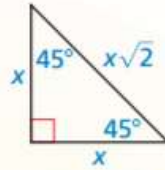


## What You Will Learn

- ▶ Find side lengths in special right triangles.
- ▶ Solve real-life problems involving special right triangles.

### Theorem 9.4 45°-45°-90° Triangle Theorem

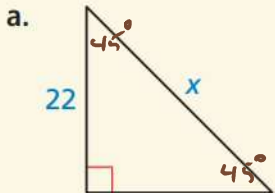
In a 45°-45°-90° triangle, the hypotenuse is  $\sqrt{2}$  times as long as each leg.



hypotenuse = leg  $\cdot \sqrt{2}$

Proof Ex. 19, p. 476

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



$$a^2 + b^2 = c^2$$

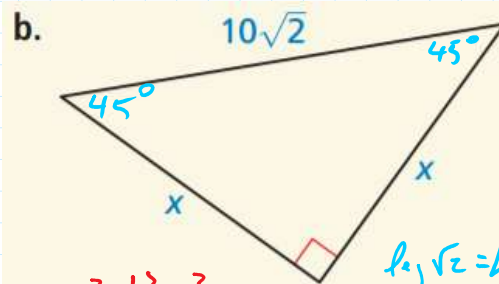
$$22^2 + 22^2 = x^2$$

$$484 + 484 = x^2$$

hyp = leg  $\cdot \sqrt{2}$

$$x = 22\sqrt{2}$$

$$\boxed{x = 22\sqrt{2}}$$



$$a^2 + b^2 = c^2$$

$$x^2 + x^2 = (10\sqrt{2})^2$$

$$2x^2 = 10^2 \cdot \sqrt{2}^2$$

$$\dots = 100 \cdot 2$$

hyp  $\sqrt{2} = \text{leg}$

$$\frac{x\sqrt{2}}{\sqrt{2}} = \frac{10\sqrt{2}}{\sqrt{2}}$$

$$\boxed{x = 10}$$

Handwritten calculations:

$$968$$

$$\frac{2 \cdot 484}{2} = 242$$

$$\frac{242}{2} = 121$$

$$\sqrt{121} = 11$$

$$\boxed{22\sqrt{2}}$$

$$484 + 484 = x^2$$

$$\sqrt{968} = \sqrt{x^2}$$

$$22\sqrt{2} = x$$

$$x = 22\sqrt{2}$$

$$2x^2 = 10^2 \cdot \sqrt{2}^2$$

$$\frac{2x^2}{2} = \frac{100 \cdot 2}{2}$$

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

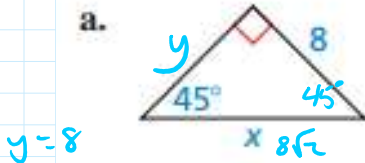
$$x = 10$$

$$\sqrt{x} \cdot \sqrt{2}$$

$$x = 10$$

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

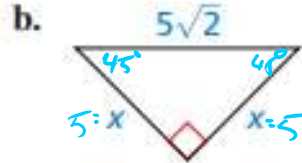
$$\text{hyp} = \text{leg} \sqrt{2}$$



$$y = 8$$

$$\text{hyp} = \text{leg} \sqrt{2}$$

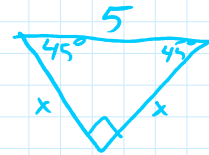
$$x = 8\sqrt{2}$$



$$\text{hyp} = \text{leg} \sqrt{2}$$

$$\frac{5\sqrt{2}}{\sqrt{2}} = \frac{x\sqrt{2}}{\sqrt{2}}$$

$$5 = x$$



$$\text{hyp} = \text{leg} \sqrt{2}$$

$$\frac{5}{\sqrt{2}} = \frac{x\sqrt{2}}{\sqrt{2}}$$

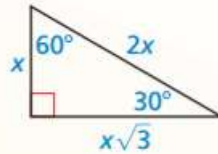
$$\frac{\sqrt{2}}{\sqrt{2}} \cdot \frac{5}{\sqrt{2}} = x$$

