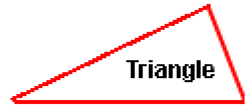
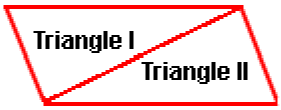
Homework: Pages 65-70.and Review C, pages 93-96 Happy New Year! See you next Year!

Area of a Triangle Part I

Unit 1 >

The area of a polygon is the number of square units inside that polygon. Area is 2-dimensional like a carpet or an area rug. A **triangle** is a three-sided polygon. We will look at several types of triangles in this lesson.





To find the area of a triangle, multiply the base by the height, and then divide by 2. The division by 2 comes from the fact that a parallelogram can be divided into 2 triangles. For example, in the diagram to the left, the area of each triangle is equal to one-half the area of the parallelogram.

Since the area of a parallelogram is $A = b \cdot h$, the area of a triangle must be one-half the area of a parallelogram. Thus, the formula for the area of a triangle is:

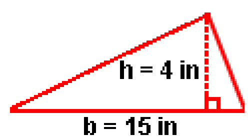
$$A = \frac{1}{2} \cdot b \cdot h \quad \text{or} \quad A = \frac{b \cdot h}{2}$$

where b is the base, h is the height and $\cdot$ means multiply.

The base and height of a triangle must be perpendicular to each other. In each of the examples below, the base is a side of the triangle. However, depending on the triangle, the height may or may not be a side of the triangle. For example, in the right triangle in Example 2, the height is a side of the triangle since it is perpendicular to the base. In the triangles in Examples 1 and 3, the lateral sides are not perpendicular to the base, so a dotted line is drawn to represent the height.

Unit 1 >

Example 1: Find the area of an acute triangle with a base of 15 inches and a height of 4 inches.



Solution:

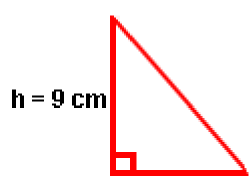
$$A = \frac{1}{2} \cdot b \cdot h$$

$$A = \frac{1}{2} \cdot (15 \text{ in}) \cdot (4 \text{ in})$$

$$A = \frac{1}{2} \cdot (60 \text{ in}^2)$$

$$A = 30 \text{ in}^2$$

Example 2: Find the area of a right triangle with a base of 6 centimeters and a height of 9 centimeters.



Solution:

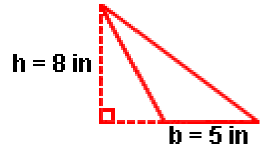
$$A = \frac{1}{2} \cdot b \cdot h$$

$A = \frac{1}{2} \cdot (6\text{ cm}) \cdot (9\text{ cm})$

$A = \frac{1}{2} \cdot (54\text{ cm}^2)$

$A = 27\text{ cm}^2$

Example 3: Find the area of an obtuse triangle with a base of 5 inches and a height of 8 inches.



Solution:

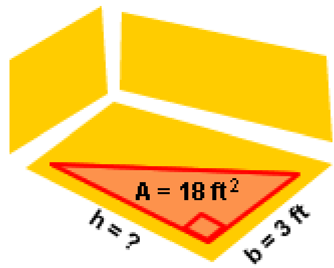
$A = \frac{1}{2} \cdot b \cdot h$

$A = \frac{1}{2} \cdot (5\text{ in}) \cdot (8\text{ in})$

$A = \frac{1}{2} \cdot (40\text{ in}^2)$

$A = 20\text{ in}^2$

Example 4: The area of a triangular-shaped mat is 18 square feet and the base is 3 feet. Find the height. *(Note: The triangle in the illustration to the right is NOT drawn to scale.)*



Solution: In this example, we are given the area of a triangle and one dimension, and we are asked to work backwards to find the other dimension.

$A = \frac{1}{2} \cdot b \cdot h$

$18\text{ ft}^2 = \frac{1}{2} \cdot (3\text{ ft}) \cdot h$

Multiplying both sides of the equation by 2, we get:

$36\text{ ft}^2 = (3\text{ ft}) \cdot h$

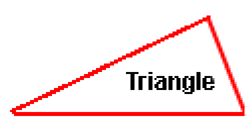
Dividing both sides of the equation by 3 ft, we get:

$12\text{ ft} = h$

Commuting this equation, we get:

$h = 12\text{ ft}$

Summary: Given the base and the height of a triangle, we can find the area. Given the area and either the base or the height of a triangle, we can find the other dimension. The formula for area of a triangle is:



$A = \frac{1}{2} \cdot b \cdot h$ or $A = \frac{b \cdot h}{2}$ where b is the base, h is the height