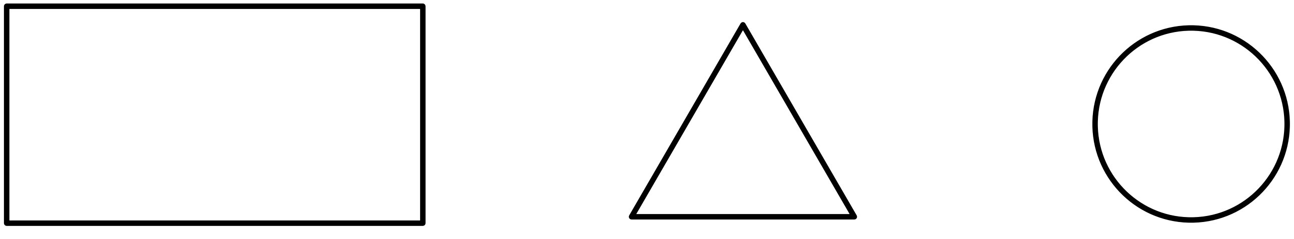
Math-2A
Lesson 9-7

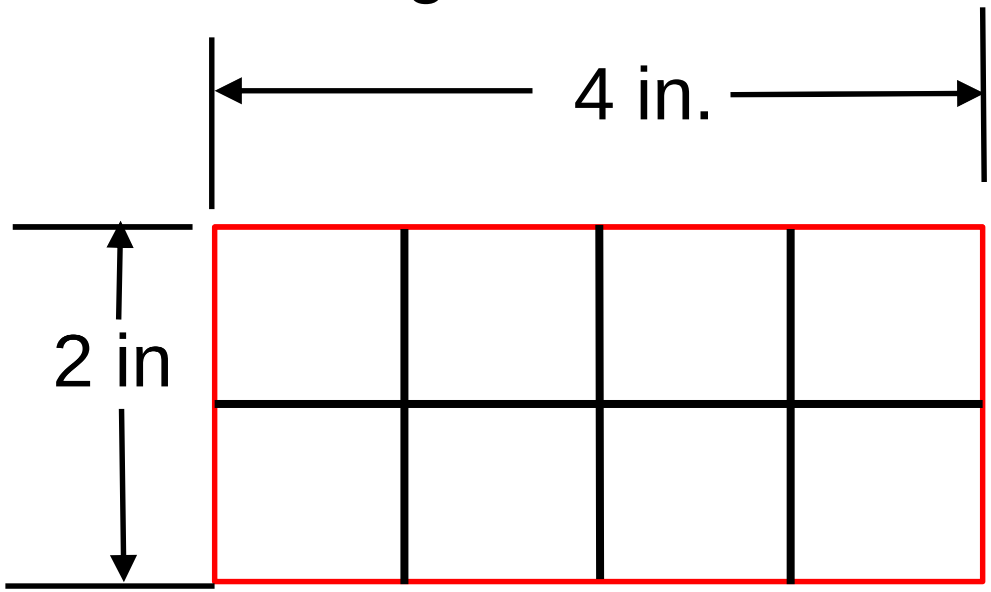
Area of Triangles

Formula: an equation that "relates" real-world quantities.

For the following geometric shapes, how would you answer the question: "How big is it?"



The area of this rectangle is….?



$$Area_{rectangle} = L * W$$

$$Area_{rectangle} = (2\ in)(4\ in)$$

$$Area_{rectangle} = 2 * 4 * \ in * \ in$$

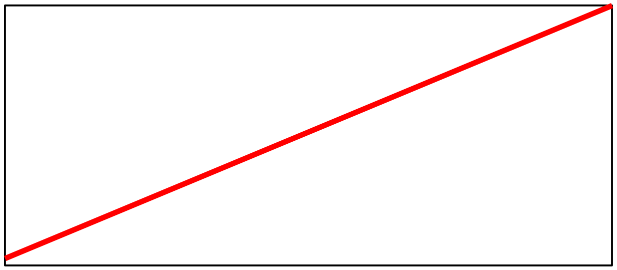
$$Area_{rectangle} = 8\ in^2$$

What are the units of area?

Rectangle area formula. $A_{\text{rectangle}} = L * W$

W = width

L = length



Triangle area formula.

