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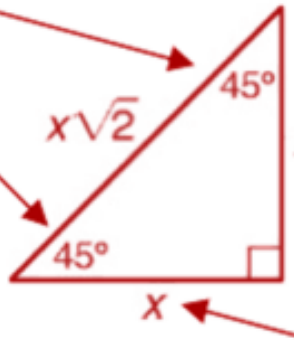
18.3 Special Right Triangles - Class & Homework

18.3

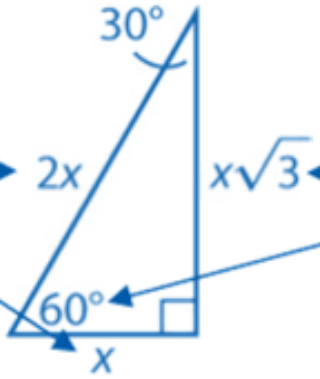
SOH SINE = $\frac{\text{OPP}}{\text{HYP}}$ **CAH** COSINE = $\frac{\text{ADJ}}{\text{HYP}}$ **TOA** TANGENT = $\frac{\text{OPP}}{\text{ADJ}}$

Each acute angle is 45°.



Each leg is the same length.

The hypotenuse is two times longer than the short leg.

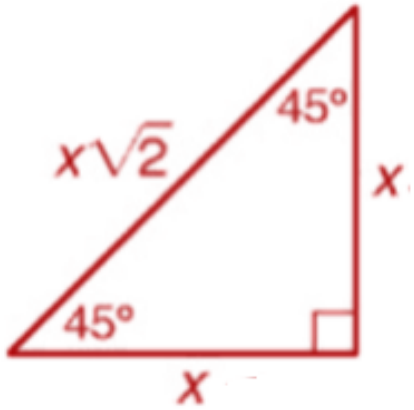


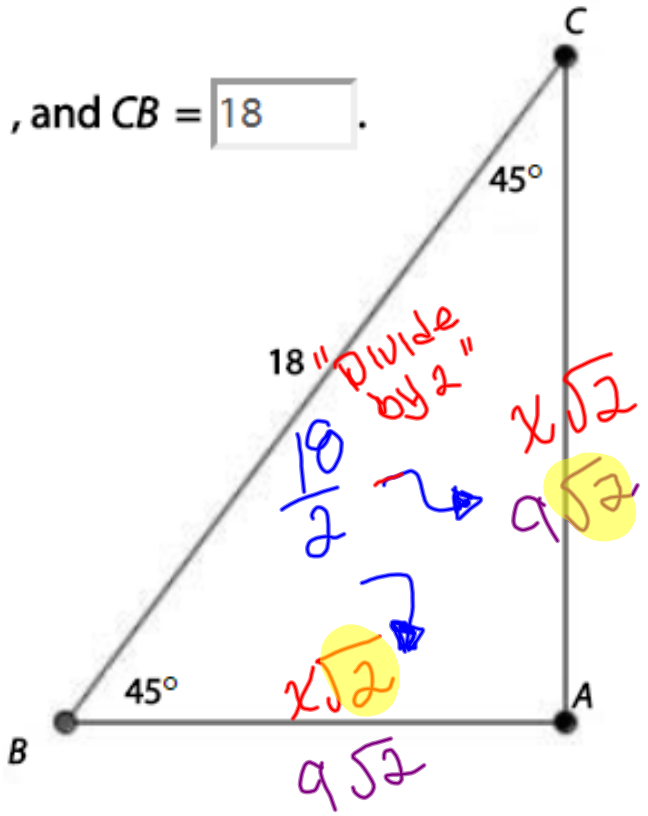
The long leg is opposite the 60° angle.

