

Geometry 8.3

Use the properties of 45-45-90 triangles

Use the properties of 30-60-90 triangles

isosceles

isosceles right triangle

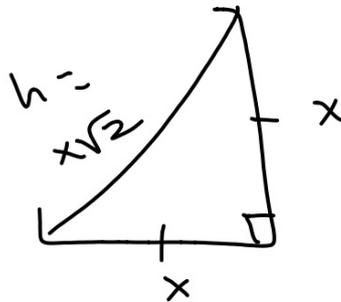
equilateral triangle

30-60-90 triangle

special right triangle

rationalizing the denominator

triangle cut-outs



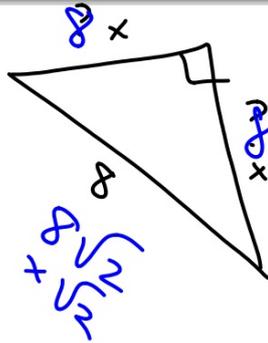
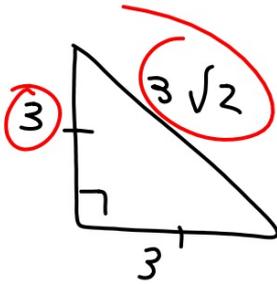
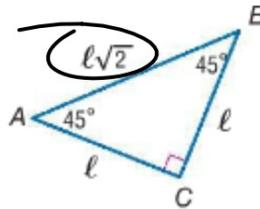
$$x^2 + x^2 = h^2$$
$$\sqrt{2}x^2 = \sqrt{h^2}$$

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

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 $h = \ell\sqrt{2}$.



$$\frac{x\sqrt{2}}{\sqrt{2}} = \frac{8}{\sqrt{2}} \left(\frac{\sqrt{2}}{\sqrt{2}} \right)$$

$$x = \frac{8\sqrt{2}}{\sqrt{2}} = 4\sqrt{2}$$

$$x, 2x, x\sqrt{3}$$

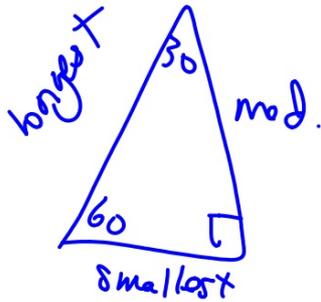
$$1, 2, \sqrt{3}$$

$$2, 4, 2\sqrt{3}$$

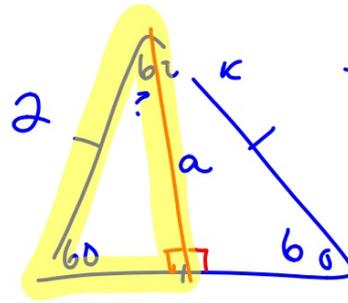
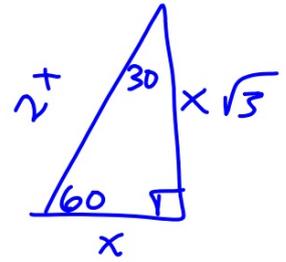
$$3, 6, 3\sqrt{3}$$

$$10, 20, 10\sqrt{3}$$

Equilateral triangle



$$60 + 90 + ? = 180$$



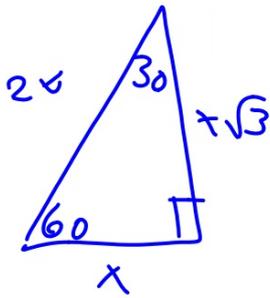
$$\begin{aligned} 1^2 + a^2 &= 2^2 \\ 1 + a^2 &= 4 \\ a^2 &= 3 \\ a &= \sqrt{3} \end{aligned}$$

From an equilateral triangle...

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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 $1 : \sqrt{3} : 2$.

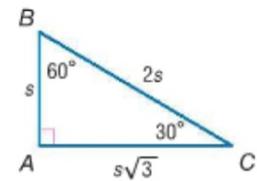


This algebraic proof verifies the following theorem.

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

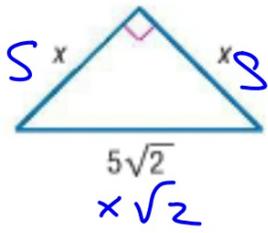
In a 30° - 60° - 90° triangle, the length of the hypotenuse h is 2 times the length of the shorter leg s , and the length of the longer leg ℓ is $\sqrt{3}$ times the length of the shorter leg.

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

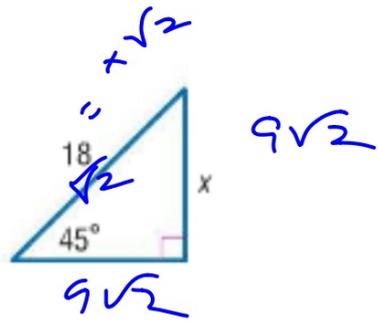


Guided Practice

2A.

