

9.2 Special Right Triangles

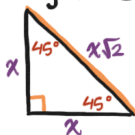
Objective: Today we will find the side lengths of special right triangles and we will solve real-life problems involving special right triangles.

Warm-up: Does a triangle with side lengths 8 , $2\sqrt{65}$, & 14 form a right triangle? If NOT, is it acute or obtuse?

9.2 SPECIAL RIGHT TRIANGLES

45°-45°-90° TRIANGLE THM

In a 45°-45°-90° triangle, the HYPOTENUSE is $\sqrt{2}$ times as long as each leg.

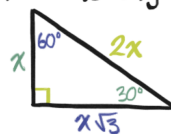


$$\text{Hyp} = \text{Leg} \sqrt{2}$$

NOTE: a 45°-45°-90° Δ is an ISOSCELES Right Δ & can be formed by cutting a square in half diagonally.

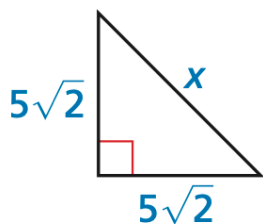
30°-60°-90° TRIANGLE THM

In a 30°-60°-90° triangle, the HYPOTENUSE is twice as long as the SHORTER leg, & the other leg is $\sqrt{3}$ times as long as the shorter leg.

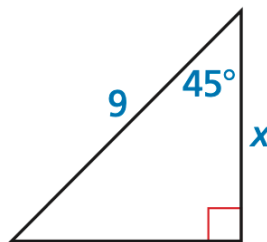


In Exercises 3–6, find the value of x . Write your answer in simplest form. (See Example 1.)

4.

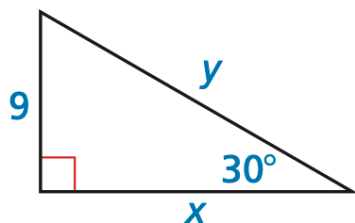


6.

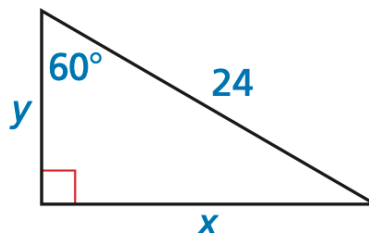


In Exercises 7–10, find the values of x and y . Write your answers in simplest form. (See Example 2.)

7.



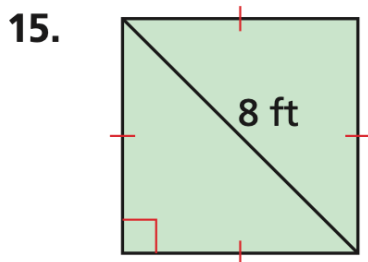
9.



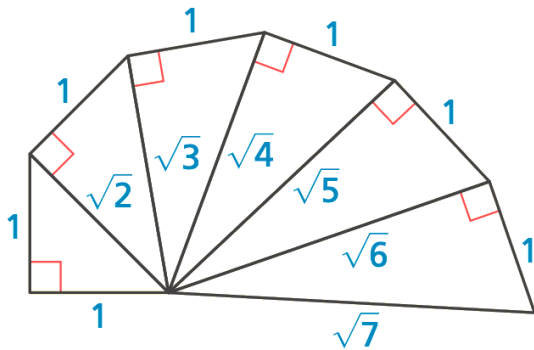
In Exercises 13 and 14, sketch the figure that is described. Find the indicated length. Round decimal answers to the nearest tenth.

- 14.** The perimeter of a square is 36 inches. Find the length of a diagonal.

In Exercises 15 and 16, find the area of the figure. Round decimal answers to the nearest tenth. (See Example 3.)



-
- 20. HOW DO YOU SEE IT?** The diagram shows part of the *Wheel of Theodorus*.

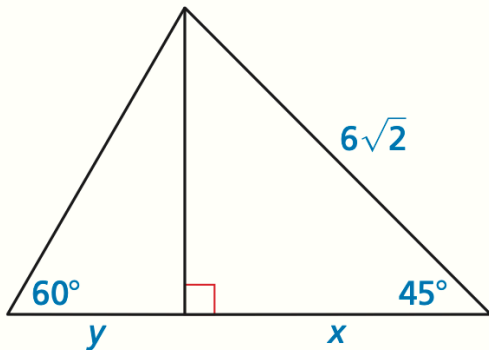


- a.** Which triangles, if any, are 45° - 45° - 90° triangles?
b. Which triangles, if any, are 30° - 60° - 90° triangles?

