2$   
 $b = 8 \text{ m}$   
 $h = \square$

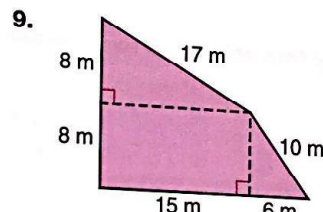
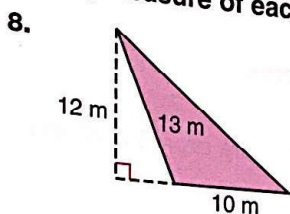
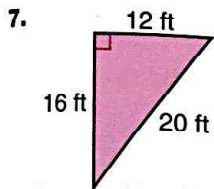
5.  $A = 60.16 \text{ in.}^2$   
 $b = \square$   
 $h = 9.4 \text{ in.}$

6.  $A = 7\frac{1}{2} \text{ in.}^2$   
 $b = 5 \text{ in.}$   
 $h = \square$

**Explain Your Thinking** Draw a parallelogram and one of its diagonals. Explain how you know that two congruent triangles are formed.

### Practice and Problem Solving

Find the area of each figure or missing measure of each triangle.



10.  $A = \square$   
 $b = 4 \text{ yd}$   
 $h = 2 \text{ yd}$

11.  $A = \square$   
 $b = 15 \text{ cm}$   
 $h = 18 \text{ cm}$

12.  $A = 156.16 \text{ ft}^2$   
 $b = 12.2 \text{ ft}$   
 $h = \square$

13.  $A = \frac{180}{40} \text{ in.}^2$   
 $b = \square$   
 $h = 2\frac{1}{2} \text{ in.}$

Solve.

14. Next to each plant in the garden is a triangular label stating the plant's name. What is the height of each label if its base is 8 inches and its area is 24 in.<sup>2</sup>?
15. The height of triangle *DEF* is 4 times the height of triangle *ABC*. If the bases have equal lengths, how do the areas of triangles *DEF* and *ABC* compare?
16. **Reasoning** The banner over the garden entrance is a triangle with a height that is 3 times the length of its base. If the area of the banner is 54 square meters, what is its height?
17. **Analyze** Cindy and Eric each drew a triangle with an area of 120 square feet. The base of Cindy's triangle is half as long as the base of Eric's triangle. Compare the heights of the triangles.

### Mixed Review and Test Prep

#### Open Response

Draw and name a polygon with the given attributes. (Ch. 15, Lesson 1)

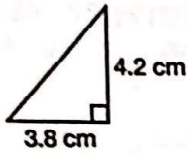
18. 2 pairs of congruent parallel sides;  
 2 acute and 2 obtuse angles
19. 5 congruent sides and angles
20. 3 sides, 2 of which are congruent;  
 1 obtuse angle

21. A diagonal divides a square patch of garden that is 4 feet on a side. What is the area on either side of the diagonal? (Ch. 20, Lesson 5)
- Explain how you found your answer.

# Area of a Triangle

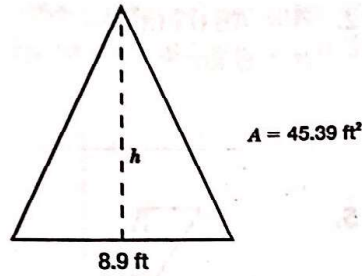
Find the area of each figure or missing measure of each triangle.

1.



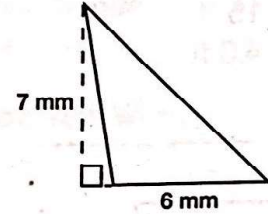
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2.



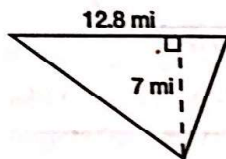
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3.



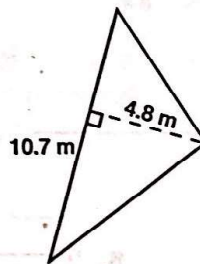
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4.



