Geometry 8.3

Use the properties of 45-45-90 triangles

Use the properties of 30-60-90 triangles

~~Quiz 8.1-8.2 Tues.~~

$90 + 2x = 180$

isosceles

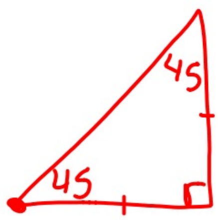
isosceles right triangle 45-45-90

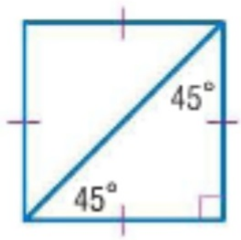
equilateral triangle

30-60-90 triangle

special right triangle

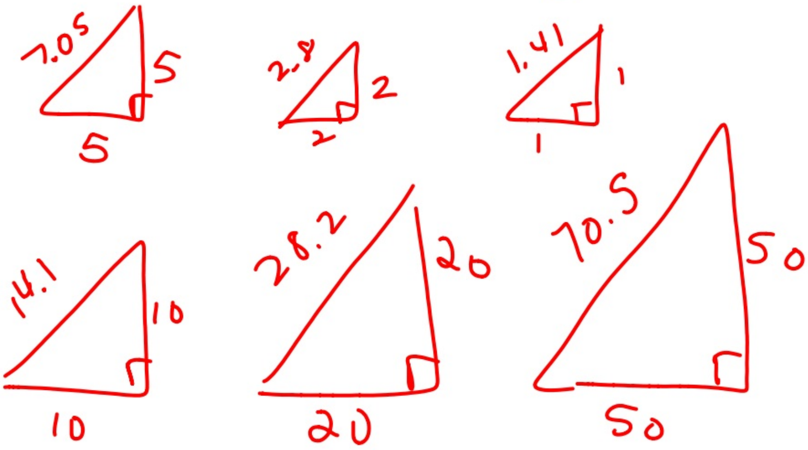
rationalizing the denominator

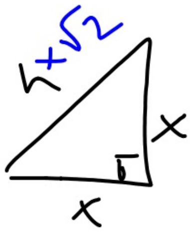




Isosceles Right triangles
Look for patterns

$h = \text{leg} \cdot \sqrt{2}$





$$x^2 + x^2 = h^2$$

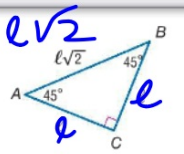
$$\sqrt{2x^2} = \sqrt{h^2}$$

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

Theorem 8.8 45°-45°-90° Triangle Theorem

In a 45°-45°-90° triangle, the legs ℓ are congruent and the length of the hypotenuse h is $\sqrt{2}$ times the length of a leg.

Symbols In a 45°-45°-90° triangle, $\ell = \ell$ and $h = \ell\sqrt{2}$.



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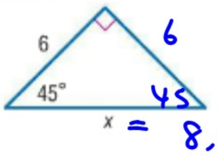
Why? P. T.

Example 1 Find the Hypotenuse Length in a 45°-45°-90° Triangle

Find x.

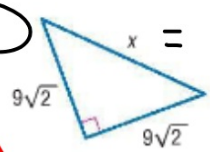
a.



$x = 8.5 \leftarrow$ rounded

$= 6\sqrt{2} \leftarrow$ exact

b.

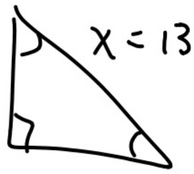


$= 9\underbrace{\sqrt{2}\cdot\sqrt{2}}$

$9 \cdot 2$

$= 18$

13

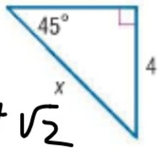


$x = 13\sqrt{2}$

GuidedPractice

Find x.

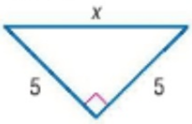
1A.



$4\sqrt{2}$

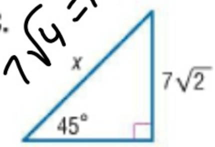
1B.

$5\sqrt{2}$



1C.

$7\sqrt{4} = 14$



Rationalize the denom.

$$\frac{12}{\sqrt{2}}=\frac{x\sqrt{2}}{\sqrt{2}}$$

(no $\sqrt{\ }$ in denom.) $\frac{6}{8}=\frac{3}{4}$

$$\frac{12}{\sqrt{2}}\left(\frac{\sqrt{2}}{\sqrt{2}}\right)=x$$

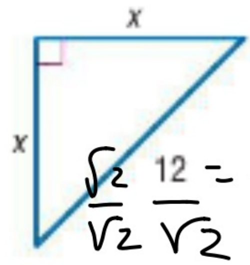
$$\frac{12\sqrt{2}}{2}=6\sqrt{2}$$

$x=?$

Example 2 Find the Leg Lengths in a 45°-45°-90° Triangle

Find x.

The legs of this right triangle have the same measure, x, so it is a 45°-45°-90° triangle. Use Theorem 8.8 to find x.



$$\frac{\sqrt{2}}{\sqrt{2}} \cdot \frac{12}{\sqrt{2}} = \frac{x \cdot \sqrt{2}}{\sqrt{2}}$$

$$\frac{12\sqrt{2}}{2} = x$$

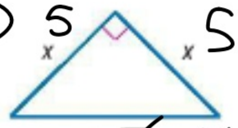
$$6\sqrt{2} = x$$

ReviewVocabulary

rationalizing the denominator a method used to eliminate radicals from the denominator of a fraction

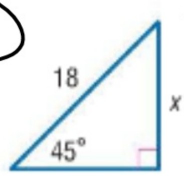
GuidedPractice

2A. 5 5



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

2B.

