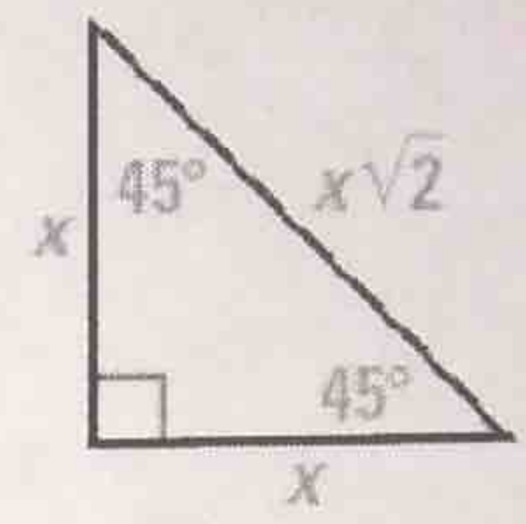
7.4 Special Right Triangles

THEOREM *For Your Notebook*

THEOREM 7.8 45°-45°-90° Triangle Theorem

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

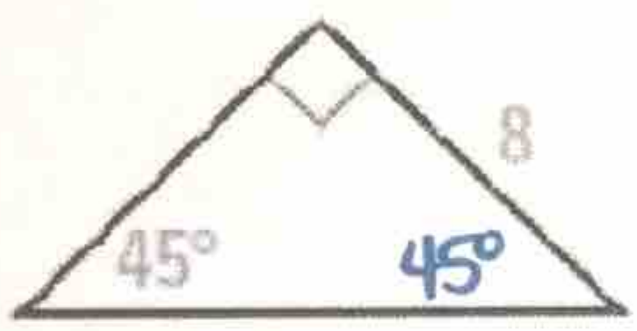


hypotenuse = leg • $\sqrt{2}$

Proof: Ex. 30, p. 463

Find the length of the hypotenuse.

Ex 1:

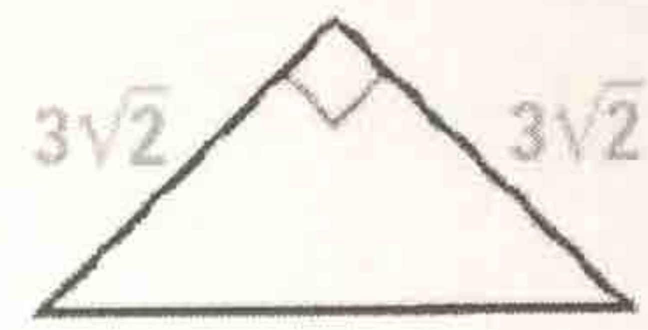


By Theorem 7.8,

hypotenuse = leg • $\sqrt{2}$

$= \boxed{8\sqrt{2} \text{ units}}$

Ex 2:



By Base Angles Theorem and Corollary to Δ sum theorem, this is a 45°-45°-90° Δ

hypotenuse = leg • $\sqrt{2}$

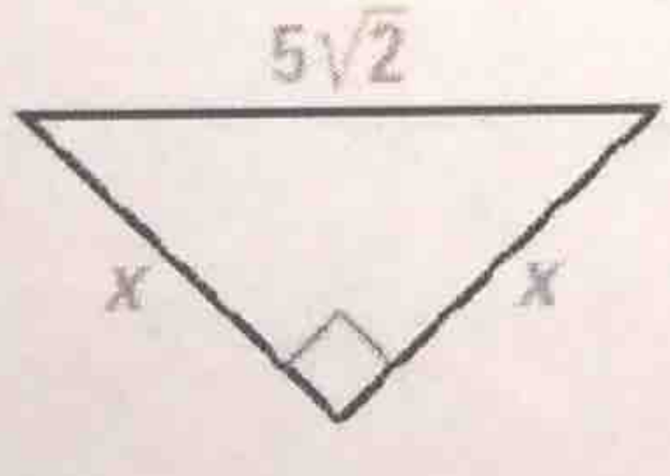
$= 3\sqrt{2} \cdot \sqrt{2}$

$= 3(2)$

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

Find the lengths of the legs in the triangle.

