

We learned the formula to calculate the area of a Right Triangle in Elementary School, here it is if you forgot...

$$\text{Area} = \frac{1}{2} \cdot \text{base} \cdot \text{height}$$

Today we will learn a couple of formulas to calculate the Area of general triangles (not Right Triangles) known as:

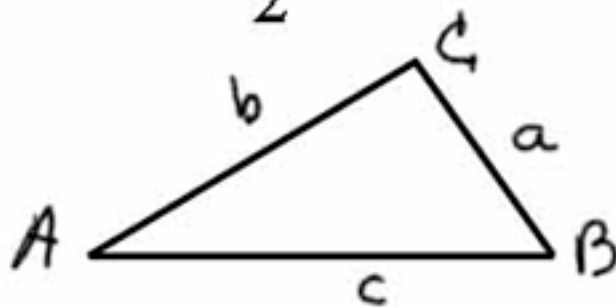
- 1) The Law of Sines and
- 2) Hero's Formula

The Law of Sines is best suited to triangles where you know the measures of two sides and the included angle (SAS) and wish to calculate the Area. The formulas are:

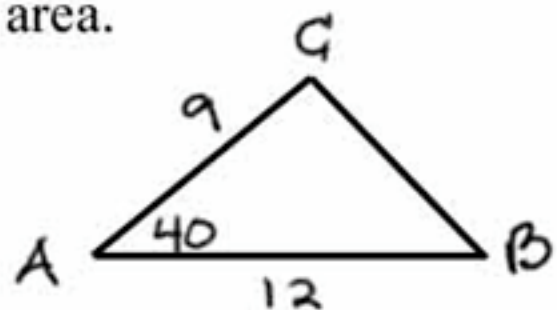
$$\text{Area} = \frac{1}{2} bc \sin A$$

$$\text{Area} = \frac{1}{2} ac \sin B$$

$$\text{Area} = \frac{1}{2} ab \sin C$$



Ex 1) In triangle ABC, $b = 9$, $c = 12$, and $\angle A = 40^\circ$. Find the area.



$$\text{Area} = \frac{1}{2}bc \sin A$$

$$\text{Area} = (0.5)(9)(12)(\sin 40^\circ)$$

$$\text{Area} = 54(0.6428)$$

$$\text{Area} = 34.7112 \text{ square units}$$

Hero's Formula can be used if you know all three sides of the triangle. This formula is a two step process:

- 1) Calculate a variable called s (**half the sum** of all three sides)
- 2) Use s and the three sides (a , b , c) to calculate the Area

Here are the two parts of the formula:

$$s = \frac{1}{2}(a + b + c)$$

$$\text{Area} = \sqrt{s(s-a)(s-b)(s-c)}$$

Ex 2) Find the area of the triangle whose sides have lengths of 50 feet 60, feet and 80 feet.

$$s = \frac{1}{2}(a + b + c)$$

$$s = \frac{1}{2}(50 + 60 + 80)$$

$$s = 95$$

$$\text{Area} = \sqrt{s(s-a)(s-b)(s-c)}$$

$$= \sqrt{95(95-50)(95-60)(95-80)}$$

$$= \sqrt{95(45)(35)(15)}$$

$$= \sqrt{2244375}$$

$$\doteq 1498.1238 \text{ square feet}$$