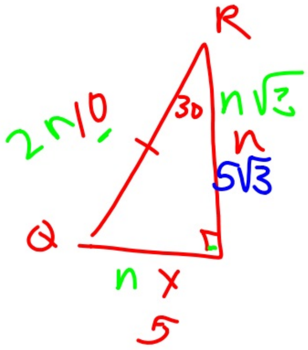


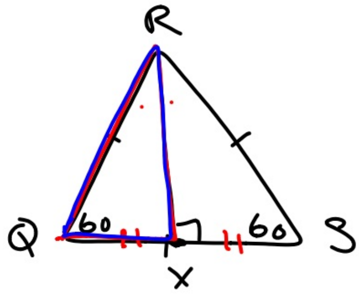
$\frac{\sqrt{2}}{\sqrt{2}} \cdot \frac{18}{\sqrt{2}} = \frac{x \cdot \sqrt{2}}{\sqrt{2}}$

$\frac{18\sqrt{2}}{2}$

$x = 9\sqrt{2}$

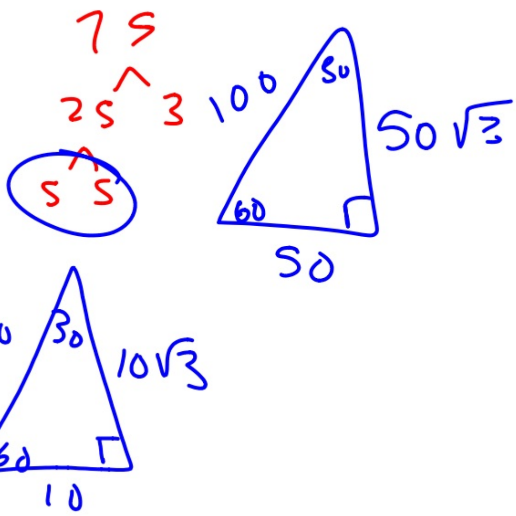
30-60-90 Triangles
Look for patterns





$n = \sqrt{75}$

$n = 5\sqrt{3}$



$5^2 + n^2 = 10^2$

$25 + n^2 = 100$

$\sqrt{n^2} = \sqrt{75}$

$n \approx 8.7$

Started out as equilateral

StudyTip

Use Ratios The lengths of the sides of a 30°-60°-90° triangle are in a ratio of 1 to $\sqrt{3}$ to 2 or 1 : $\sqrt{3}$:2.

This algebraic proof verifies the following theorem.

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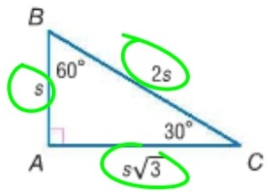
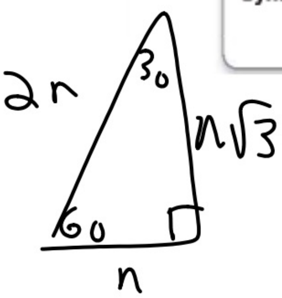
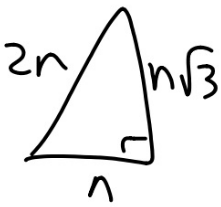
Theorem 8.9 30°-60°-90° Triangle Theorem

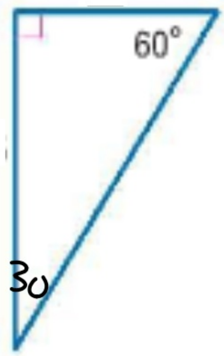
In a 30°-60°-90° triangle, the length of the hypotenuse h is 2 times the length of the shorter leg s, and the length of the longer leg ℓ is $\sqrt{3}$ times the length of the shorter leg.

Symbols In a 30°-60°-90° triangle, $h = 2s$ and $\ell = s\sqrt{3}$.

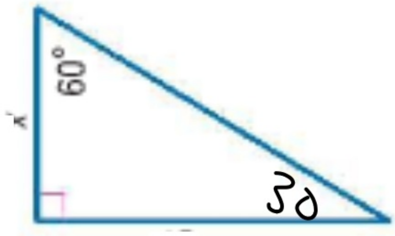




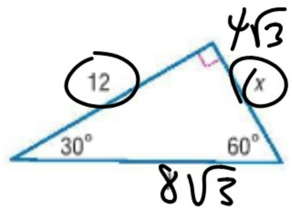


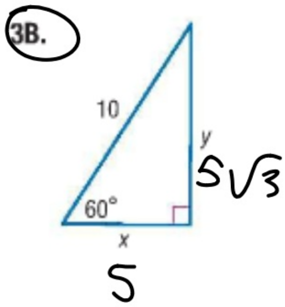


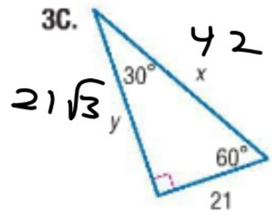
Label each angle
Which side is largest (always)?
Smallest?
Medium?



Guided Practice







$$\frac{\sqrt{3}}{\sqrt{3}}\cdot\frac{12}{\sqrt{3}} = \frac{n\sqrt{3}}{\sqrt{3}}$$

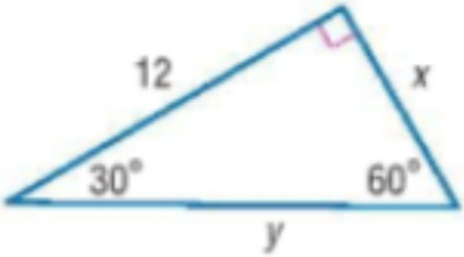
$$\frac{12\sqrt{3}}{3} \qquad n$$

$$4\sqrt{3}$$

9-33 odds

Find x and y.

3A.



Example 3 Find Lengths in a 30°-60°-90° Triangle

Find x and y.