9.3 Similar Right Triangles

Objective: Today we will identify similar triangles, solve real-life problems involving similar triangles, & we will use geometric means.

Warm-up: Find the values of x & y .

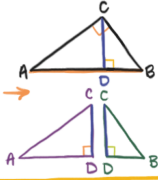


9.3 SIMILAR RIGHT TRIANGLES

RIGHT Δ SIMILARITY THM

IF the ALTITUDE is drawn to the Hypotenuse of a Right Δ , THEN the two triangles formed are SIMILAR to the ORIGINAL Δ & to Each other.

$\Delta ACD \sim \Delta ABC$,
 $\Delta CBD \sim \Delta ABC$,
& $\Delta ACD \sim \Delta CBD$.



GEOMETRIC MEAN

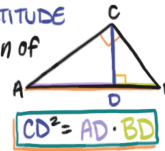
The **geometric mean** of two positive numbers a & b is the positive number x that satisfies:

$$\frac{a}{x} = \frac{x}{b}, \text{ so } x^2 = ab$$

$$\Rightarrow x = \sqrt{ab}$$

GEOMETRIC MEAN (Altitude) THM

The length of the ALTITUDE is the Geometric Mean of the lengths of TWO segments of the HYPOTENUSE.



$$CD^2 = AD \cdot DB$$

GEOMETRIC MEAN (Leg) THM

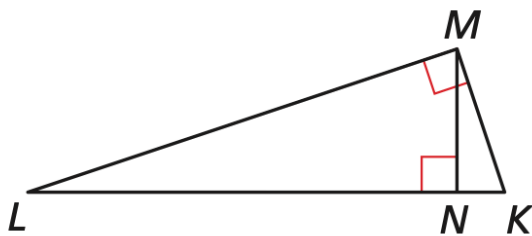
The length of EACH Leg of the RIGHT Δ is the Geometric Mean of the lengths of the Hypotenuse & the segment of the hypotenuse that is Adjacent to the leg.



$$AC^2 = AD \cdot AB \quad BC^2 = BD \cdot BA$$

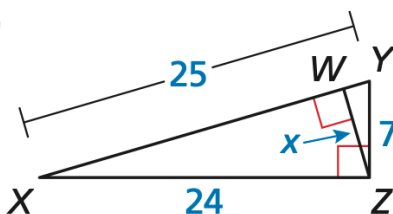
In Exercises 3 and 4, identify the similar triangles.

4.

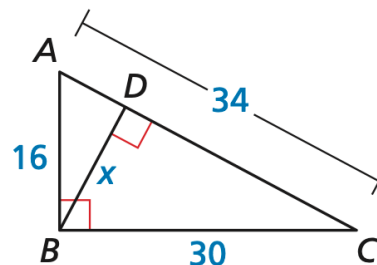


In Exercises 5–10, find the value of x .

5.



8.



In Exercises 11–18, find the geometric mean of the two numbers. (See Example 3.)

12. 9 and 16

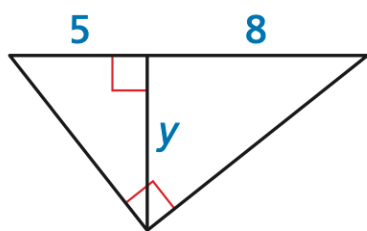
14. 25 and 35

15. 16 and 25

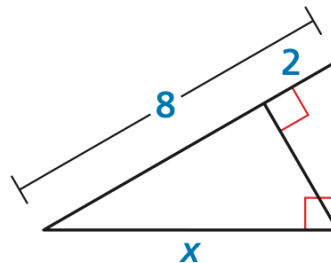
17. 17 and 36

In Exercises 19–26, find the value of the variable.

20.



26.



MODELING WITH MATHEMATICS In Exercises 29 and 30, use the diagram. (See Example 5.)



29. You want to determine the height of a monument at a local park. You use a cardboard square to line up the top and bottom of the monument, as shown at the above left. Your friend measures the vertical distance from the ground to your eye and the horizontal distance from you to the monument. Approximate the height of the monument.