LESSON
13.2 Area of Triangles

? ESSENTIAL QUESTION
How do you find the area of a triangle?

EXPLORE ACTIVITY 1 COMMON CORE 6.G.1

Area of a Right Triangle

A Draw a large rectangle on grid paper.

What is the formula for the area of a rectangle? $A =$ **bh**

B Draw one diagonal of your rectangle.

The diagonal divides the rectangle into **two right triangles**

Each one represents $\frac{1}{2}$ **half** of the rectangle.

Use this information and the formula for area of a rectangle to write a formula for the area of a right triangle. $A =$ **$\frac{1}{2}bh$**

Reflect

1. **Communicate Mathematical Ideas** In the formula for the area of a right triangle, what do b and h represent?
   base and height

EXPLORE ACTIVITY 2 COMMON CORE 6.G.1

Area of a Triangle

A Draw a large triangle on grid paper. Do not draw a right triangle.

B Cut out your triangle. Then trace around it to make a copy of your triangle. Cut out the copy.

C Cut one of your triangles into two pieces by cutting through one angle directly across to the opposite side. Now you have three triangles — one large triangle and two smaller right triangles.

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EXPLORE ACTIVITY 2 *(cont'd)*

When added together, the areas of the two smaller triangles equal the **area** of the large triangle.

D Arrange the three triangles into a rectangle.

What fraction of the rectangle does the large triangle represent? **$\frac{1}{2}$ half**

The area of the rectangle is $A = bh$. What is the area of the large triangle? $A =$ **$\frac{1}{2}bh$**

How does this formula compare to the formula for the area of a right triangle that you found in Explore Activity 1?
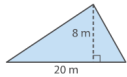**It's the same**

Reflect

2. **Communicate Mathematical Ideas** What type of angle is formed by the base and height of a triangle?
   Right angle

Finding the Area of a Triangle

Area of a Triangle

The area A of a triangle is half the product of its base b and its height h.

$$A = \frac{1}{2}bh$$

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EXAMPLE 1 COMMON CORE 6.G.1

Find the area of each triangle.

A

$b = 20$ meters $h = 8$ meters

$A = \frac{1}{2}bh$

$= \frac{1}{2}$ (20 meters) (8 meters)   *Substitute.*

$= 80$ square meters   *Multiply.*

8 m

20 m

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Find the area of each triangle.

B

5 in.

12 in.

$b = 12$ inches $h = 5$ inches

$A = \frac{1}{2} bh$

$= \frac{1}{2}(12 \text{ inches})(5 \text{ inches})$ Substitute.

$= 30$ square inches   Multiply.

YOUR TURN

Find the area of the triangle.

3.

14 in.

8.5 in.

$A =$ _____

Handwritten: $A = \frac{1}{2}bh$; 14 ; $2\overline{)119}$; $\times 8.5$; $59\frac{1}{2}in^2$; $59.5 in^2$; 119.0

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Math Talk
Mathematical Practices
Why can you also write the formula for the area of a triangle as $A = \frac{bh}{2}$?

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Problem Solving Using Area of Triangles

You can use the formula for the area of a triangle to solve real-world problems.

EXAMPLE 2 Real World   COMMON CORE **6.G.1**

Each triangular face of the Pyramid of Peace in Kazakhstan is made up of 25 smaller equilateral triangles. These triangles have measurements as shown in the diagram. What is the area of one of the smaller equilateral triangles?
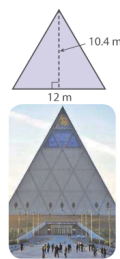
10.4 m

12 m

STEP 1 Identify the length of the base and the height of the triangle.

$b = 12$ m and $h = 10.4$ m

STEP 2 Use the formula to find the area of the triangle.

$A = \frac{1}{2} bh$ Substitute.

$= \frac{1}{2}(12)(10.4)$ Multiply.

$= 62.4$

The area of one small equilateral triangle is 62.4 m².

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Reflect

4. **Persevere in Problem Solving** What is the total area of one face of the pyramid? What is the total surface area of the faces of the pyramid, not counting the bottom? (Hint: the bottom of the pyramid is a square.)