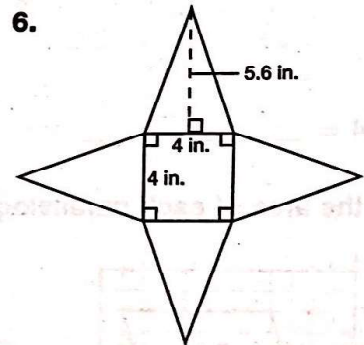
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5.



\_\_\_\_\_

6.



\_\_\_\_\_

7.  $b = 20 \text{ ft}$

$h = 15 \text{ ft}$

$A =$  \_\_\_\_\_

8.  $A = 25 \text{ m}^2$

$h = 6 \text{ m}$

$b =$  \_\_\_\_\_

9.  $A = 40 \text{ yd}^2$

$b = 10 \text{ yd}$

$h =$  \_\_\_\_\_

## Test Prep

10. A triangular piece of land has a base of 12 yards and a height of 16 yards. What is the area of the piece of land?

A  $192 \text{ yd}^2$

C  $48 \text{ yd}^2$

B  $96 \text{ yd}^2$

D None of the above

11. A square quilt block measures 6 inches  $\times$  6 inches. It is made up of two congruent triangles. What is the area of each triangle? Explain how you found your answer.

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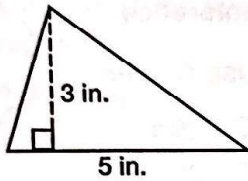


# Area of a Triangle

## How to Find the Area of a Triangle

$b = 5 \text{ in.}$

$h = 3 \text{ in.}$



Use the formula  $A = \frac{1}{2}bh$

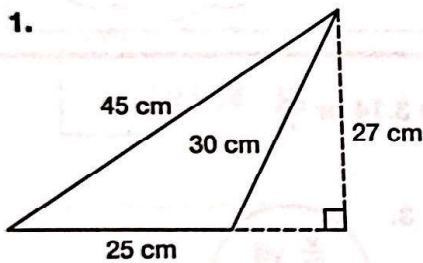
$A = \frac{1}{2}(5 \times 3)$

$A = \frac{1}{2}(15)$

$A = 7.5 \text{ in.}^2$

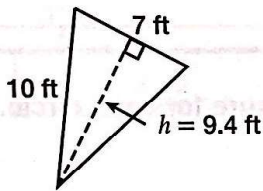
Find the area of each figure or missing measure of each triangle.

1.



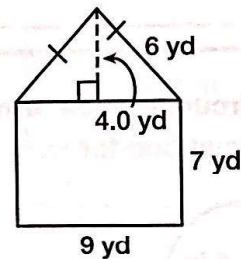
$A = \underline{\hspace{2cm}}$

2.



$A = \underline{\hspace{2cm}}$

3.



$A = \underline{\hspace{2cm}}$

4.  $A = \underline{\hspace{2cm}}$

$b = 15 \text{ ft}$

$h = 30 \text{ ft}$

5.  $A = \underline{\hspace{2cm}}$

$b = 8 \text{ yd}$

$h = 7.45 \text{ yd}$

6.  $A = \underline{\hspace{2cm}}$

$b = 9\frac{1}{2} \text{ m}$

$h = 6\frac{1}{4} \text{ m}$

7.  $A = 66 \text{ cm}^2$

$b = 11 \text{ cm.}$

$h = \underline{\hspace{2cm}}$

8.  $A = 21.6 \text{ yd}^2$

$b = 13.5 \text{ yd}$

$h = \underline{\hspace{2cm}}$

9.  $A = 32.5 \text{ ft}^2$

$b = 13 \text{ ft}$

$h = \underline{\hspace{2cm}}$

### Problem Solving

10. A triangular piece of fabric has an area of 45 square inches. If the height of the fabric is 6 inches, what is the length of the base of the piece of fabric?

Show Your Work

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