1 For the triangle, find the unknown side lengths and trigonometric ratios for the 45° angles.

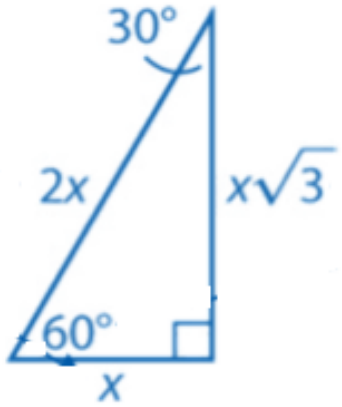
The side lengths are $AB =$ $9\sqrt{2}$, $AC =$ $9\sqrt{2}$, and $CB =$ 18.

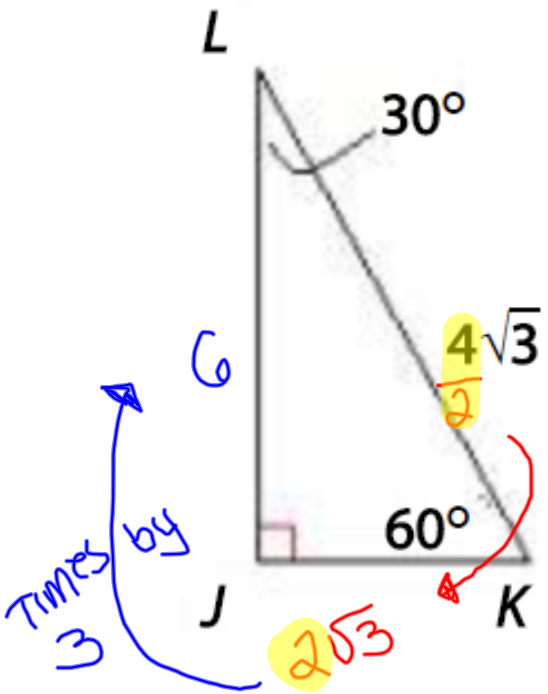
Angle	Sine = $\frac{\text{opp}}{\text{hyp}}$	Cosine = $\frac{\text{adj}}{\text{hyp}}$	Tangent = $\frac{\text{opp}}{\text{adj}}$
45°	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{2}}{2}$	1





2 Find the unknown side lengths in each right triangle.



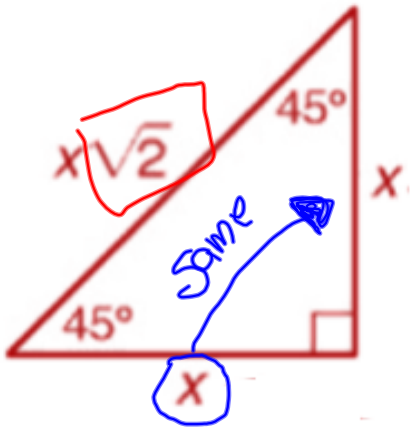


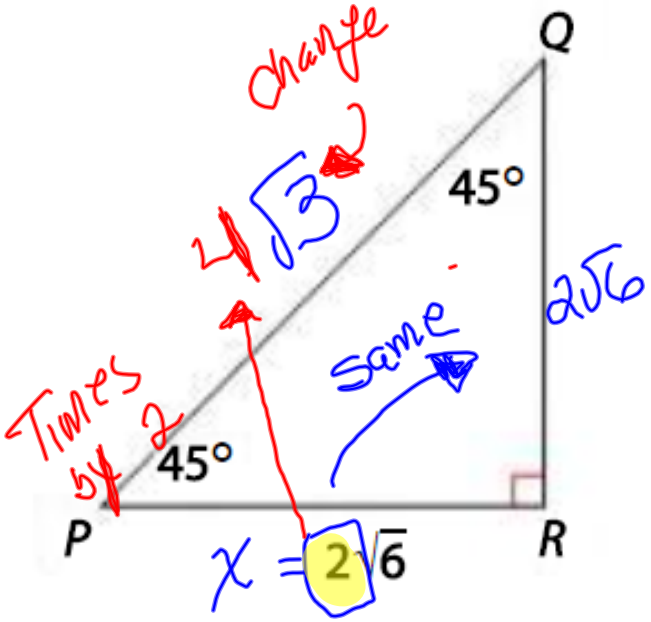
The length of side *JK* is $2\sqrt{3}$.

