

Special Right Triangles

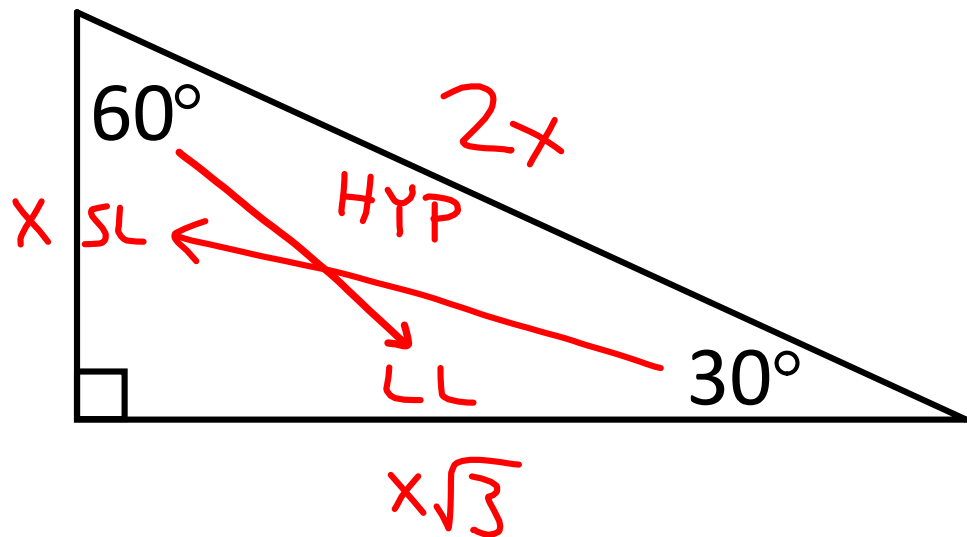
2 Types:

1) $30^\circ - 60^\circ - 90^\circ$ Right Triangles

2) $45^\circ - 45^\circ - 90^\circ$ Right Triangles

30° - 60° - 90° Right Triangles

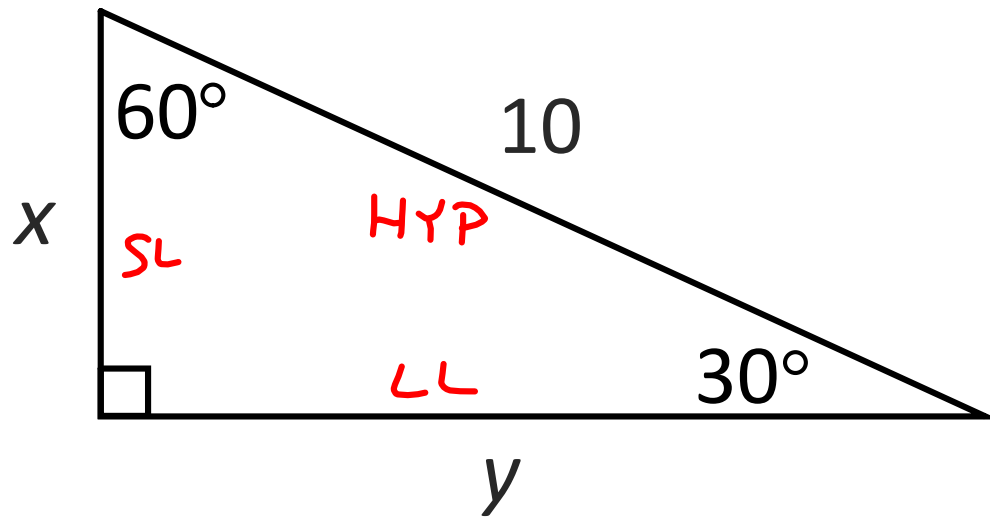
In any 30° - 60° - 90° triangle, the hypotenuse is twice as long as the short leg, and the long leg is $\sqrt{3}$ times as long as the short leg