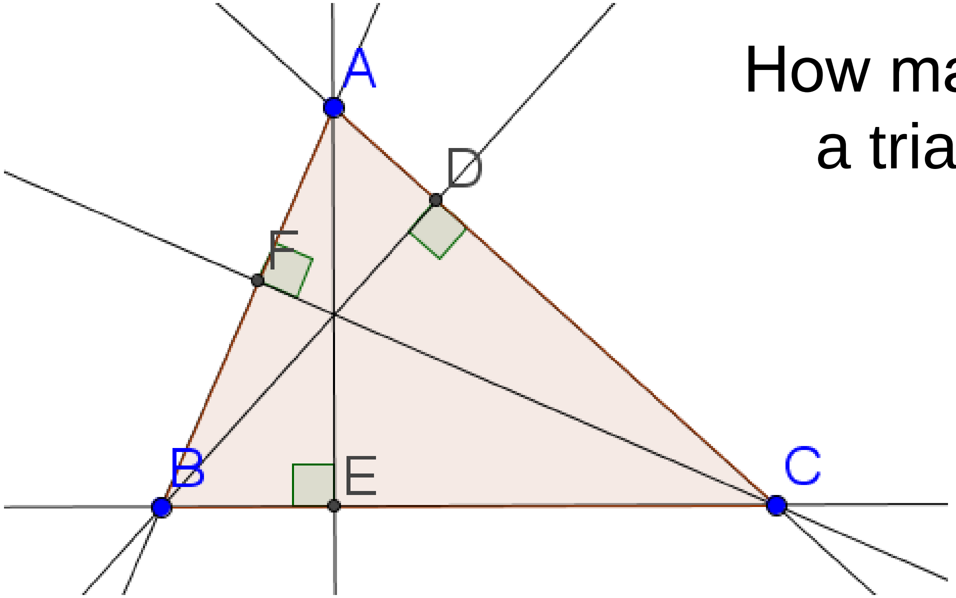
$$A_{\text{triangle}} = \frac{1}{2} * A_{\text{rectangle}} = \frac{1}{2} * L * W$$

$$A_{\text{triangle}} = \frac{1}{2} * B * h$$

Altitude of a triangle: The perpendicular distance from any vertex to its opposite side.

Altitude of a triangle: means the same thing as the height of a triangle.

Height = Altitude



How many "heights" (altitudes) does a triangle have?

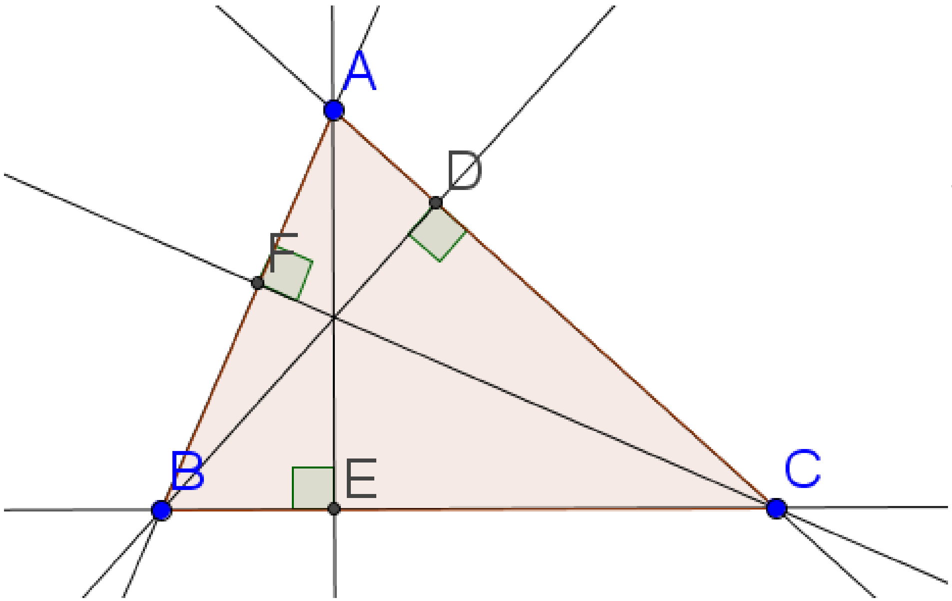
three

base of a triangle: any side of a triangle.

base = side

Height = Altitude

How many different ways are there to calculate the area of a triangle?