Ex 3:



By Base Angles Theorem & Corollary to Δ Sum Theorem, this is a 45°-45°-90° Δ

hypotenuse = leg • $\sqrt{2}$

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

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

$\boxed{x = 5 \text{ units}}$

THEOREM — *For Your Notebook*

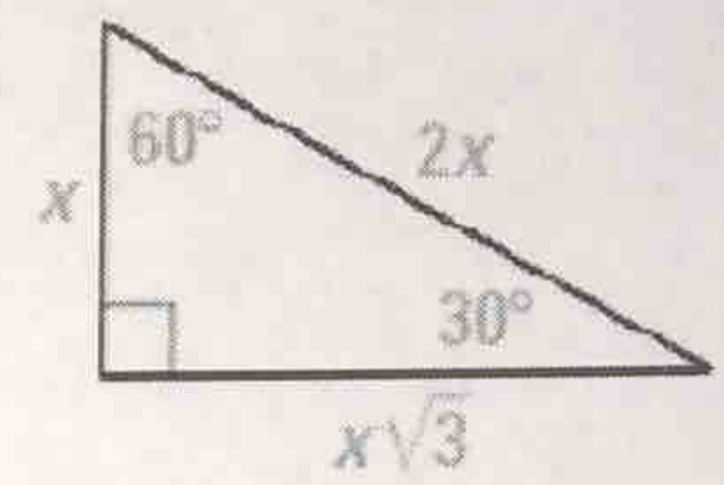
THEOREM 7.9 30°-60°-90° Triangle Theorem

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.

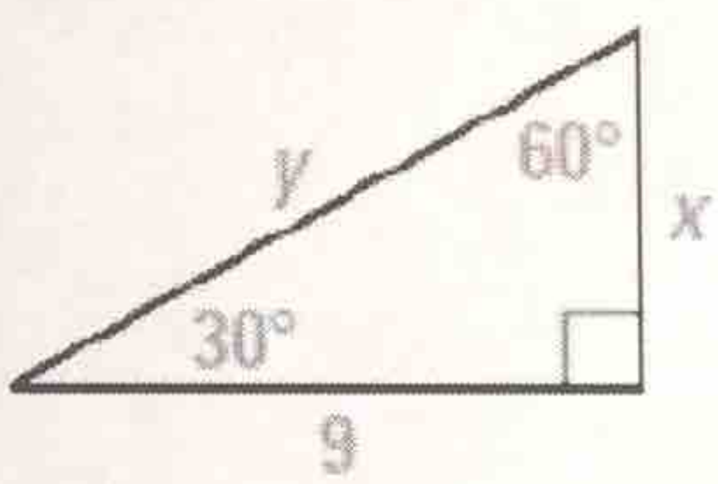
hypotenuse = 2 • shorter leg

longer leg = shorter leg • $\sqrt{3}$

Proof: Ex. 32, p. 463



Ex 4: Find the values of **x** and **y**. Write the answer in simplest radical form.



longer leg = shorter leg • $\sqrt{3}$

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

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

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

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

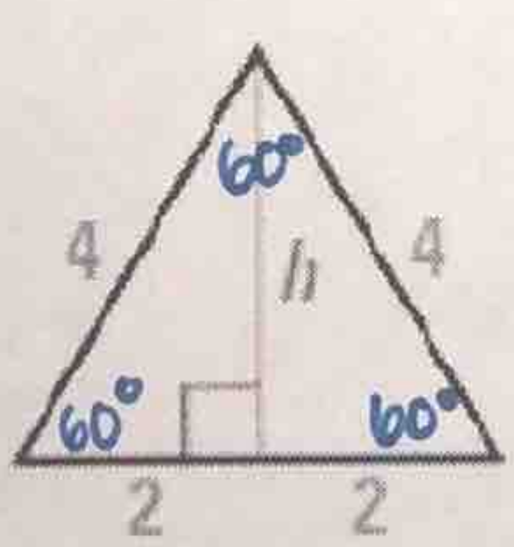
hypotenuse = 2 • shorter leg

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

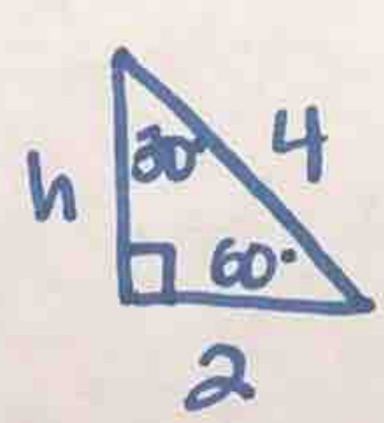
$$\boxed{y = 6\sqrt{3}\text{ units}}$$

Find the value of the variable.

Ex 5:



Equilateral Δ so every ∠ = 60°



longer leg = shorter leg • $\sqrt{3}$

$$\boxed{h = 2\sqrt{3}\text{ units}}$$