$$\text{HYP} = 2 \cdot \text{SL}$$

$$\text{LL} = \text{SL}\sqrt{3}$$

Lesson 1 - Special Right Triangles Marked



$$\text{HYP} = 2 \cdot \text{SL}$$

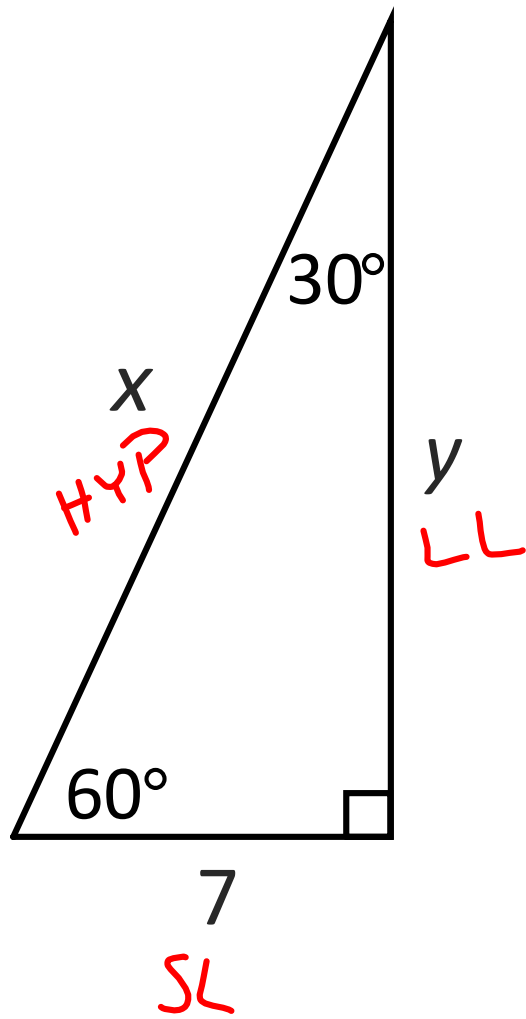
$$\text{LL} = \text{SL}\sqrt{3}$$

$$10 = 2x$$

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

$$x = 5 \longrightarrow y = 5\sqrt{3}$$

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$$HYP = 2 \cdot SL$$

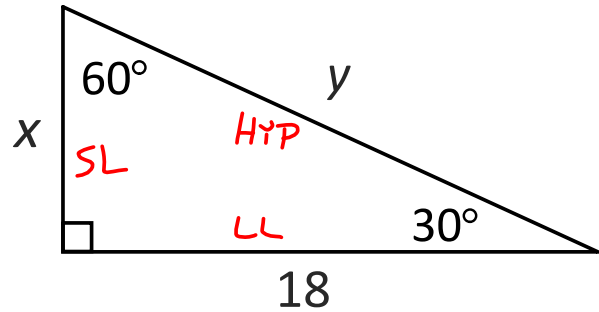
$$x = 2 \cdot 7$$

$$x = 14$$

$$LL = SL\sqrt{3}$$

$$y = 7\sqrt{3}$$

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$$HYP = 2 \cdot SL$$

$$y = 2x$$

$$\rightarrow y = 2(6\sqrt{3})$$

$$y = 12\sqrt{3}$$

$$LL = SL\sqrt{3}$$

$$\frac{18}{\sqrt{3}} = \frac{x\sqrt{3}}{\sqrt{3}}$$

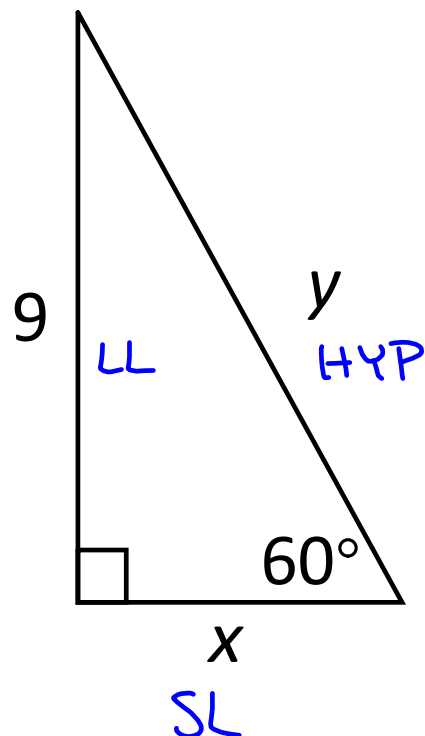
RATIONALIZE

$$x = \frac{18}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}}$$

$$x = \frac{18\sqrt{3}}{3}$$

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

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$$HYP = 2 \cdot SL$$

