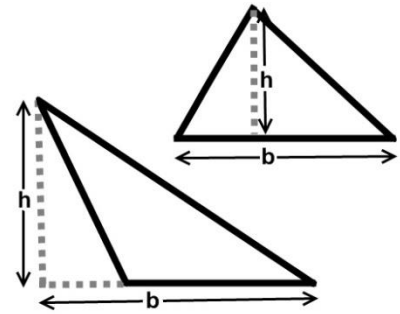


**Area of a Triangle**

The most common formula for area of a triangle is  $A = \frac{1}{2}bh$  where  $b$  is base and  $h$  is height.



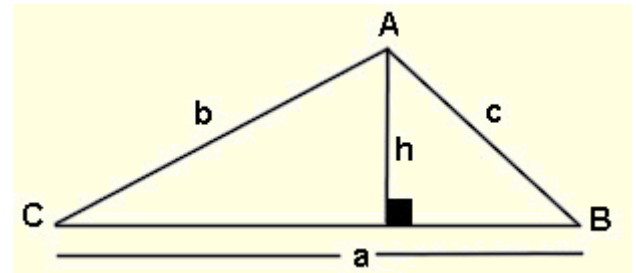
But what if we don't know the height? GET CREATIVE ☺

By using the right triangle on the left side of the diagram, and our knowledge of trigonometry, we can state that:

$$\sin C = \frac{h}{b}$$

$$b \sin C = h$$

Thus, the height can be expressed as  $b \sin C$



If we substitute this in to our common area formula we get:

$$A = \frac{1}{2}ab \sin C$$

where  $a$  and  $b$  are adjacent sides and  $C$  is the included angle (**THIS HAS TO BE TRUE!**)

**Example 1:** Find the area of a triangle with the sides of length 7 and 9 and the included angle of  $72^\circ$ .

$$A = \left(\frac{1}{2}\right)(7)(9) \sin 72$$

$$A \approx 29.96$$

**Example 2:** Find the area of a triangle with the sides of length 10 and 22 and the included angle of  $10^\circ$ .

$$A = \left(\frac{1}{2}\right)(10)(22) \sin 10$$

$$A \approx 19.1$$

**Example 3:** Find the area of an equilateral triangle with side length of 10.

all  $\angle$ 's =  $60^\circ$   
all sides are congruent

$$A = \left(\frac{1}{2}\right)(10)(10) \sin 60$$

$$A \approx 43.3$$

**Example 4:** In  $\triangle ABC$ ,  $AB = 12$  meters and  $AC = 20$  meters. If the area of the triangle is 77 sq. meters, find the measure of  $\angle A$ , to the nearest degree.

$$77 = \left(\frac{1}{2}\right)(12)(20)\sin A$$

$$\frac{77}{120} = \frac{120 \sin A}{120}$$

$$\sin^{-1} = \frac{77}{120}$$

$$A \approx 40^\circ$$

**Example 5:** A farmer has a triangular field where two sides measure 450 yards and 320 yards. The angle between these two sides measures  $80^\circ$ . The farmer wishes to use an insecticide that costs \$4.50 per 100 sq. yards or any part of 100 yds. What will it cost to use this insecticide on this field?

$$A = \left(\frac{1}{2}\right)(450)(320)\sin 80$$

$$\frac{70,906}{100} = 709 \cdot 4.50$$

$$A \approx 70,906$$

$$\$3190.77$$

### Unit 2 Day 3 HW

Find the area of the triangle.

- In  $\triangle ABC$ ,  $AB = 10$ ,  $AC = 8$ , and  $m\angle A = 45^\circ$ . Find the area of  $\triangle ABC$ , to the *nearest tenth* of a square unit.
- In an isosceles  $\triangle$ , the two equal sides each measure 24 meters, and they include an angle of  $30^\circ$ . Find the area of the isosceles triangle, to the *nearest sq. meter*.
- A triangle has two sides of 30 meters and 26 meters, and the angle between them is an obtuse angle. If the area of the triangle is 300 sq. meters, find the measure of the obtuse angle (to the
- If the vertex angle of an isosceles triangle measures  $30^\circ$  and each leg measures 4, find the area of the triangle.
- The vertex angle of isosceles triangle ABC measures  $30^\circ$ , and each leg has length 20. What is the area of ABC?
- Jack is planting a triangular rose garden. The lengths of two sides of the plot are 8 feet and 12 feet, and the angle between them is  $87^\circ$ . Write an expression that could be used to find the area of this garden?