LESSON
8.1

Areas of Triangles and Special Quadrilaterals

Learning Targets

a) I can apply the area formula(s) of Triangles to solve problems.

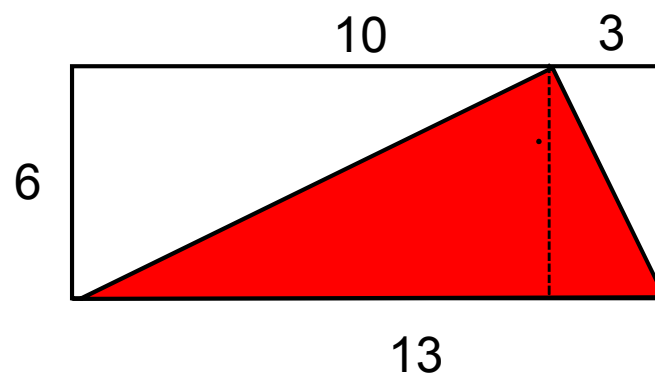b) I can apply the area formula(s) of Rhombi to solve problems.

Discovering Geometry
©2015 Kendall Hunt Publishing

Lesson 8.1 Areas of Triangles and Special Quadrilaterals

What is the area of this red triangle?

14

14

What is the area of this red triangle?

12

7

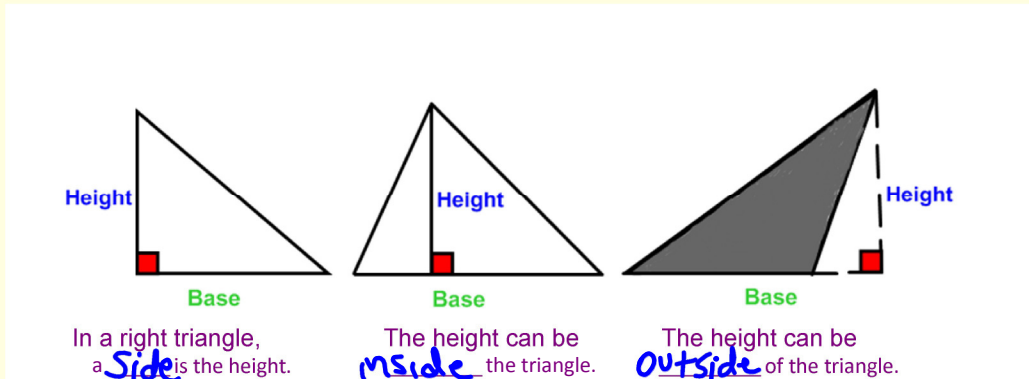# What is the area of this red triangle?

10   3

6

13
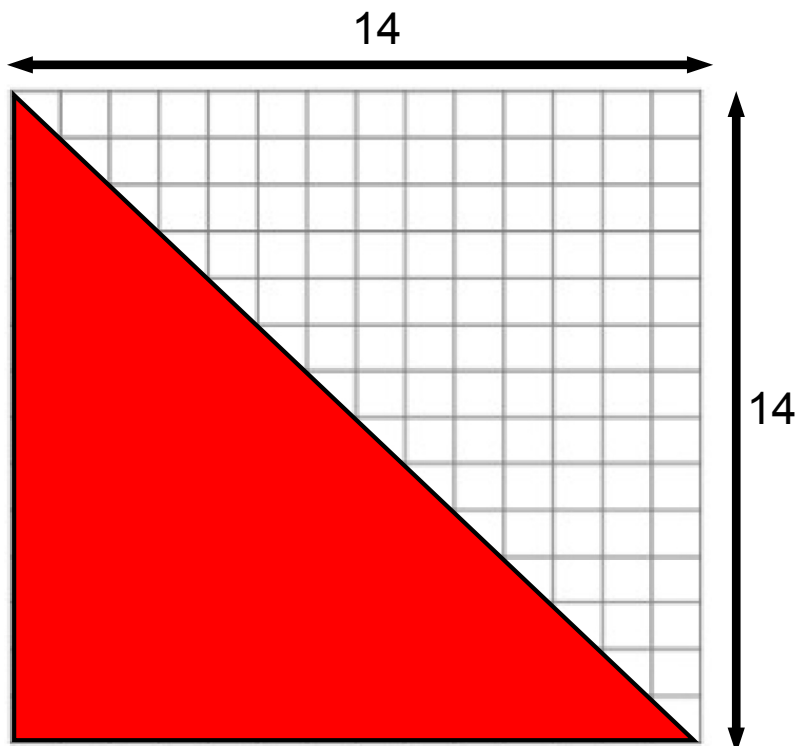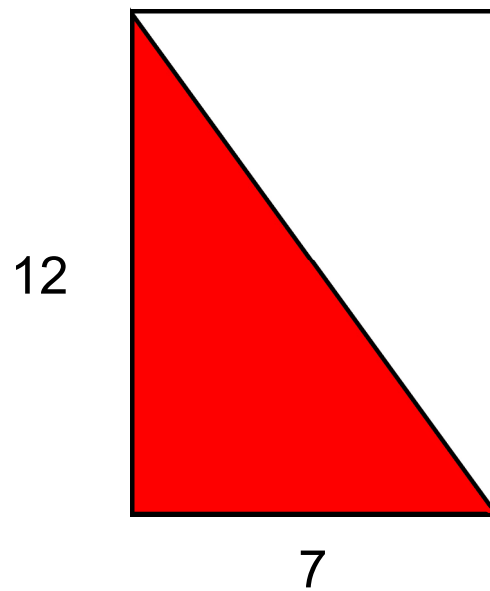
Area of a Triangle