$$y = 2 \cdot x$$

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

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

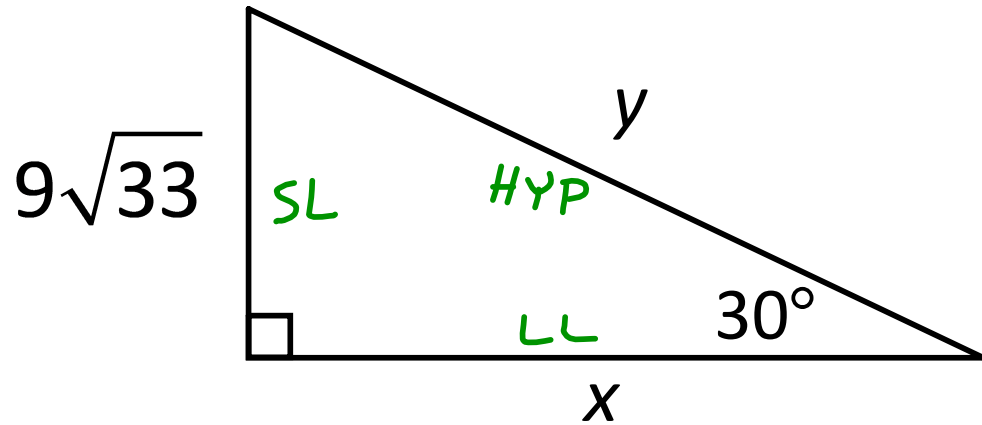
$$LL = SL\sqrt{3}$$

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

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

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

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$$HYP = 2 \cdot SL$$

$$y = 2 \cdot 9\sqrt{33}$$

$$y = 18\sqrt{33}$$

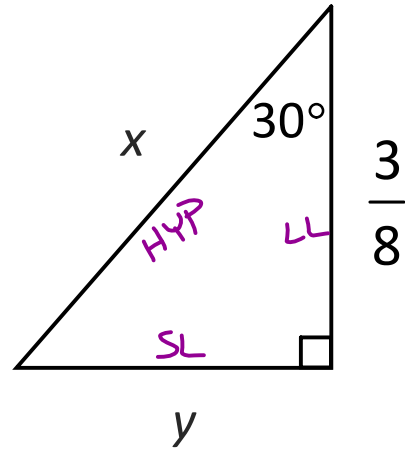
$$LL = SL\sqrt{3}$$

$$x = 9\sqrt{33}\sqrt{3}$$

$$x = 9\sqrt{11 \cdot 3 \cdot 3}$$

$$x = 27\sqrt{11}$$

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$$HYP = 2 \cdot SL$$

$$x = 2 \cdot y$$

$$x = 2 \left(\frac{\sqrt{3}}{8} \right) = \frac{2\sqrt{3}}{8}$$

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

$$LL = SL\sqrt{3}$$

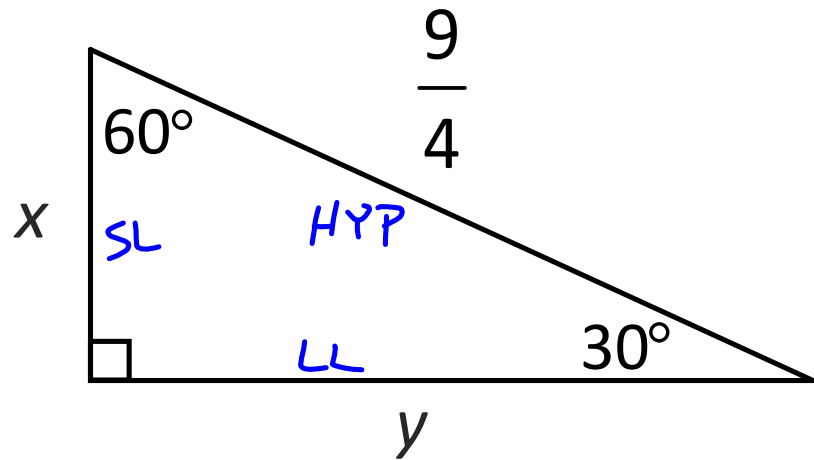
$$\frac{3}{8} = y\sqrt{3}$$

$$y = \frac{3}{8\sqrt{3}} \frac{\sqrt{3}}{\sqrt{3}}$$