The length of side *JL* is 6 .

3

Right triangle PQR has acute angles P and Q measuring 45°. Leg PR measures 2 6. Find the unknown side lengths in the right triangle.





The side $\overline{QR}$ has a length of $2\sqrt{6}$.

The side $\overline{PQ}$ has a length of $4\sqrt{3}$.

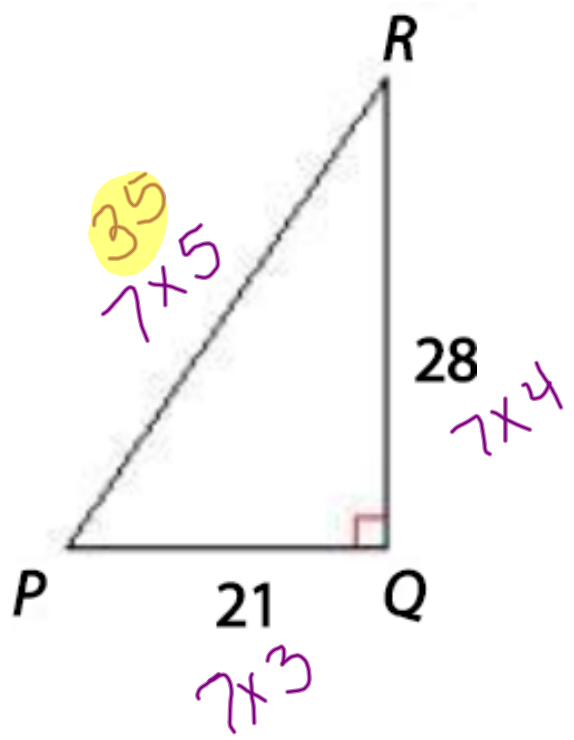
4 Use Pythagorean triples to find the unknown side length.

Ratios

$\frac{RQ}{PQ} = \frac{21 \div 7}{28 \div 7} = \frac{3}{4}$

21 = 7 x 3 : 28 = 7 x 4 : 35 = 7 x 5

3 : 4 : 5

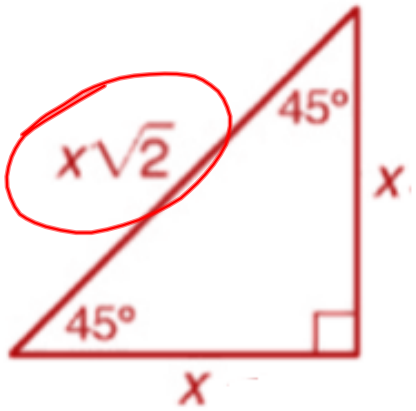


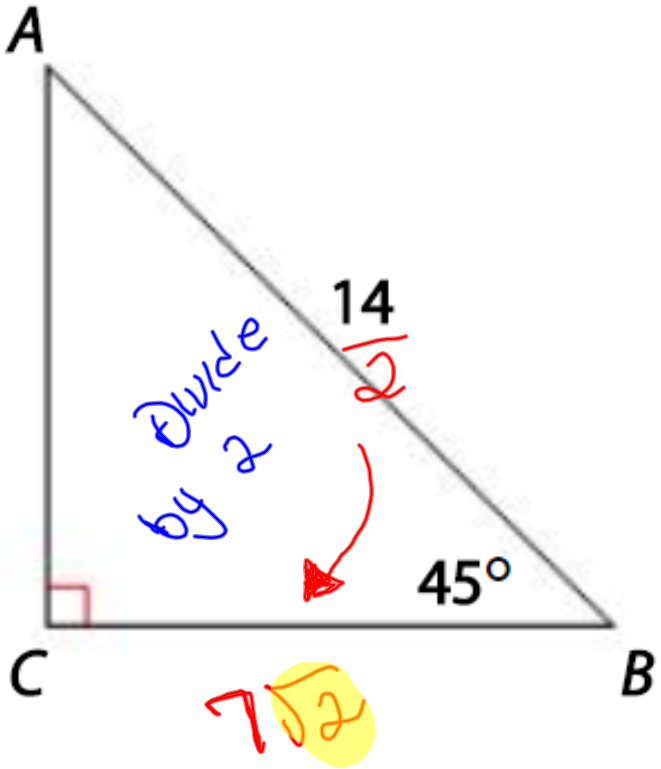
The length of side *PR* is 35.