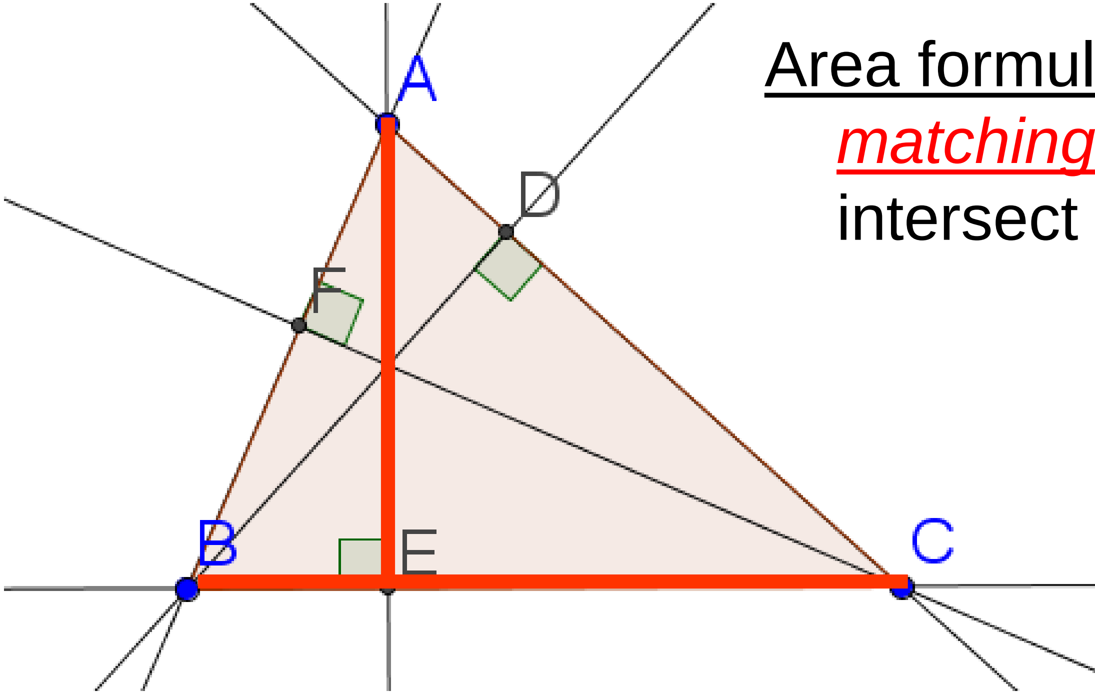


$$A_{\Delta} = \frac{1}{2} * \text{base} * \text{height}$$

three

The altitude of a triangle.

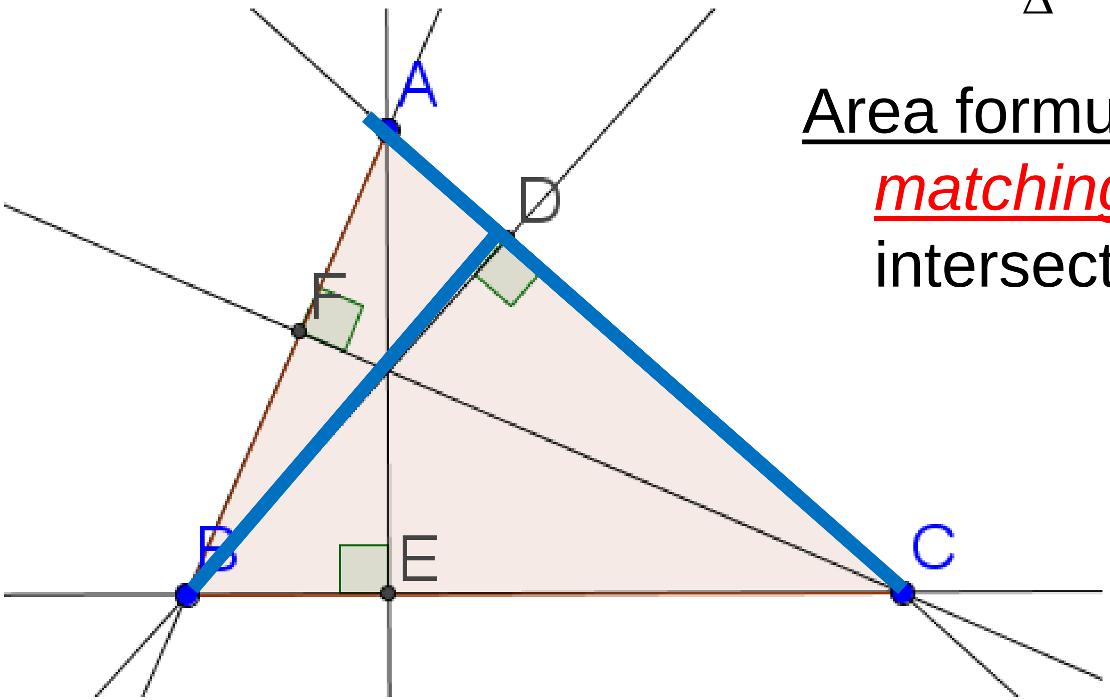
$$A_{\Delta} = \frac{1}{2} * \text{base} * \text{height}$$



Area formula: requires the use of *matching* heights and sides (that intersect at a 90 degree angle).

Using segment BC as the base, requires the use of segment AE as the height.