$$y = \frac{3\sqrt{3}}{24}$$

$$y = \frac{\sqrt{3}}{8}$$

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$$HYP = 2 \cdot SL$$

$$\frac{9}{4} = 2x$$

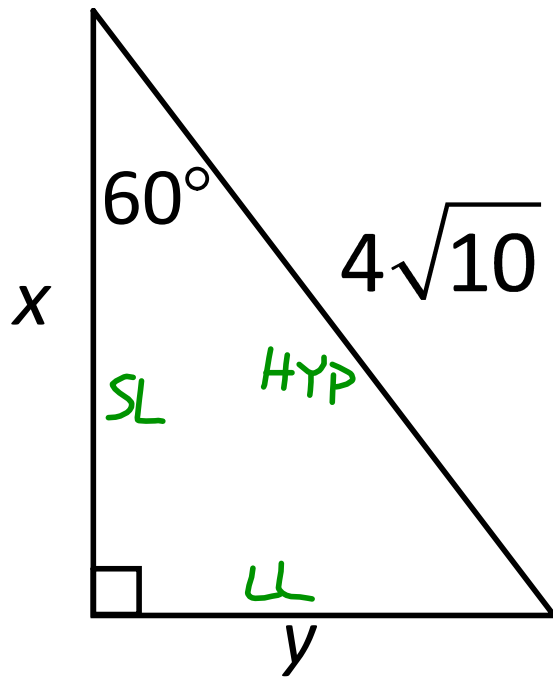
$$x = \frac{9}{4} \cdot \frac{1}{2} = \frac{9}{8}$$

$$LL = SL\sqrt{3}$$

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

$$y = \frac{9}{8}\sqrt{3}$$

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$$HYP = 2 \cdot SL$$

$$4\sqrt{10} = 2x$$

$$x = 2\sqrt{10}$$

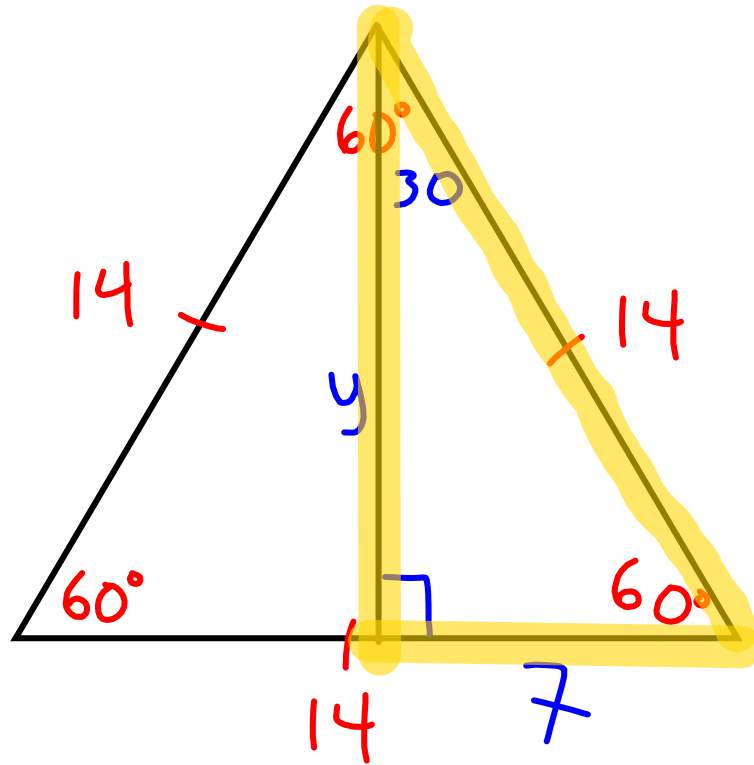
$$LL = SL\sqrt{3}$$

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

$$y = 2\sqrt{10}\sqrt{3}$$

$$y = 2\sqrt{30}$$

Given an equilateral triangle with a side of 14 cm, find the altitude of the triangle.



$$LL = y$$

$$SL = 7$$

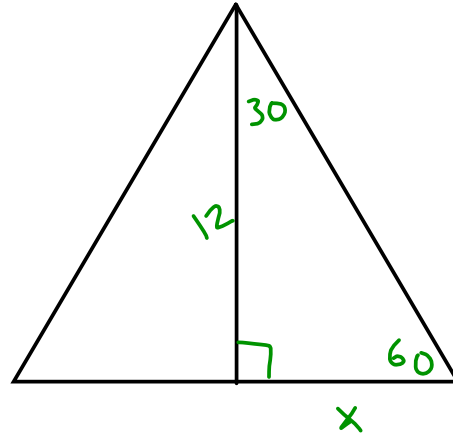
$$LL = SL\sqrt{3}$$

$$y = 7\sqrt{3}$$

\therefore ALTITUDE IS $7\sqrt{3}$ cm

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Given an equilateral triangle with an altitude of 12 in, find the area of the triangle.



