

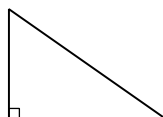
# Key Concepts

Lesson  
14-2

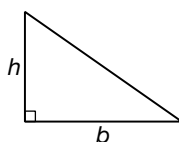
## Area of Triangles

**Objective** Teach students the formula for finding the area of a triangle, justify that the formula is true, and use the formula to find the areas of triangles.

**Note to the Teacher** *In this lesson your students will learn to compute the area of triangles. The general formula for the area of a triangle is one half the base times the height:  $A = \frac{1}{2}bh$ . While this formula works for any triangle, conceptually it is most clear for right triangles. Therefore it is suggested that you begin by reminding your students that a right triangle is a triangle where one of the angles is  $90^\circ$ .*



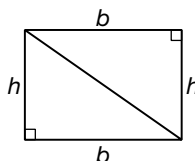
*Right Triangle*



*The area of this right triangle is  $\frac{1}{2}bh$ .*

## Area of Right Triangles

Have a class discussion to see if your students can determine why the area of a right triangle is given by the expression  $\frac{1}{2}bh$ . To get them started, point out that two right triangles of the same height and base ( $h$  and  $b$ , respectively) can form a rectangle of height  $h$  and width  $b$ , as shown below.



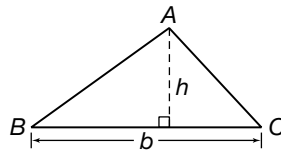
We know that the area of the entire rectangle is  $b \cdot h$  and that both triangles have the same area. Therefore the area of each of the right triangles is half of the area of the rectangle, or  $\frac{1}{2}bh$ .

## Area of Triangles

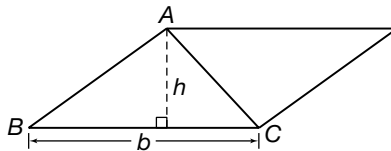
Draw a non-right triangle with vertices  $A$ ,  $B$ , and  $C$ . Let  $h$  (the height) be the distance from vertex  $A$  to the line containing the side  $BC$ .

Let  $b$  (the base) be the length of the side  $BC$ . Add these measures to your triangle, as shown below. Again, give your students the formula

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



Now, have a class discussion about why the area formula is true for all triangles. On your triangle, draw a line segment of length  $b$  beginning at vertex  $A$  and parallel to side  $BC$ . Connecting the other endpoint of the new segment to either  $B$  or  $C$  (depending on which direction from point  $A$  you drew the segment) makes a parallelogram of height  $h$  and base  $b$ . The area of the parallelogram is  $b \cdot h$ . Point out that this parallelogram consists of the original triangle and another triangle that is the same size and shape. So both of the triangles have the same area. Therefore both triangles have an area equal to half the area of the parallelogram, or  $\frac{1}{2}bh$ .



Now work through a problem in class. Here is a good one that comes from the Student Edition.

**Example 1** The Bermuda Triangle is a triangular region in the Atlantic Ocean whose vertices are the island of Bermuda, the coastal town of Melbourne, Florida, and the island of Puerto Rico. (See the diagram in the Student Edition.) Suppose the base of the triangle is viewed as the line from Bermuda to Melbourne, which is 1,150 miles. Then the height of the triangle is the distance from Puerto Rico to the line connecting Bermuda to Melbourne, which is 756 miles. What is the area of the Bermuda Triangle?

**Solution** Use the formula for the area of a triangle.

$$\begin{aligned} A &= \frac{1}{2}bh \\ &= \frac{1}{2}(1,150)(756) \\ &= 434,700 \end{aligned}$$

So, the area of the Bermuda Triangle is 434,700 square miles.

Finally, have your students do several problems like the following examples.

**Example 2** Find the area of a triangle having height 4 and base length 12.

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

$$\begin{aligned} A &= \frac{1}{2}(12)(4) \\ &= 24 \end{aligned}$$

**Example 3** Find the area of a triangle having height 2.5 and base length 3.4.

**Solution**  $A = \frac{1}{2}(3.4)(2.5)$

$$= 4.25$$

**Example 4** Find the area of a triangle having height  $\frac{2}{7}$  and base length 3.

**Solution**  $A = \frac{1}{2}(3)\left(\frac{2}{7}\right)$

$$= \frac{3}{7}$$

## Exercise

Can triangles with different shapes have the same area? Justify your answer. **Yes; two triangles might have the same base and height measurements, and therefore the same area, but look different. Ask your students to draw some examples; one example is shown below.**