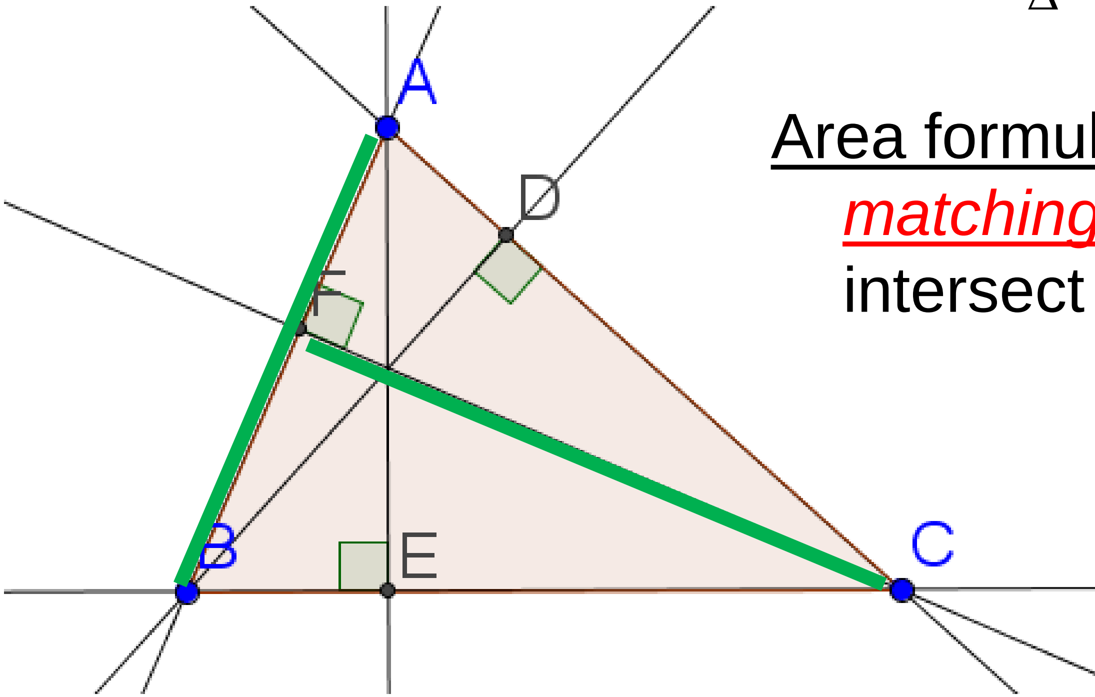
$$A_{\Delta} = \frac{1}{2} * \text{base} * \text{height}$$



Area formula: requires the use of *matching* heights and sides (that intersect at a 90 degree angle).

Using segment AC as the base, requires the use of segment BD as the height.

$$A_{\Delta} = \frac{1}{2} * \text{base} * \text{height}$$



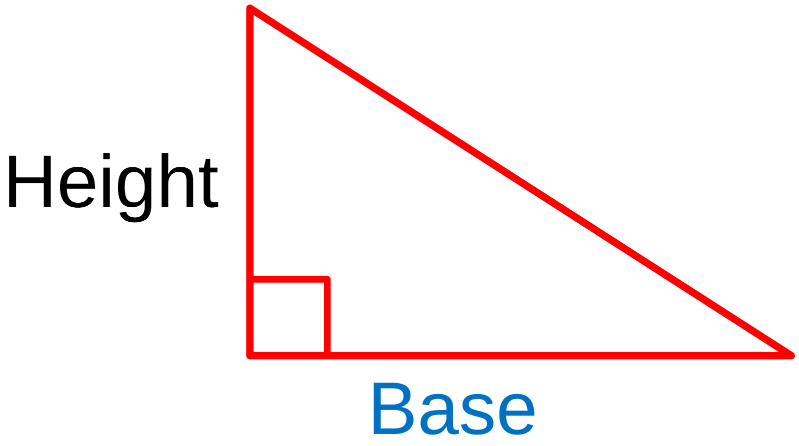
Area formula: requires the use of *matching* heights and sides (that intersect at a 90 degree angle).

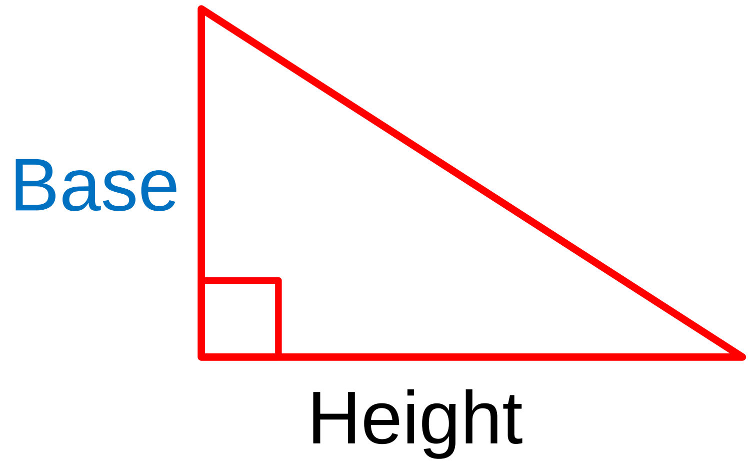
Using segment AB as the base, requires the use of segment FC as the height.