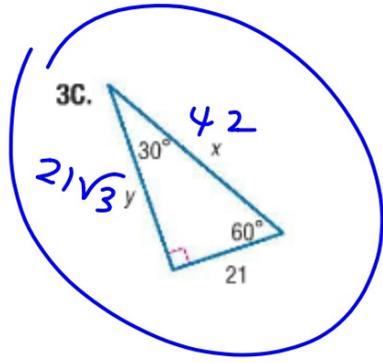
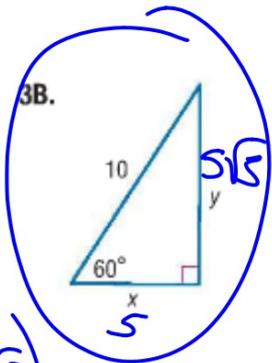
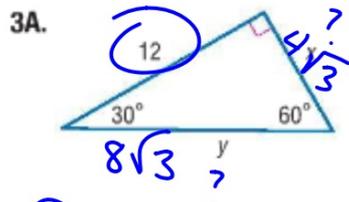


2B.

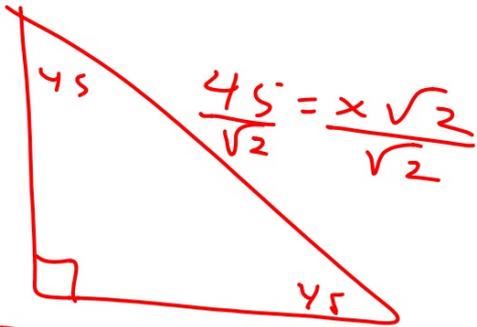


Guided Practice

Find x and y .



$$\frac{12}{\sqrt{3}} = \frac{x\sqrt{3}}{\sqrt{3}}$$
$$\frac{12\sqrt{3}}{\sqrt{3}\sqrt{3}} = \frac{x\sqrt{3}}{\sqrt{3}}$$
$$\frac{12\sqrt{3}}{3} = 4\sqrt{3}$$

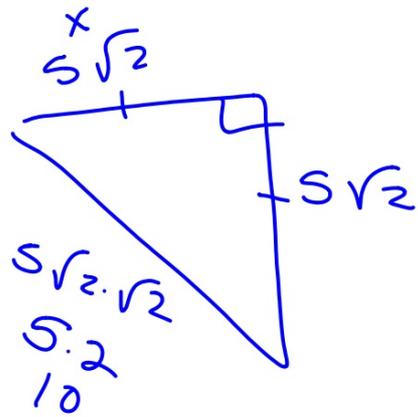
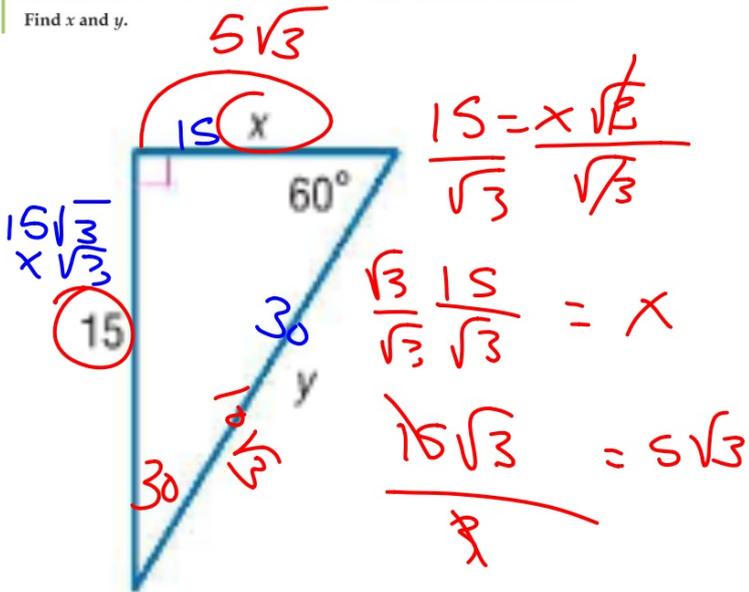


$$\frac{\frac{45\sqrt{2}}{\sqrt{2}\sqrt{2}}}{2}$$

$$22.5\sqrt{2}$$

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

Find x and y .



$$\frac{9 \cdot \sqrt{3}}{\sqrt{3} \cdot \sqrt{3}} \quad \frac{\cancel{4} \sqrt{3}}{\cancel{4}} \quad 3 \sqrt{3}$$

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

$$\sqrt{5} \cdot \sqrt{5}$$

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

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

$$\sqrt{5 \cdot 5}$$

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

$$\sqrt{4}$$

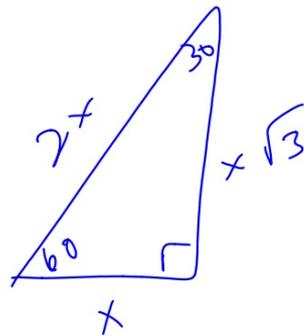
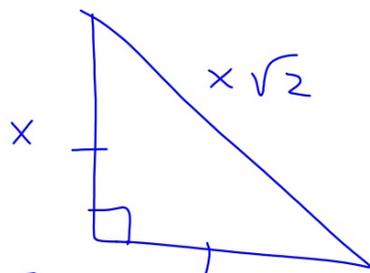
$$\sqrt{25}$$

$$\sqrt{9}$$

$$2$$

$$5$$

$$3$$



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4-6
18-25
30, 32

+ WB prac. 8.3
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