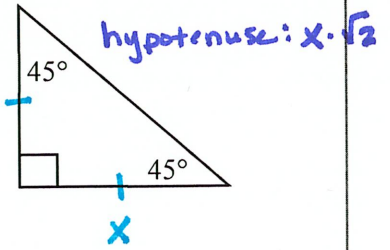


Chapter 7.4: Special Triangles

45° - 45° - 90° Triangle Theorem (Theorem 7.8):

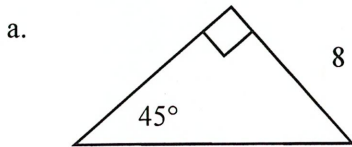
In a 45° - 45° - 90° triangle, the hypotenuse is $\sqrt{2}$ times as long as each leg.

legs are \cong since they are across from \cong angles \times

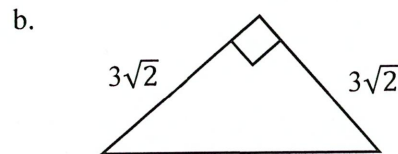


Hypotenuse = $\underline{\text{leg} \cdot \sqrt{2}}$ Leg = $\underline{\frac{\text{hypotenuse}}{\sqrt{2}}}$

Example #1: Find the length of the hypotenuse.

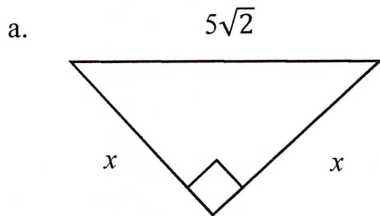


hypotenuse = $\underline{8\sqrt{2}}$ units

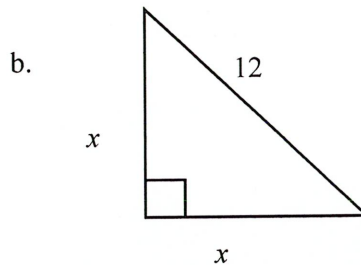


hypotenuse = $3\sqrt{2} \cdot \sqrt{2}$
 $= 3\sqrt{4}$
 $= 3 \cdot 2$
 $= \underline{6}$ units

Example #2: Find the lengths of the legs in the triangle.



Leg = $\frac{5\sqrt{2}}{\sqrt{2}}$
 $= \underline{5}$ units



Leg = $\frac{12 \cdot \sqrt{2}}{\sqrt{2} \cdot \sqrt{2}} \rightarrow \frac{12\sqrt{2}}{\sqrt{4}}$
 $= \frac{12\sqrt{2}}{2}$
 $= \underline{6\sqrt{2}}$ units

30° - 60° - 90° Triangle Theorem (Theorem 7.9):

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.

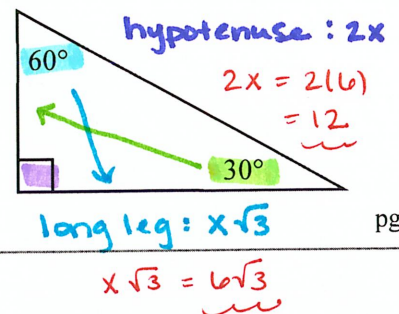
across from 90° across from 30° angle

Hypotenuse = $\underline{(\text{short leg}) \cdot 2}$

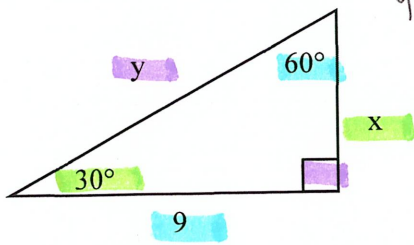
Longer Leg = $\underline{(\text{short leg}) \cdot \sqrt{3}}$

across from 60° angle

Short leg: x
 * Example: If x = 6



Example #3: Find the values of x and y . Write your answer in simplest radical form.



