# 9.2 Special Right Triangles

**Learning Target** Understand and use special right triangles.

**Success Criteria**

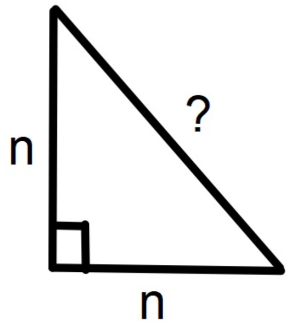
- I can find side lengths in 45°-45°-90° triangles.
- I can find side lengths in 30°-60°-90° triangles.
- I can use special right triangles to solve real-life problems.

$$n^2 + n^2 = x^2$$

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

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

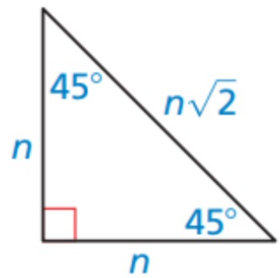
$$\sqrt{2n^2} = \sqrt{2} \cdot \sqrt{n^2} = n\sqrt{2}$$



## THEOREM

### 9.4 45°-45°-90° Triangle Theorem

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



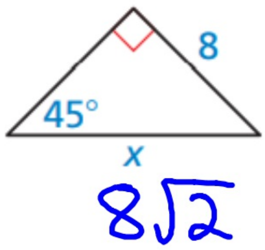

hypotenuse = leg • $\sqrt{2}$

*Prove this Theorem* Exercise 17, page 459

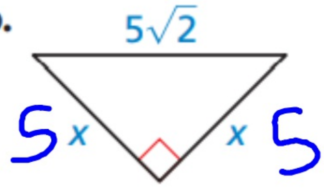
**EXAMPLE 1** **Finding Side Lengths in 45°-45°-90° Triangles**

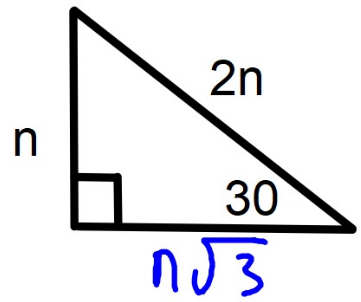
Find the value of $x$. Write your answer in simplest form.

**a.**




**b.**






$$n^2 + x^2 = (2n)^2$$

$$n^2 + x^2 = 4n^2$$

$$-n^2 \qquad -n^2$$

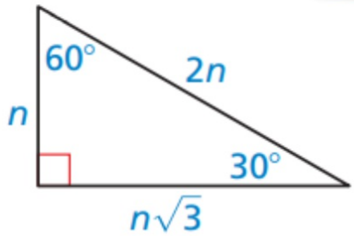
$$\sqrt{x^2} = \sqrt{3n^2}$$

$$x = \sqrt{3n^2} = \sqrt{3} \cdot \sqrt{n^2} = n\sqrt{3}$$

## THEOREM

### 9.5 30°-60°-90° Triangle Theorem

In a 30°- 60°- 90° triangle, the hypotenuse is twice as long as the shorter leg, and the longer leg is $\sqrt{3}$ times as long as the shorter leg.




hypotenuse = shorter leg • 2

longer leg = shorter leg • $\sqrt{3}$

*Prove this Theorem* Exercise 19, page 460

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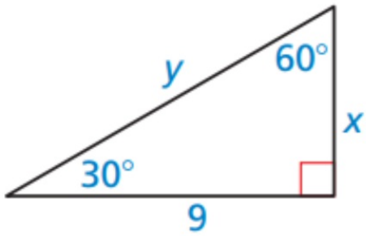
EXAMPLE 2 **Finding Side Lengths in a 30°-60°-90° Triangle**

WATCH

Find the values of $x$ and $y$. Write your answers in simplest form.




**SOLUTION**

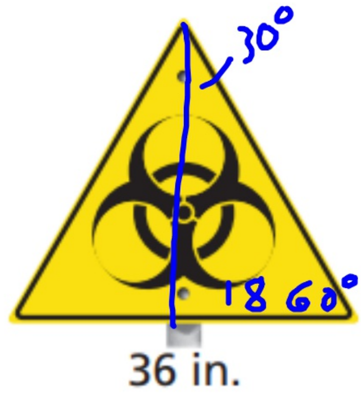
$x = \frac{9}{3}\sqrt{3} = 3\sqrt{3}$

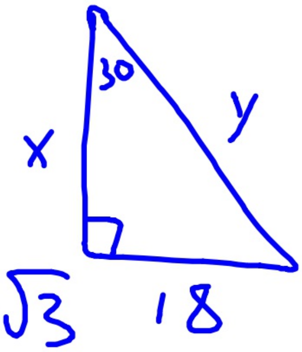
$y = 2 \times 3\sqrt{3} = 6\sqrt{3}$

## EXAMPLE 3 Modeling Real Life

WATCH INFO

The biohazard sign is shaped like an equilateral triangle. Estimate the area of the sign.



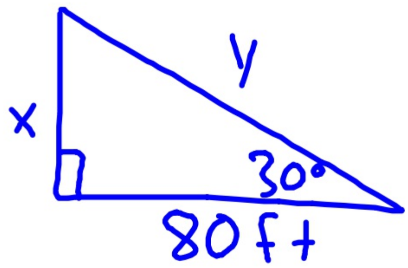

$x = \frac{18}{3}\sqrt{3} = 6\sqrt{3}$

$y = 2 \times 6\sqrt{3} = 12\sqrt{3}$

## EXAMPLE 4 Modeling Real Life

WATCH

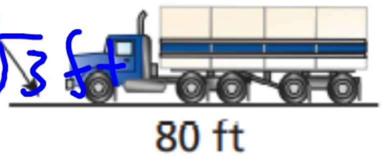
A tipping platform is a ramp used to unload trucks. How high is the end of an 80-foot ramp when the tipping angle is 30°? 45°?

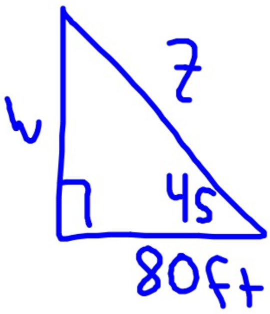



$x = \frac{80}{3}\sqrt{3} = 26.67\sqrt{3}$ ft

$y = 2 \times 26.67\sqrt{3}$

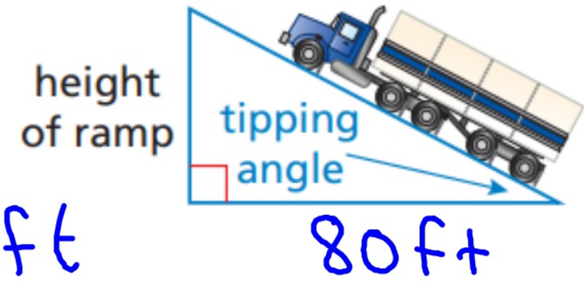
$53.34\sqrt{3}$ ft




$w = 80$ft

$z = 80\sqrt{2}$ ft



HW:

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