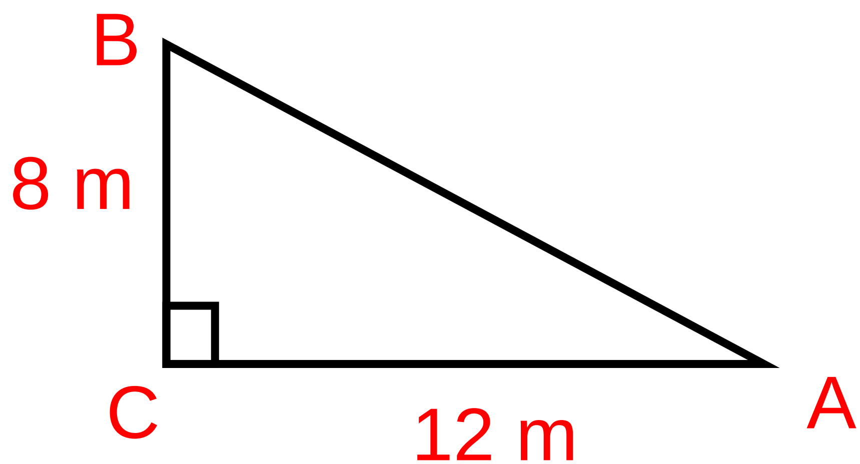
For a <u>right triangle</u>

- one leg is the base
- the other leg is the altitude.

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







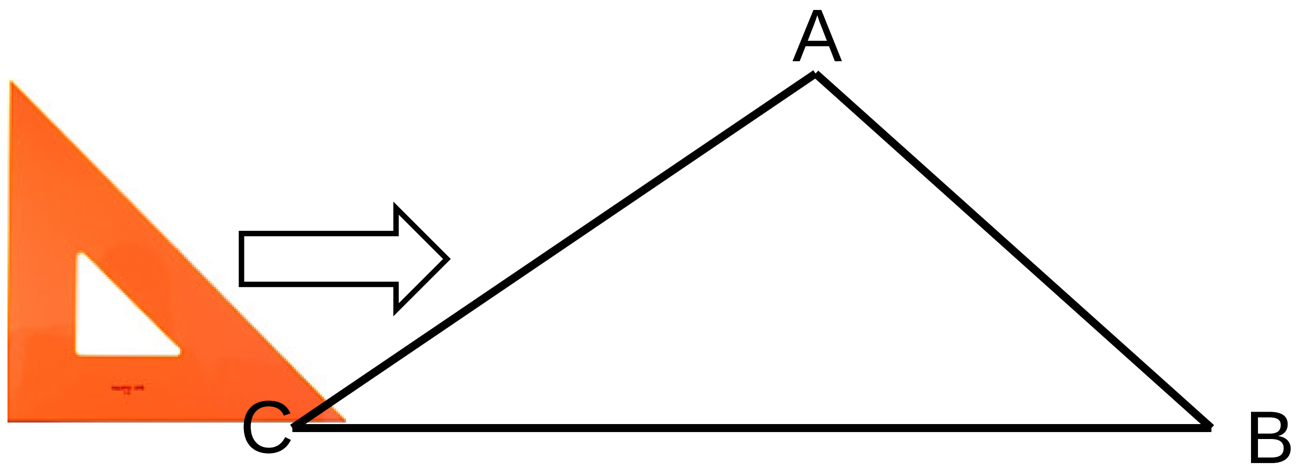
$$A_{\Delta} = \frac{1}{2} * 8 * 12$$

$$A_{\Delta} = 48\, m^2$$

Dropping an altitude: drawing a perpendicular segment from a corner angle to the opposite side.

1) Use the biggest angle.

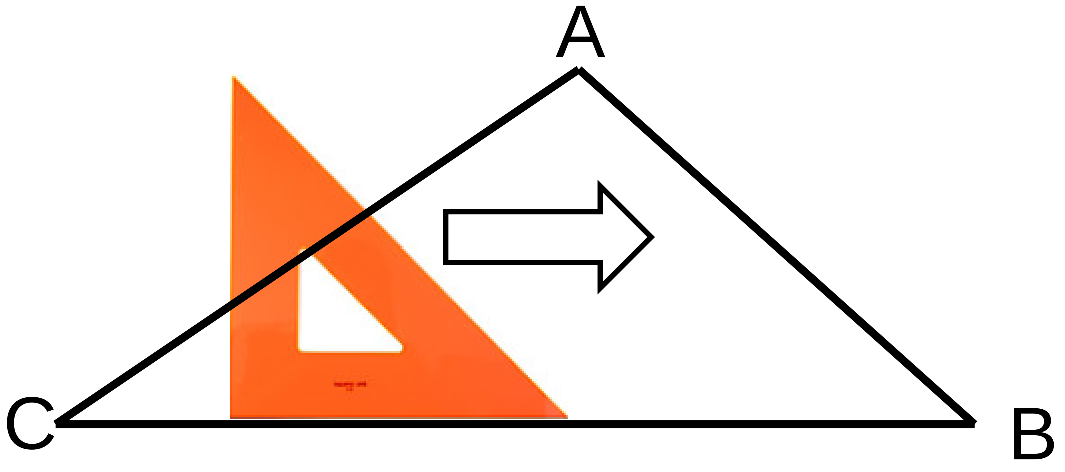
2) Slide the plastic triangle along one edge of your triangle until the vertical side passes through the biggest angle.