$$LL = SL\sqrt{3}$$

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

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

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

$$A = \frac{1}{2}bh$$

$$\text{WHERE } h = 12$$

$$b = 2x$$

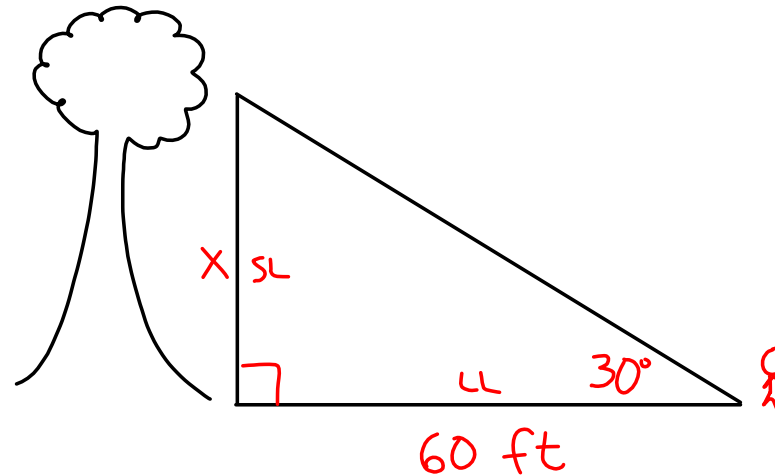
$$= 2(4\sqrt{3}) = 8\sqrt{3}$$

$$A = \frac{1}{2}(8\sqrt{3})(12)$$

$$= 48\sqrt{3} \text{ in}^2$$

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A tree casts a 60-foot shadow. If you are standing at the end of the shadow, and you must look up at an angle of 30° to see the top of the tree, then what is the height of the tree?



$$L = SL\sqrt{3}$$

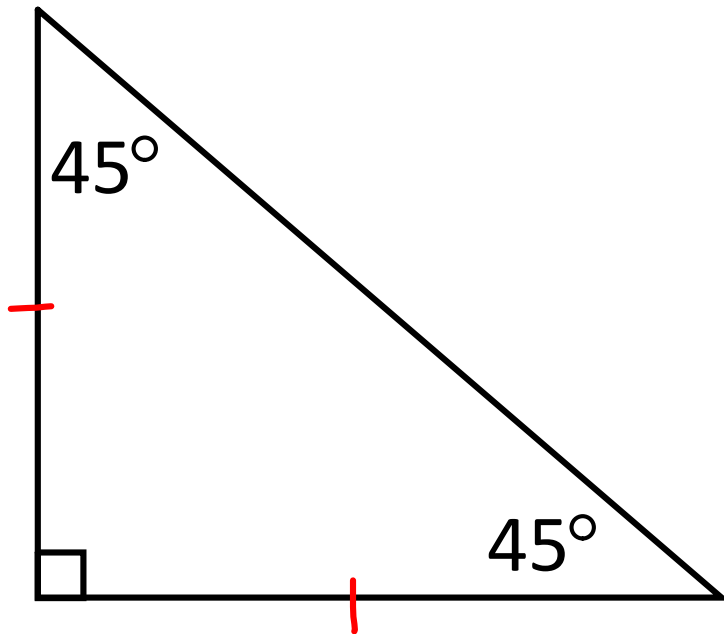
$$60 = x\sqrt{3}$$

$$x = \frac{60}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{60\sqrt{3}}{3} = 20\sqrt{3}$$