The **HEIGHT** of a triangle is the perpendicular segment from a vertex to the line containing the opposite side.

The opposite side is called the **BASE** of the triangle.

The terms **HEIGHT** and **BASE** are also used to represent the segment lengths.

Height   Height   Height

Base   Base   Base

In a right triangle,   The height can be   The height can be
a **Side** is the height. **Inside** the triangle. **Outside** of the triangle.

$$\text{Area of Triangle} = \frac{1}{2}bh \ or \ \frac{bh}{2}$$

1. Find the area of the triangle.

38 cm
12 cm

36 cm
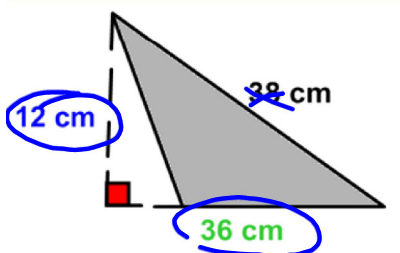
$$A = \frac{1}{2}(36)(12)$$
$$A = 216 \ cm^2$$

2. Find the area of the triangle

8   10

3   6

9

$$x^2 + 6^2 = 10^2$$
$$x^2 + 36 = 100$$
$$\underline{-36 \quad -36}$$
$$\sqrt{x^2} \neq \sqrt{64}$$
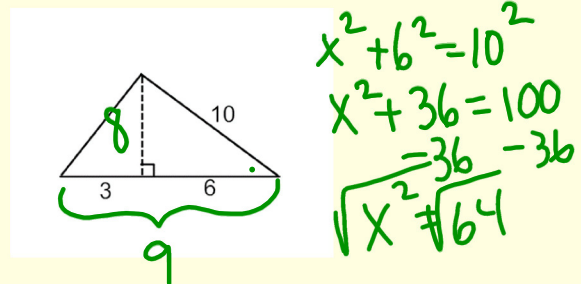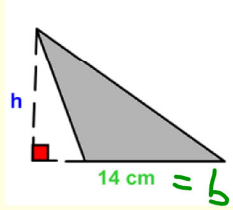
$$A = \frac{1}{2}(9)(8)$$
$$A = 36$$

Area of Triangle $= \dfrac{1}{2}bh \ or \ \dfrac{bh}{2}$

3. Area of $\triangle = 63 \ cm^2$

h

14 cm $= b$
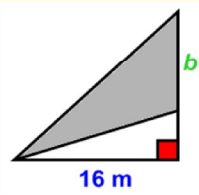
$A = \frac{1}{2}bh$

$63 = \frac{1}{2}(14)h$

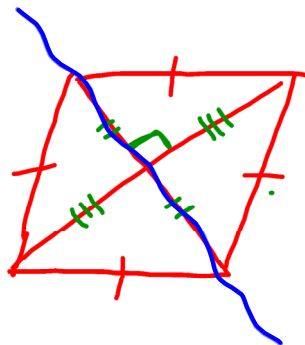$\dfrac{63}{7} = \dfrac{7h}{7}$

$\boxed{h = 9 \ cm}$

4.   Area of $\triangle = 80 \ m^2$

b

16 m

$80 = \frac{1}{2}b(16)$
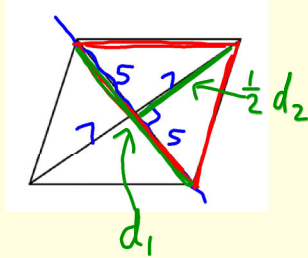
$\dfrac{80}{8} = \dfrac{8b}{8}$