<u>Dropping an altitude</u>: drawing a <u>perpendicular</u> segment from <u>a corner angle</u> to the <u>opposite side.</u>

1) Use the biggest angle.

2) Slide the plastic triangle along one edge of your triangle until the vertical side passes through the biggest angle.

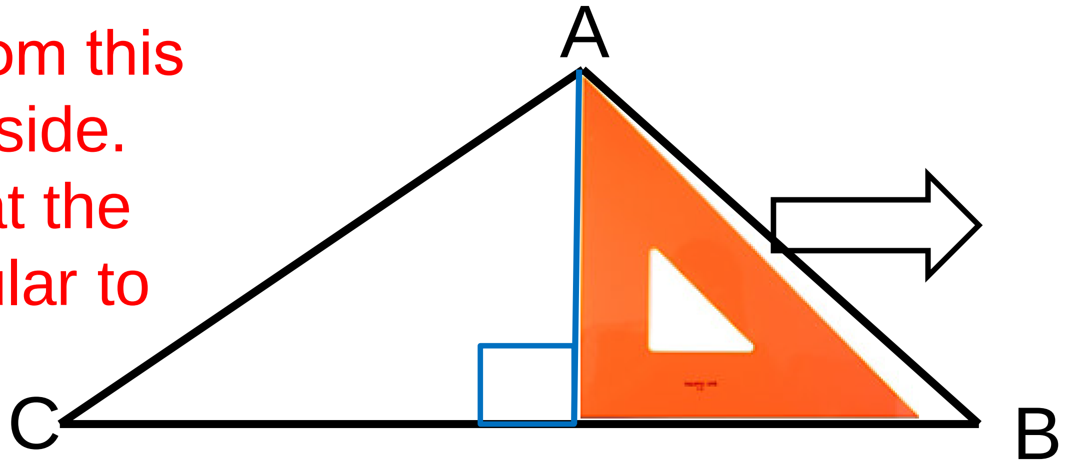


<u>Dropping an altitude</u>: drawing a <u>perpendicular</u> segment from <u>a corner angle</u> to the <u>opposite side.</u>

1) Use the biggest angle.

2) Slide the plastic triangle along one edge of your triangle until the vertical side passes through the biggest angle.

3) "drop an altitude" from this vertex to the opposite side. Make sure to show that the segment is perpendicular to the opposite side.



4) The <u>length of the altitude</u> is the <u>height of the triangle.</u>

Drop an altitude from angle A to opposite side BC.

$$Area = 0.5 * \text{base} * \text{height}$$

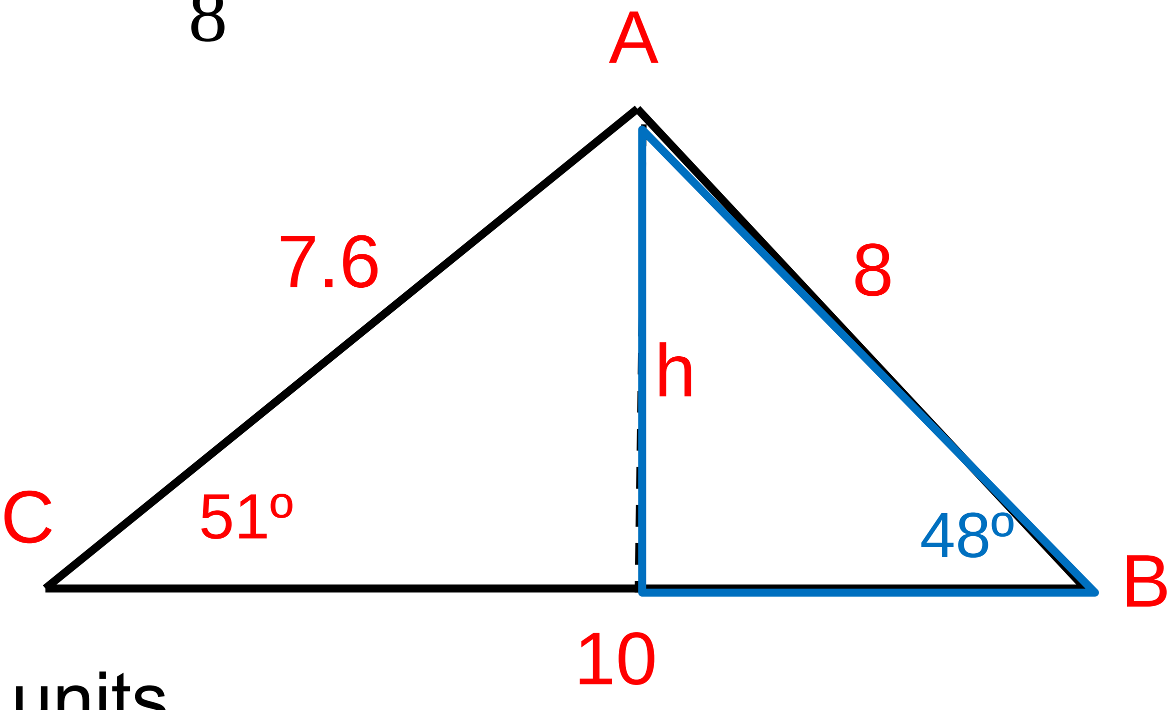
$$\sin A = \frac{opp}{hyp} \qquad \sin(48) = \frac{h}{8}$$