$3 : 4 : 5 = 7(3) : 7(4) : 7(5)$

$= 21 : 28 : 35$

5 Use trigonometric ratios to solve each right triangle. Be sure to rationalize the denominators when you write your answers.





The length of side *AC* is $7\sqrt{2}$. Same

The length of side *BC* is $7\sqrt{2}$.

6 Use trigonometric ratios to solve the right triangle.

$$\sin 60^\circ = \frac{DF}{EF}$$

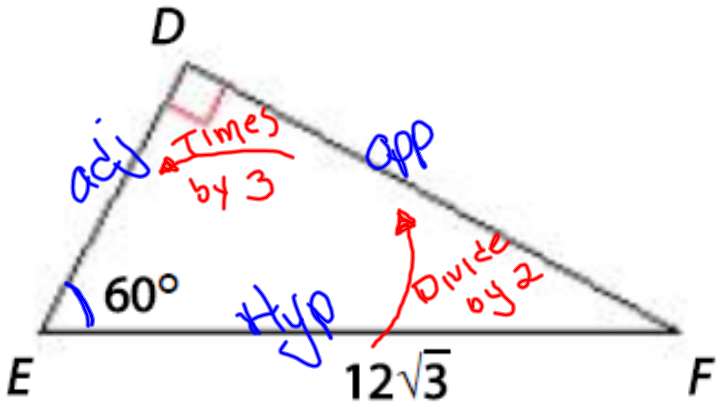
$$\frac{\sqrt{3}}{2} = \frac{DF}{12\sqrt{3}}$$