$$\frac{5\sqrt{2}}{\sqrt{2} \cdot \sqrt{2}} = x$$

$$\frac{5\sqrt{2}}{2} = x$$

### 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.

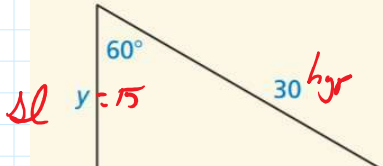


$$\text{hypotenuse} = \text{shorter leg} \cdot 2$$

$$\text{longer leg} = \text{shorter leg} \cdot \sqrt{3}$$

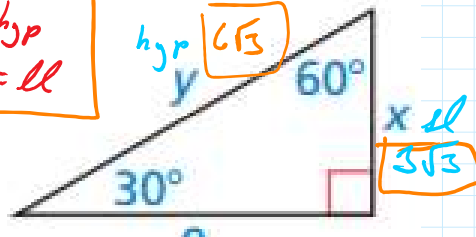
Proof Ex. 21, p. 476

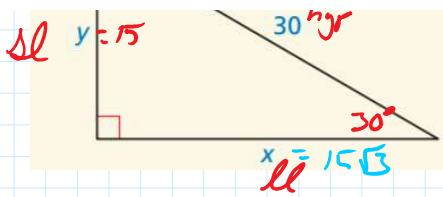
Find the values of  $x$  and  $y$ . Write your answer in simplest form.



$$\text{sl} \cdot 2 = \text{hyp}$$

$$\text{sl} \sqrt{3} = \text{ll}$$





$$sl \cdot 2 = hyp$$

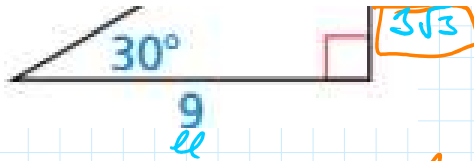
$$\frac{y \cdot 2}{2} = \frac{30}{2}$$

$$y = 15$$

$$x = 15\sqrt{3}$$

$$sl \sqrt{3} = ll$$

$$15\sqrt{3} = x$$



$$sl \sqrt{3} = ll$$

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

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

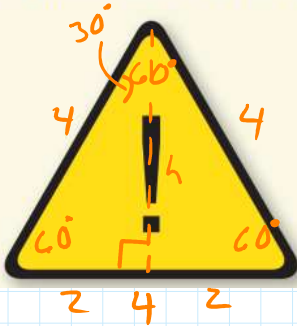
$$x = \frac{9\sqrt{3}}{3} = 3\sqrt{3}$$

$$sl \cdot 2 = hyp$$

$$3\sqrt{3} \cdot 2 = y$$

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

A warning sticker is shaped like an equilateral triangle with side length of 4 inches. Estimate the area of the sticker by finding the area of the equilateral triangle to the nearest tenth of an inch.



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

$$b = 4$$

$$h = 2\sqrt{3}$$

$$A = \frac{1}{2} \cdot 4 \cdot 2\sqrt{3}$$

$$2 \cdot 2\sqrt{3}$$

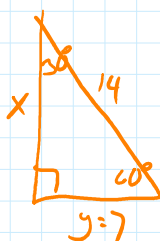
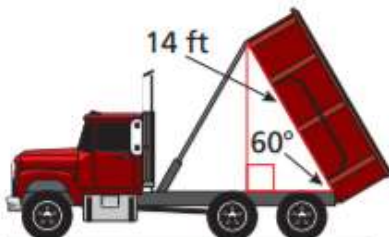
$$A = 4\sqrt{3} \text{ in}^2$$

$$A \approx 6.9 \text{ in}^2$$

$$ll = sl\sqrt{3}$$

$$h = 2\sqrt{3}$$

6. The body of a dump truck is raised to empty a load of sand. How high is the 14-foot-long body from the frame when it is tipped upward by a  $60^\circ$  angle?



$$hyp = sl \cdot 2$$

$$\frac{14}{2} = \frac{y \cdot 2}{2}$$

$$7 = y$$



$$\square \begin{matrix} 60 \\ y=7 \end{matrix}$$

$$7=y$$

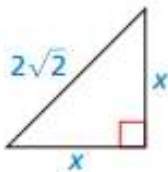
$$7\sqrt{3}!$$

$$\begin{matrix} ll = 11\sqrt{3} \\ x = 7\sqrt{3} \end{matrix}$$

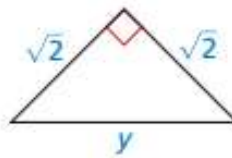
Practice sec 9.2 pg.  
475: 1-3A,  
5-9EO, 13-17EO

Find the value of the variable. Write your answer in simplest form.

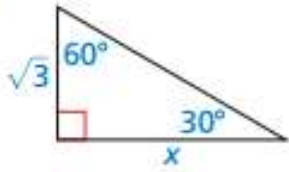
1.



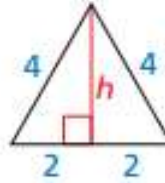
2.



3.



4.



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Practice sec 9.2 pg.  
475: 4-10EE, 11,  
12-16EE