h = 8*Sin(48º)

h = 5.9

Area = ½(10)(5.9)

Area = 29.5 square units



For height "h" we could use the other triangle.

$$Area = 0.5 * \text{base} * \text{height}$$

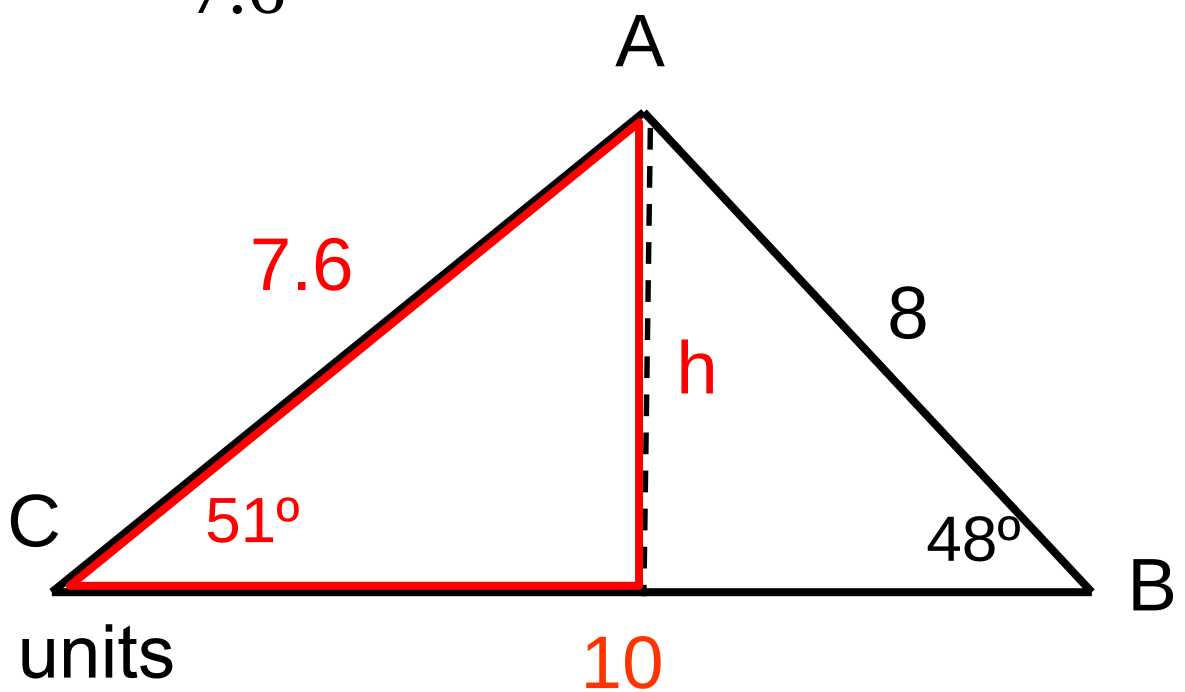
$$\sin A = \frac{opp}{hyp} \qquad \sin(51) = \frac{h}{7.6}$$

h = 7.6*Sin(51º)

h = 5.9

Area = ½(10)(5.9)