$$18 = DF$$

$$\cos 60^\circ = \frac{DE}{EF}$$

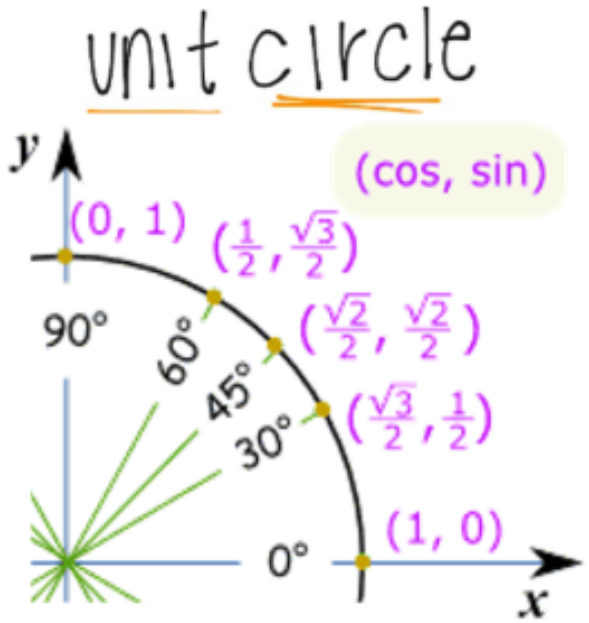
$$\frac{1}{2} = \frac{DE}{12\sqrt{3}}$$

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

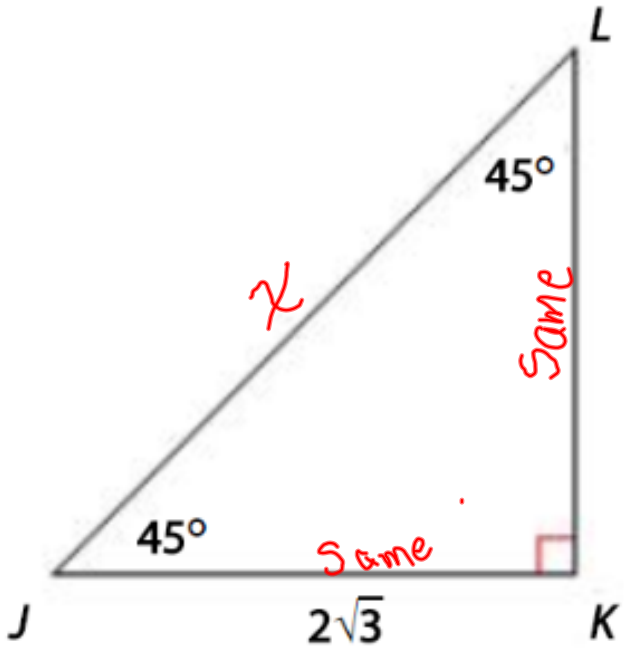


The length of leg DF is 18.

The length of leg DE is $6\sqrt{3}$.



7 Use trigonometric ratios to solve the right triangle.



The length of hypotenuse JL is $2\sqrt{6}$.

The length of leg KL is $2\sqrt{3}$.

$$\sin 45^\circ = \frac{JK}{JL}$$

$$\frac{\sqrt{2}}{2} = \frac{2\sqrt{3}}{x}$$

$$\frac{x\sqrt{2}}{\sqrt{2}} = \frac{4\sqrt{3}}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}}$$

$$x = \frac{4\sqrt{6}}{2} = 2\sqrt{6}$$

8 For the right triangle, find the unknown side length using a Pythagorean triple. If it is not possible to do so using a Pythagorean triple, state why.