\therefore THE TREE HAS A HEIGHT OF
 $20\sqrt{3}$ ft

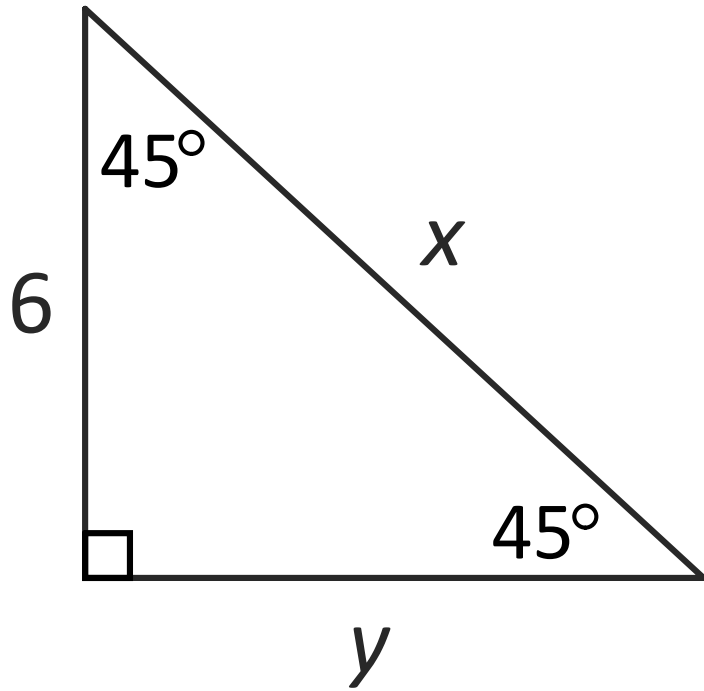
45° - 45° - 90° Right Triangles

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



$$\text{HYP} = \text{LEG} \sqrt{2}$$

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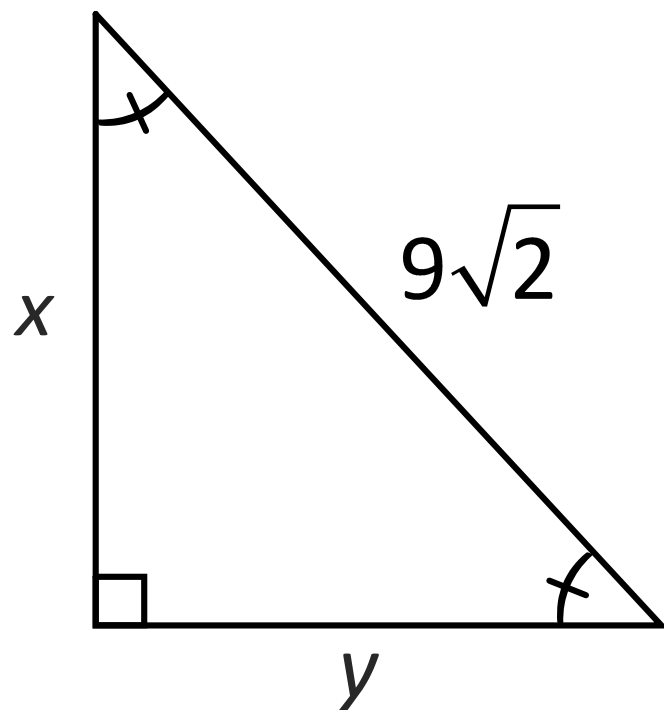


$$y = 6$$

$$\text{HYP} = \text{LEG} \sqrt{2}$$

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

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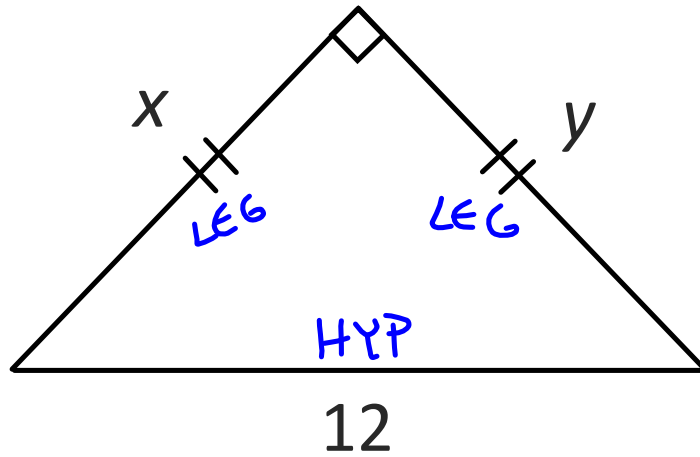
$$\text{HYP} = \text{LEG}\sqrt{2}$$

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

$$x = 9$$

$$y = 9$$

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$$\text{HYP} = \text{LEG}\sqrt{2}$$