you know long leg, so \Rightarrow long leg = short $\cdot \sqrt{3}$ then

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

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

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

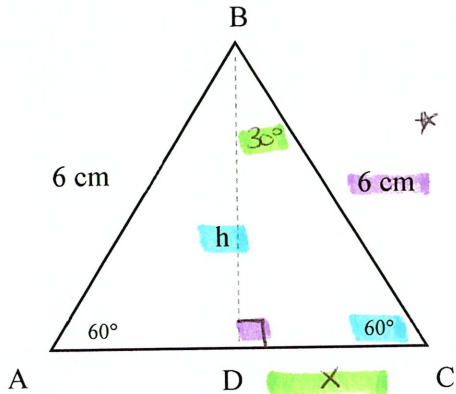
then

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

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

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

Example #4: Find the height of the given triangle.



$x = 3\sqrt{3}$ units

* to find height (long leg) you need to find short leg first so \Rightarrow hyp = short $\cdot 2$

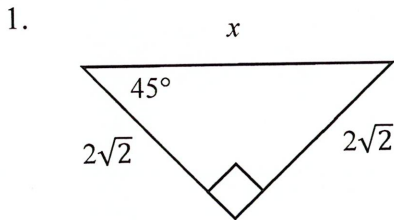
$$6 = x \cdot 2$$

$$x = 3 \text{ units}$$

then \Rightarrow long = short $\cdot \sqrt{3}$

$$h = 3\sqrt{3} \text{ units}$$

Check Point: Find the value of each variable.

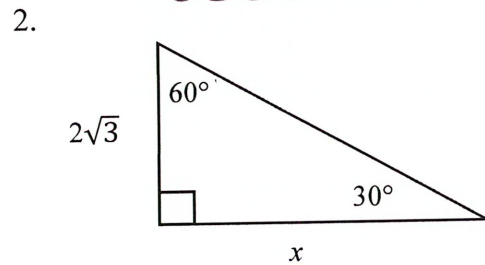


$$x = \text{leg} \cdot \sqrt{2} \Rightarrow x = (2\sqrt{2}) \cdot \sqrt{2}$$

$$x = 2\sqrt{4}$$

$$x = 2 \cdot 2$$

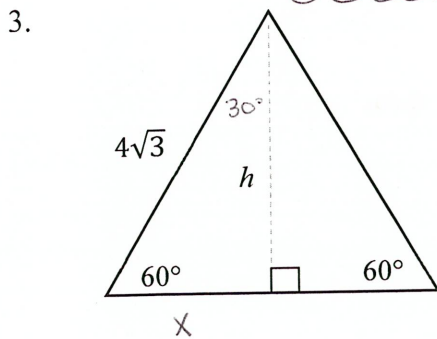
$$x = 4 \text{ units}$$



$$x = \text{short} \cdot \sqrt{3} \Rightarrow x = (2\sqrt{3}) \cdot \sqrt{3}$$

$$x = 2(3)$$

$$x = 6 \text{ units}$$



$$x = \frac{\text{hyp}}{2} \Rightarrow x = \frac{4\sqrt{3}}{2}$$

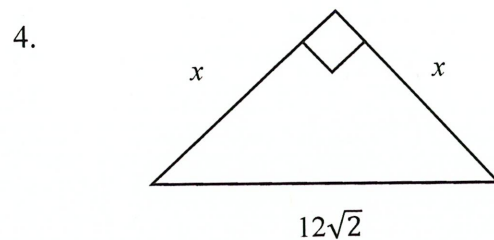
$$x = 2\sqrt{3} \text{ units}$$

$$h = \text{short} \cdot \sqrt{3} \Rightarrow h = (2\sqrt{3}) \cdot \sqrt{3}$$

$$h = 2\sqrt{9}$$

$$h = 2 \cdot 3$$

$$h = 6 \text{ units}$$



$$x = \frac{\text{hyp}}{\sqrt{2}} \Rightarrow x = \frac{12\sqrt{2}}{\sqrt{2}}$$

$$x = 12 \text{ units}$$