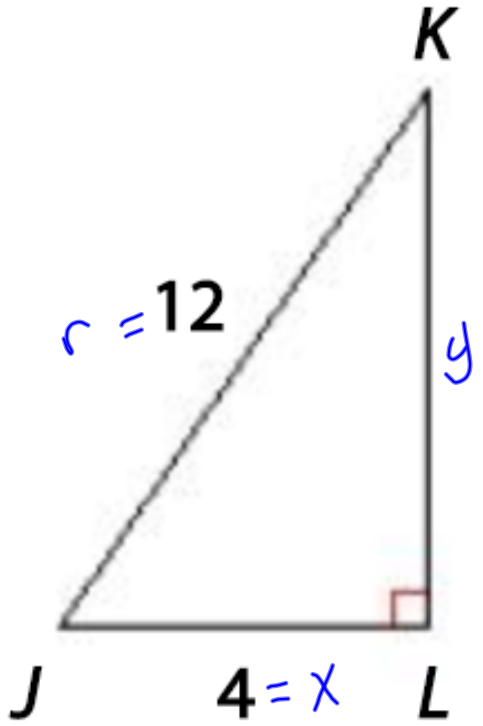
$x^2 + y^2 = r^2$

$4^2 + y^2 = 12^2$

$16 + y^2 = 144$

$-16 \quad -16$

$y^2 = 128$

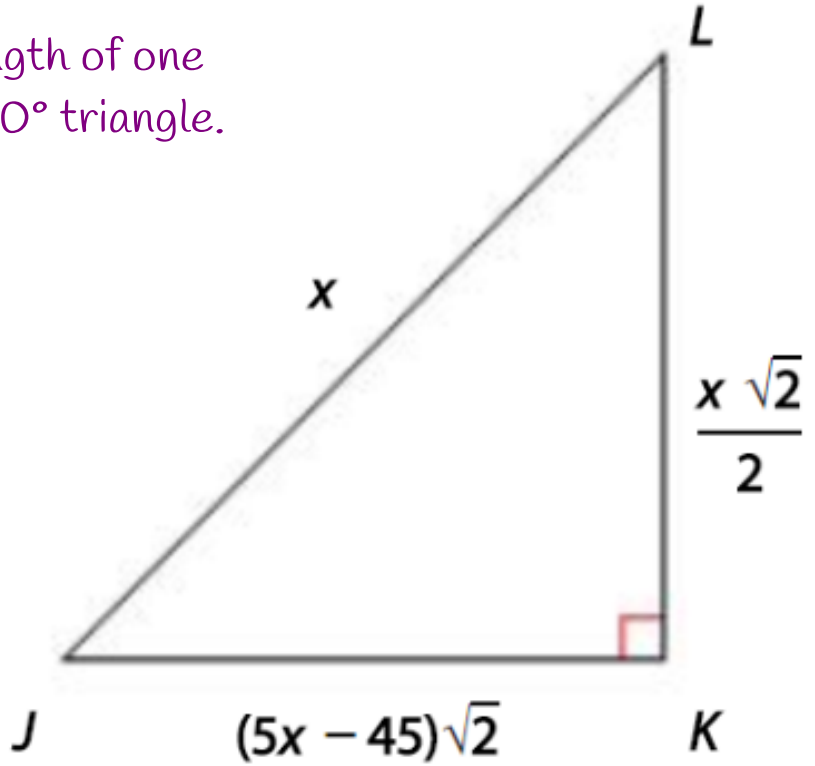


The difference of the squares of the two sides is 128, which is not ▼ a perfect square. So, finding the third side of the triangle by using a Pythagorean triple is not ▼ possible.

9 Find the value of x in the right triangle.

Since the hypotenuse is 2 times the length of one of the legs, triangle JKL is a 45°-45°-90° triangle. Therefore,

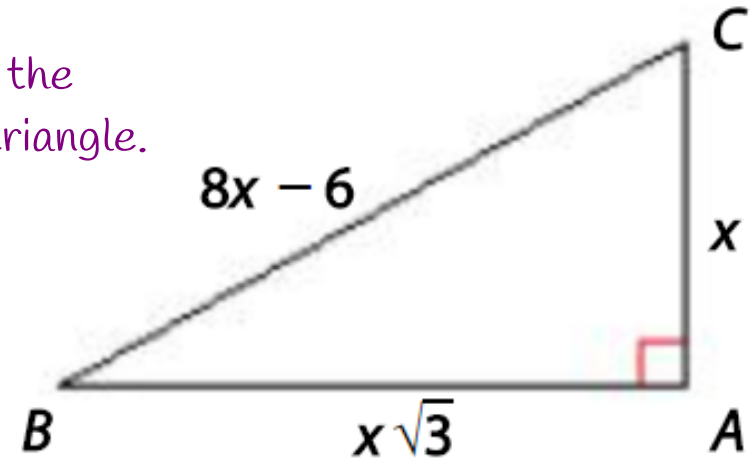
$$\begin{aligned} JK &= JL \\ \frac{x\sqrt{2}}{2} &= (5x - 45)\sqrt{2} \\ x &= 2(5x - 45) \\ x &= 10x - 90 \\ 90 &= 9x \\ 10 &= x \end{aligned}$$



The value of x is **10**.

10 Find the value of x in the right triangle.

Since the longer leg is x 3 times the length of the shorter leg, triangle ABC is a 30°-60°-90° triangle.



Therefore,

$$\begin{aligned} BC &= 2AC \\ 8x - 6 &= 2x \\ 6x &= 6 \\ x &= 1 \end{aligned}$$

$x =$ 1 .


Never say,
"I can't"
Always say,
"I'll try"