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

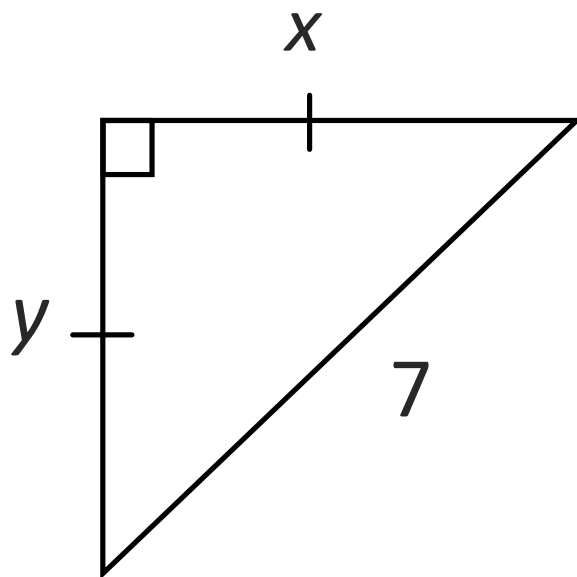
$$x = \frac{12}{\sqrt{2}} \frac{\sqrt{2}}{\sqrt{2}}$$

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

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

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

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$$\text{HYP} = \text{LEG}\sqrt{2}$$

