

Geometry

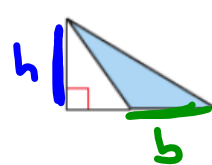
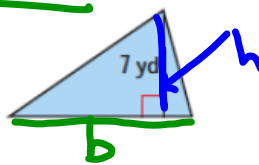
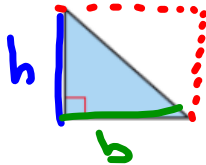
8.4: Area of Triangles

Name: _____

🎯 Students will be able to find the area of a triangle and use the area to find missing side lengths.

☆Height of a Triangle: perpendicular segment from a vertex to the opposite side.

☆Base of a triangle: The opposite side is called the base.

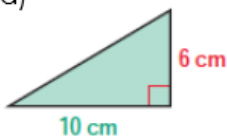


Area of a Triangle:

$$\text{Area} = \frac{\text{base} \times \text{height}}{2} \quad A = \frac{bh}{2} \text{ or } \frac{1}{2}bh$$

Example 1: Find the area of the triangle.

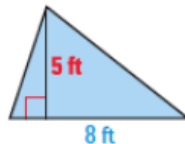
a)



$$A = \frac{bh}{2}$$

$$A = \frac{10 \cdot 6}{2} = \frac{60}{2} = 30 \text{ cm}^2$$

b)

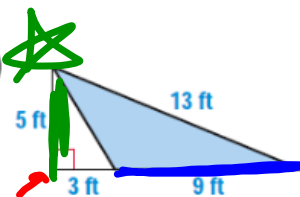


$$A = \frac{1}{2}bh$$

$$A = \frac{1}{2} \cdot 8 \cdot 5$$

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

c)

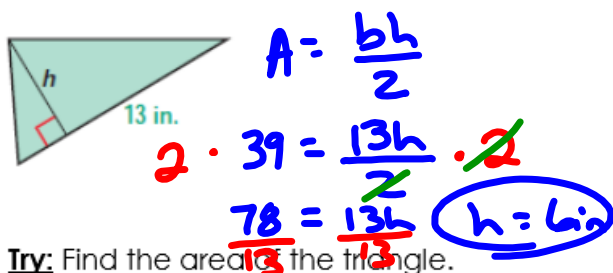


$$A = \frac{5 \cdot 9}{2}$$

$$A = 22.5 \text{ ft}^2$$

Example 2: Find the height of the triangle given the area.

a. Area = 39 square inches.

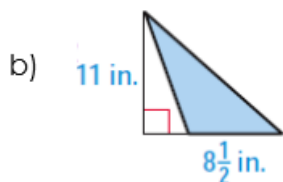


Try: Find the area of the triangle.



$$A = \frac{1}{2}bh$$

$$A = \frac{1}{2} \cdot 2 \cdot 3$$

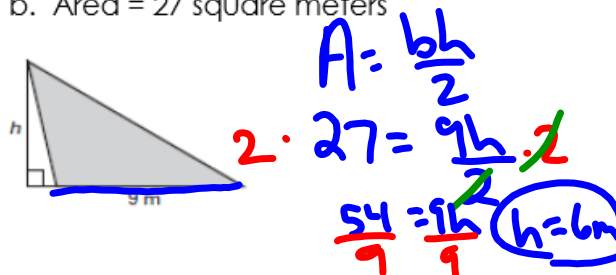


$$A = \frac{bh}{2}$$

$$A = \frac{11 \cdot 8.5}{2}$$

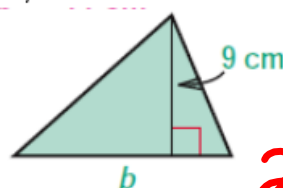
$$A = 46.75 \text{ in}^2$$

b. Area = 27 square meters



Try: Find the height or base of the triangle given the area.

c) Area = 63 cm²



$$A = \frac{bh}{2}$$

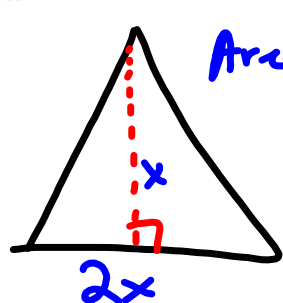
$$2 \cdot 63 = \frac{9b}{2} \cdot 2$$

$$126 = 9b$$

$$\frac{126}{9} = \frac{9b}{9}$$

$$b = 14 \text{ cm}$$

Example 3: The area of a triangle is 225 square units. The base of the triangle is twice the height. Find the base and the height.



$$\text{Area} = 225 \text{ u}^2$$

$$h = x$$

$$b = 2x$$

$$A = \frac{bh}{2}$$

$$225 = \frac{2x(x)}{2}$$

$$225 = \frac{2x^2}{2}$$

$$\text{Base} = 30 \text{ u}$$

$$\text{Height} = 15 \text{ u}$$

Example 4:

a. Find the ratio of the areas of the similar triangles.

$\triangle ABC$

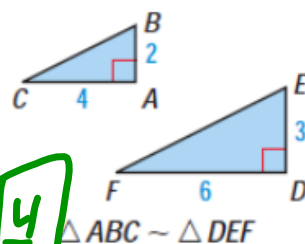
$$A = \frac{2 \cdot 4}{2} = 4 \text{ u}^2$$

$\triangle DEF$

$$A = \frac{6 \cdot 3}{2} = 9 \text{ u}^2$$

$$x = 15$$

$$\text{Ratio} \frac{\triangle ABC}{\triangle DEF} = \frac{4}{9}$$



b. Find the scale factor of $\triangle ABC$ to $\triangle DEF$ and compare it to the ratio of their areas.

$$\frac{CA}{FD} = \frac{4}{6} = \left(\frac{2}{3}\right) \text{ scale factor}$$

Scale factor

$$\frac{2}{3} \rightarrow \left(\frac{2}{3}\right)^2 = \frac{4}{9}$$

Ratio of Areas

Areas of Similar Polygons

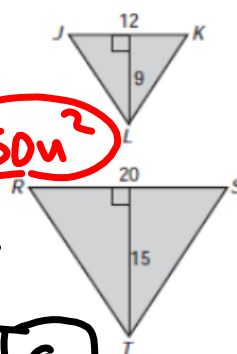
If two polygons are similar with a scale factor $\frac{a}{b}$, then the ratio of their areas is $\frac{a^2}{b^2}$
scale factor squared

Example 5:

a. Find the ratio of the areas of the similar triangles.

$$\begin{array}{c} \Delta JKL \\ \hline A = \frac{12 \cdot 9}{2} = 54u^2 \end{array}$$

$$\begin{array}{c} \Delta RST \\ \hline A = \frac{20 \cdot 15}{2} = 150u^2 \end{array}$$



b. Find the scale factor of ΔJKL to ΔRST and compare it to the ratio of their areas.

$$\frac{JK}{RS} = \frac{12}{20} = \frac{6}{10} = \left(\frac{3}{5}\right)$$

Ratio of Areas

$$\frac{54}{150} = \frac{9}{25}$$

Homework: 8.4 worksheet
Scale factor

$$\frac{3}{5} \rightarrow \left(\frac{3^2}{5^2}\right) \rightarrow \frac{9}{25}$$