_____

_____

_____

Handwritten: $A = \frac{1}{2} 24$

YOUR TURN

5. Amy needs to order a shade for a triangular-shaped window that has a base of 6 feet and a height of 4 feet. What is the area of the shade?
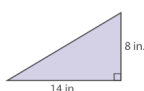
_____

Handwritten: $12 ft^2$

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Guided Practice

Find the area of each triangle. (Explore Activities 1 and 2, Example 1)

1.

8 in.

14 in.

$A = \frac{1}{2} bh$

$= \frac{1}{2}(\text{_____})(\text{_____})$

$= \text{_____} in^2$

2. A pennant in the shape of a triangle has a base of 12 inches and a height of 30 inches. What is the area of the pennant? (Example 2)

$A = \frac{1}{2} bh$

$= \frac{1}{2}(\text{_____})(\text{_____})$

$= \text{_____} in^2$

GO COYOTES!

? ESSENTIAL QUESTION CHECK-IN

3. How do you find the area of a triangle?

_____

_____

_____

Name _____ Class _____ Date _____

13.2 Independent Practice
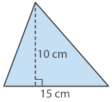
COMMON CORE 6.G.1
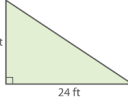
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Find the area of each triangle.

$A = \frac{1}{2}bh$

4.

10 cm
15 cm

$= 15 \cdot 10$
$\frac{1}{2} 150$
75 cm^2

5.

20 ft
24 ft

24
$\times 20$
00
$+480$
240 ft^2

6.

17 in.
12 in.

17
$\times 12$
34
170
204
102 in^2

$\cancel{75.25}$
$\times 18$
12200
15250
27450

7.

18 ft
32 ft

$A = \frac{1}{2}bh$

$2\overline{)576}$
-4
-16
16

288
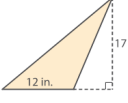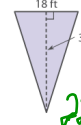
32
$\times 18$
256
320
576

288 ft^2

8. What is the area of a triangle that has a base of $15\frac{1}{4}$ in. and a height of 18 in.?

_____
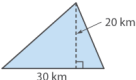
9. A right triangle has legs that are 11 in. and 13 in. long. What is the area of the triangle?

_____

10. A triangular plot of land has the dimensions shown in the diagram. What is the area of the land?

_____

20 km
30 km

11. The front part of a tent has the dimensions shown in the diagram. What is the area of this part of the tent?

_____

5 ft
8 ft

12. **Multistep** The sixth-grade art students are making a mosaic using tiles in the shape of right triangles. Each tile has leg measures of 3 centimeters and 5 centimeters. If there are 200 tiles in the mosaic, what is the area of the mosaic?
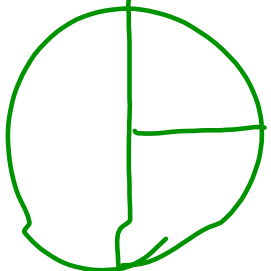
13. **Critique Reasoning** Monica has a triangular piece of fabric. The height of the triangle is 15 inches and the triangle's base is 6 inches. Monica says that the area of the fabric is 90 in². What error did Monica make? Explain your answer.

_____

_____

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137.25 in^2

$2\overline{)274.50}$
-2
7
-6
14
-14
5
-4
0

14. Multistep Wayne is going to paint the side of the house shown in the diagram. What is the area that will be painted? Explain how you found your answer.

400ft² because I added the area of the triangle which was 100ft² to the area of the rectangle which was 300ft²

Handwritten work (green):
$A = \frac{1}{2}bh$
$\frac{1}{2}25 \cdot 8$
$= 100$

$25 \times 8 = 200$

$25 \times 12 = 300$ ($50 + 250 = 300$)

House diagram labels: 100 ft², 25 ft, 300 ft², 12 ft, 25 ft

Work Area

H.O.T. FOCUS ON HIGHER ORDER THINKING

15. Communicate Mathematical Ideas Explain how the areas of a triangle and a parallelogram with the same base and height are related.

_____
_____
_____
_____
_____
_____

16. Analyze Relationships A rectangle and a triangle have the same area. If their bases are the same lengths, how do their heights compare? Justify your answer.

_____
_____
_____
_____
_____
_____
_____
_____

17. What If? A right triangle has an area of 18 square inches.

a. If the triangle is an isosceles triangle, what are the lengths of the legs of the triangle?

_____

b. If the triangle is not an isosceles triangle, what are all the possible lengths of the legs, if the lengths are whole numbers?

_____
_____

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