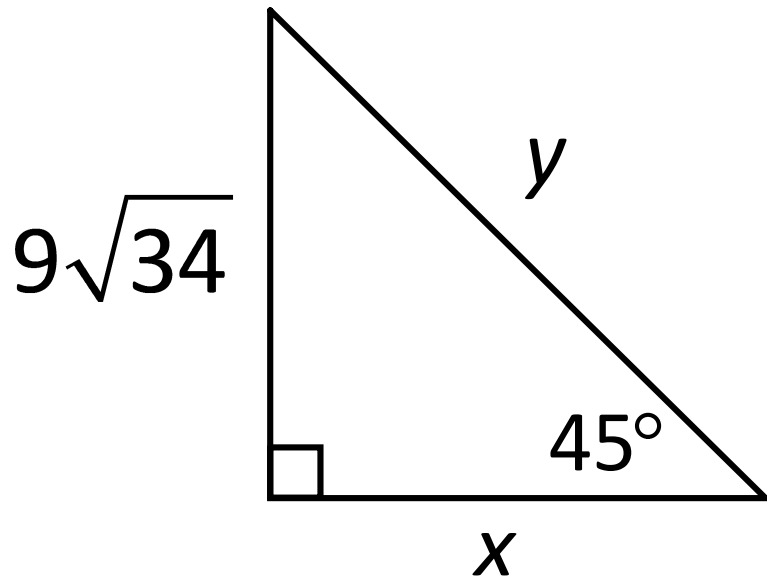
$$7 = x\sqrt{2}$$

$$x = \frac{7}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}}$$

$$x = \frac{7\sqrt{2}}{2}$$

$$y = \frac{7\sqrt{2}}{2}$$

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$$x = 9\sqrt{34}$$

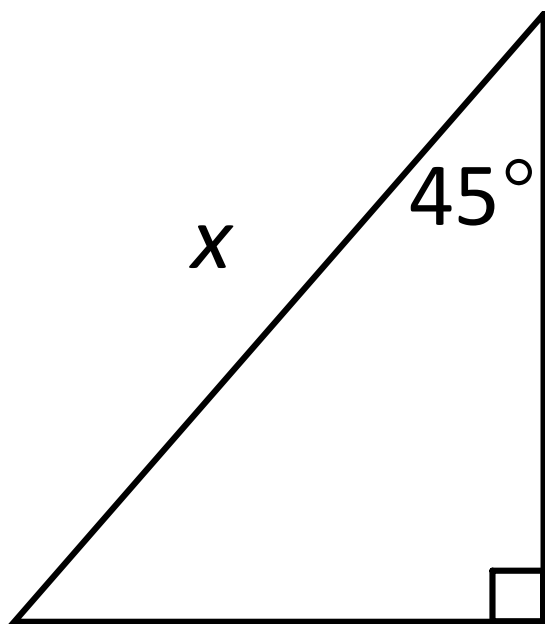
$$\text{HYP} = \text{LEG} \sqrt{2}$$

$$y = 9\sqrt{34} \sqrt{2}$$

$$y = 9\sqrt{17 \cdot 2 \cdot 2}$$

$$y = 18\sqrt{17}$$

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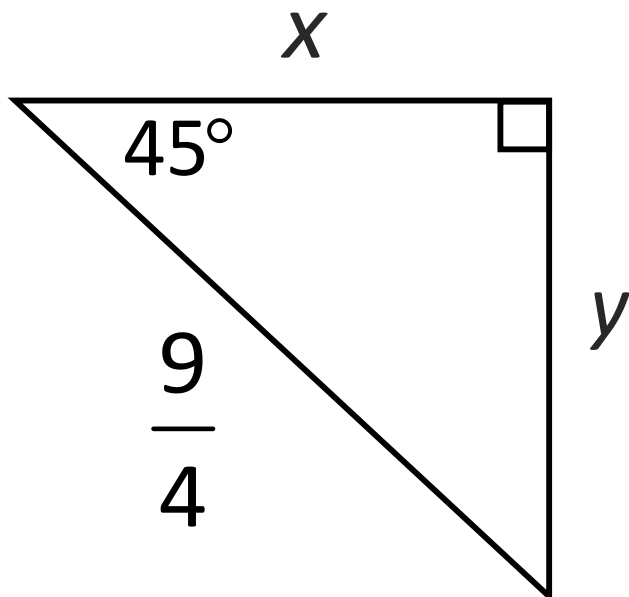
$$\frac{3}{8}$$

$$\text{HYP} = \text{LEG} \sqrt{2}$$

$$x = \frac{3}{8} \sqrt{2}$$

$$y = \frac{3}{8}$$

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$$\text{HYP} = \text{LEG} \sqrt{2}$$

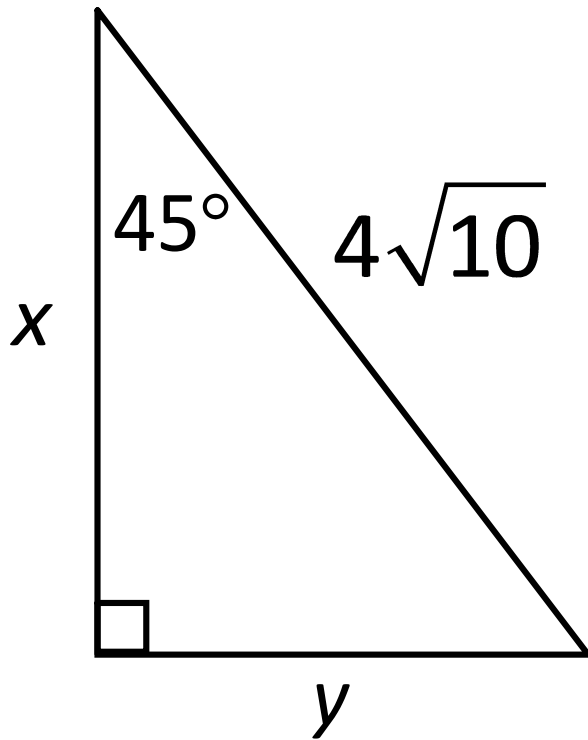
$$\frac{9}{4} = x\sqrt{2}$$

$$x = \frac{9}{4\sqrt{2}} \quad \frac{\sqrt{2}}{\sqrt{2}}$$

$$x = \frac{9\sqrt{2}}{8}$$

$$y = \frac{9\sqrt{2}}{8}$$

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$$\text{HYP} = \text{LEG} \sqrt{2}$$

$$4\sqrt{10} = x\sqrt{2}$$

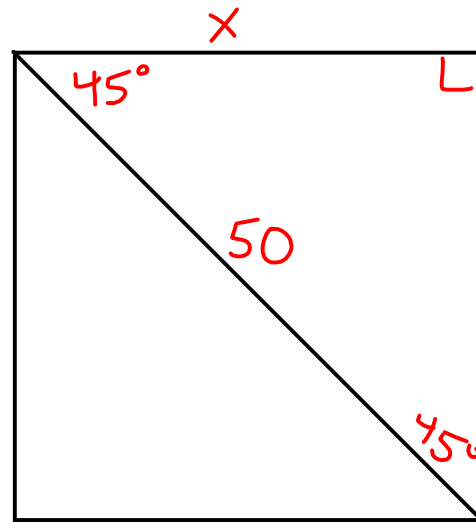
$$x = \frac{4\sqrt{10}}{\sqrt{2}}$$

$$x = 4\sqrt{5}$$

$$y = 4\sqrt{5}$$

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A square has a diagonal of 50 cm. Find its area.



$$\text{HYP} = \text{LEG} \sqrt{2}$$

$$50 = x\sqrt{2}$$

$$x = \frac{50}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}}$$

$$x = \frac{50\sqrt{2}}{2}$$

$$x = 25\sqrt{2}$$

$$\begin{aligned} A_{\text{SQUARE}} &= s^2 \\ &= (25\sqrt{2})^2 \\ &= 625 \cdot 2 \\ &= 1250 \text{ cm}^2 \end{aligned}$$