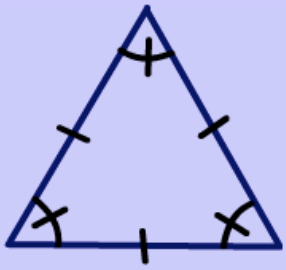
Indicator 28 Class Notes by Mrs. Joshi
Areas of Triangles and Parallelograms-(AL 26, 26a)

I can find the area or missing measure of a parallelogram.
I can find the area or missing measure of a triangle.

Source: https://www.mathgoodies.com

Types of Triangles

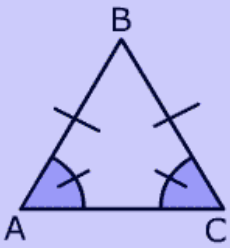
Equilateral triangle



The Equilateral triangle shown on the left has three congruent sides and three congruent angles.

Each angle is 60°

Isosceles triangle



The Isosceles triangle shown on the left has **two** equal sides and two equal angles.

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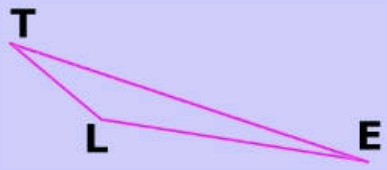
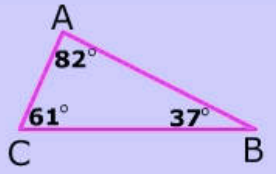
Scalene Triangle



The Scalene Triangle has no congruent sides. In other words, each side must have a different length..

https://www.mathwarehouse.com/geometry/triangles/triangle-types.php#scalene

Acute Triangle



The Acute Triangle has three acute angles (an acute angle measures less than 90°)

https://www.mathwarehouse.com/geometry/triangles/triangle-types.php#acute

Obtuse Triangle

The Obtuse Triangle has an obtuse angle (an obtuse angle has more than 90°). In the picture on the left, the shaded angle is the obtuse angle that distinguishes this triangle

Since the total degrees in any triangle is 180°, an obtuse triangle can only have one angle that measures more than 90°.

https://www.mathwarehouse.com/geometry/triangles/triangle-types.php#obtuse

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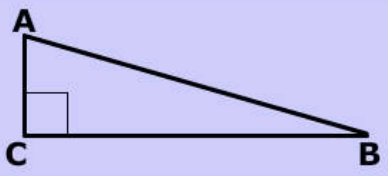
Right Triangles



A right triangle has one 90° angle and a variety of often-studied topics:

- Pythagorean Theorem
- Pythagorean Triplets
- Sine, Cosine, Tangent

Area of a Triangle

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.

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 below, the area of each triangle is equal to one-half the area of the parallelogram.

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Since the area of a parallelogram is A = B * 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 · 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.

Definition

Perpendicular lines meet at a right (90 degree) angle. The symbol for a right angle is ◻ .

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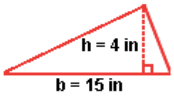
Area of a Triangle - Examples

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

Solution:

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



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

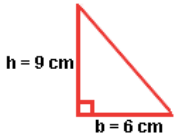
$A = \frac{1}{2} \cdot (60 \text{ in}^2)$

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

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

Solution:

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



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

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

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

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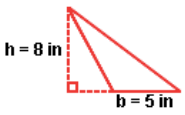
Example 3: Find the area of an obtuse triangle with a base of 5 inches and a height of 8 inches.

Solution:

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

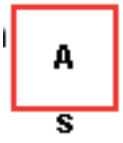


$A = \frac{1}{2} \cdot (5 \text{ in}) \cdot (8 \text{ in})$

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

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

Area of a Square



A **square** is a rectangle with 4 equal sides. To find the area of a square, multiply the length of one side by itself. The formula is:

$A = S^2$ or $A = S \cdot S$ where A is the area, s is the length of a side, and · means multiply.

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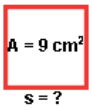
Example 1: Find the area of a square with each side measuring 2 inches.

Solution: $A = s \cdot s$

A = (2 in) • (2 in) = 4 in^2

Example 3: The area of a square is 9 square centimeters. How long is one side?



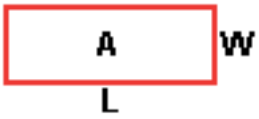
Solution: $A = s \cdot s$

9 cm^2 = s * s

Since 3 • 3 = 9, we get 3 cm • 3 cm = 9 cm^2. So s must equal 3 cm.

s = 3 cm.

Area of a Rectangle



To find the area of a rectangle, multiply the length by the width. The formula is:

A = L * W where A is the area, L is the length, W is the width, and * means multiply.

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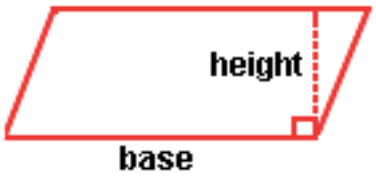
Example 2: A rectangle has a length of 8 centimeters and a width of 3 centimeters. Find the area.

Solution: A = L * W

$A = (8\ cm) \cdot (3\ cm) = 24\ cm^2$

Area of a Parallelogram



The area of a polygon is the number of square units inside the polygon. Area is 2-dimensional like a carpet or an area rug.

A parallelogram is a 4-sided shape formed by two pairs of parallel lines. Opposite sides are equal in length and opposite angles are equal in measure. To find the area of a parallelogram, multiply the base by the height. The formula is:

A = B * H where B is the base, H is the height, and * means multiply.

The base and height of a parallelogram must be perpendicular. However, the lateral sides of a parallelogram are not perpendicular to the base. Thus, a dotted line is drawn to represent the height. Let's look at some examples involving the area of a parallelogram.

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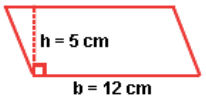
Example 1: Find the area of a parallelogram with a base of 12 centimeters and a height of 5 centimeters.



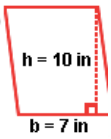
Solution:

A = B * H

A = (12 cm) · (5 cm)

A = 60 cm^2

Example 2: Find the area of a parallelogram with a base of 7 inches and a height of 10 inches.



Solution:

A = B * H

A = (7 in) · (10 in)

A = 70 in^2