$\boxed{b = 10 \ m}$

* diagonals perp. bisectors
  of each other

* formed from 2
  $\cong$ triangles

Rhombus d_1 d_2

a) Find the area of the rhombus below if the diagonals are 10 in and 14 in (use two triangles).

$$A = 2\left(\tfrac{1}{2}(10)(7)\right)$$

$$A = 70 \text{ in}^2$$

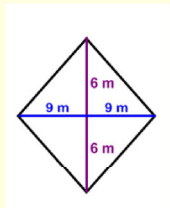b) Now, find the area of the rhombus below if the diagonals are d_1 and d_2.

$$A = 2\left(\tfrac{1}{2}(d_1)\left(\tfrac{1}{2}d_2\right)\right)$$

$$\boxed{A = \tfrac{1}{2}\, d_1 d_2}$$

$$\boxed{\text{Area of a Rhombus: } \tfrac{1}{2}\, d_1 d_2 \quad \text{or} \quad \frac{d_1 d_2}{2}}$$

diagonals

Find the area of each rhombus.

5.

$$d_1 = 12 m$$
$$d_2 = 18 m$$

$$A = \tfrac{1}{2} d_1 d_2$$
$$A = \tfrac{1}{2}(12)(18)$$
$$\boxed{A = 108 m^2}$$

6.

17 ft
15   8 ft.
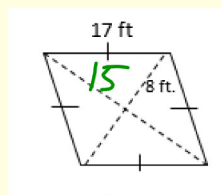
$$x^2 + 8^2 = 17^2$$
$$x^2 + 64 = 289$$
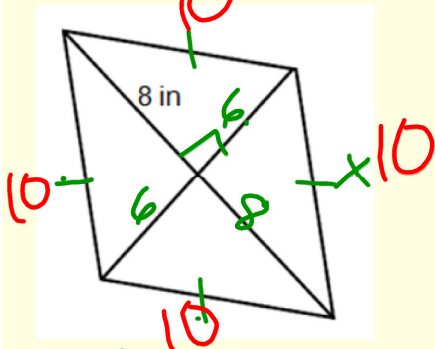$$\quad -64 \quad -64$$
$$\sqrt{x^2} = \sqrt{225} \quad x = 15$$
$$d_1 = 30$$
$$d_2 = 16$$
$$A = \tfrac{1}{2}(30)(16)$$
$$\boxed{A = 240 \text{ ft}^2}$$

8.   The rhombus below has an area of 96 in^2. Find the perimeter of the rhombus

8 in

$$A = \frac{1}{2} d_1 d_2$$

$$96 = \frac{1}{2}(16)d_2$$

$$\frac{96}{8} = \frac{8\,d_2}{8}$$

$$12 = d_2$$

$$6^2 + 8^2 = x^2$$

$$36 + 64 = x^2$$

$$\sqrt{100} = \sqrt{x^2}$$

$$10 = x$$

$$\boxed{P = 40 \text{ in}}$$

9.   Find the area of the shaded region using 2 different methods if the outside figure is a square.

12 cm

6

Method 1

$$A_\square - A_\diamond$$
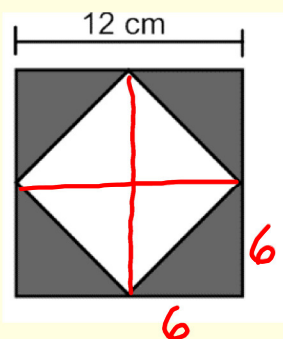
$$(12)(12) - \frac{1}{2}(12)(12)$$

$$\boxed{A = 72 \text{ cm}^2}$$

Method 2

$$4(A_\triangle)$$

$$4\left(\frac{1}{2}(6)(6)\right)$$

$$\boxed{A = 72 \text{ cm}^2}$$

Assignment:

8.1 Areas of Special Quadrilaterals Homework Day 2