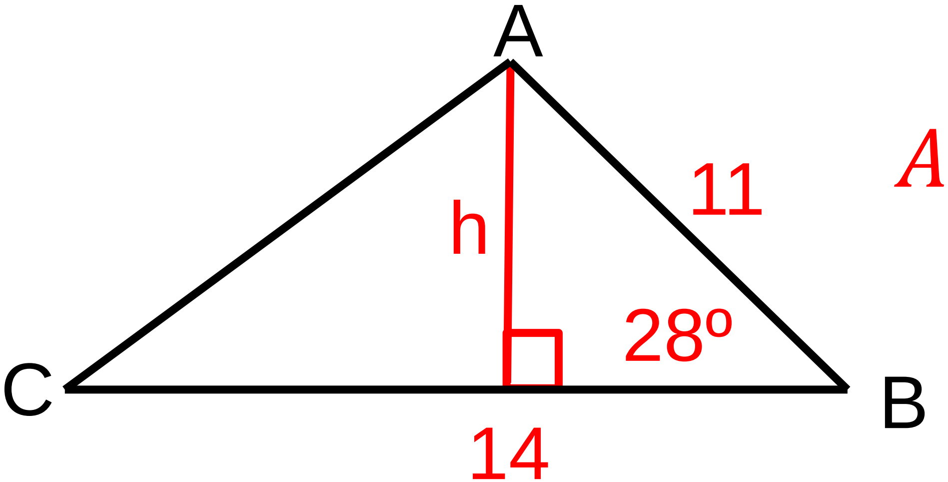
Area = 29.5 square units



Either triangle gives us the same height (and therefore the same area).

B=28, a = 14, c = 11, Find the Area of the Triangle

$$A_{\Delta} = 0.5 * \text{base} * \text{height}$$

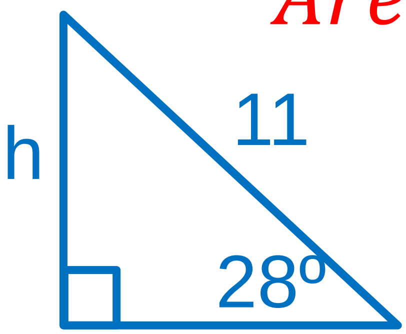


$$Area_{\Delta ABC} = 0.5 * 14 * h$$

$$Area_{\Delta ABC} = 0.5 * 14 * (5.2)$$

$$Area_{\Delta ABC} = 36.1$$

$$\sin 28 = \frac{h}{11}$$



$$11(\sin 28) = h$$

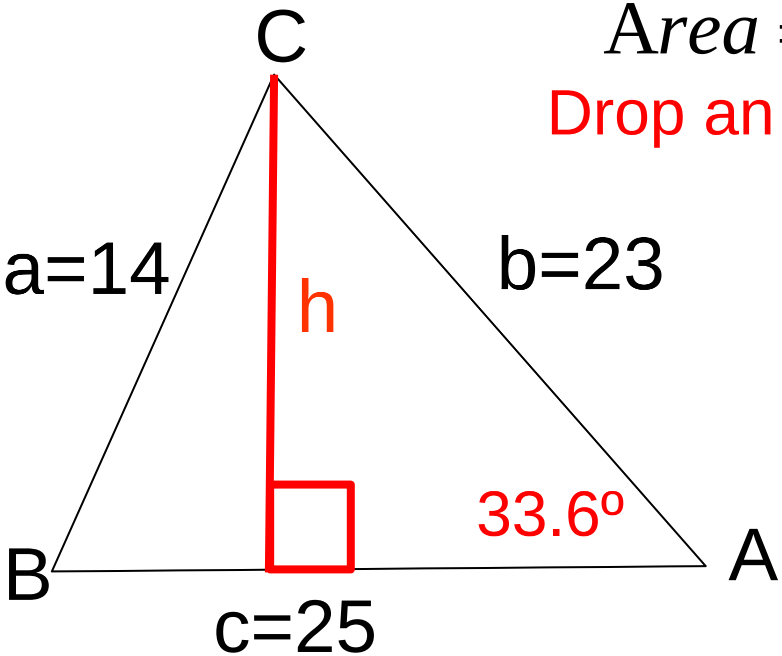
$$h = 5.2$$

A=33.6º, a = 14, b = 23 $Area_{\Delta ABC} = ?$

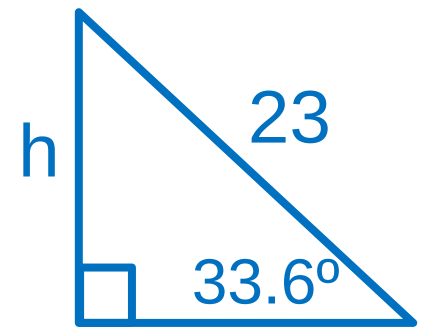
Build an ABC triangle with the longest side on the bottom.

$$Area = 0.5 * \text{base} * \text{height}$$

Drop an altitude to the longest side.



$$\sin 33.6 = \frac{h}{23}$$



$$23\,(\sin 33.6) = h$$

$$h = 12.7$$

$$Area_{\Delta ABC} = 0.5 * 25 * (12.7)$$

$$Area_{\Delta ABC} = 159.1$$