

Special Triangles

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Click on the topic that you wish to view . . .

 45° – 45° – 90° Triangle

 30° – 60° – 90° Triangle

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$45^\circ - 45^\circ - 90^\circ$ Triangle

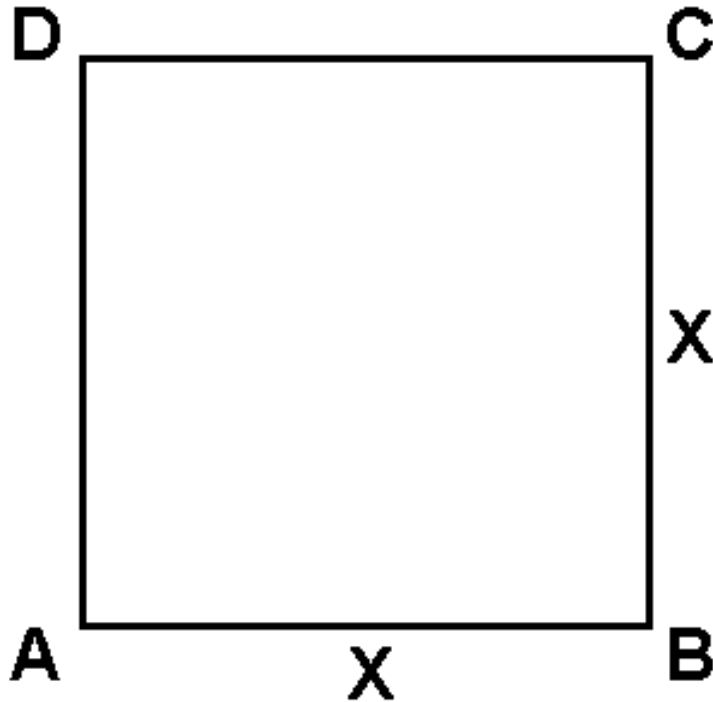
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Consider a square with sides X .



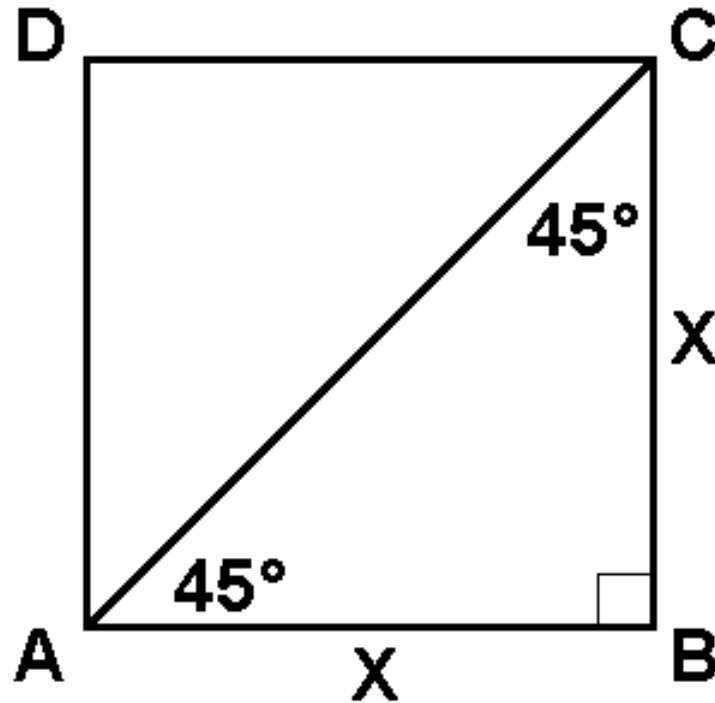
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If we draw in diagonal \overline{AC} we'll obtain two triangles.



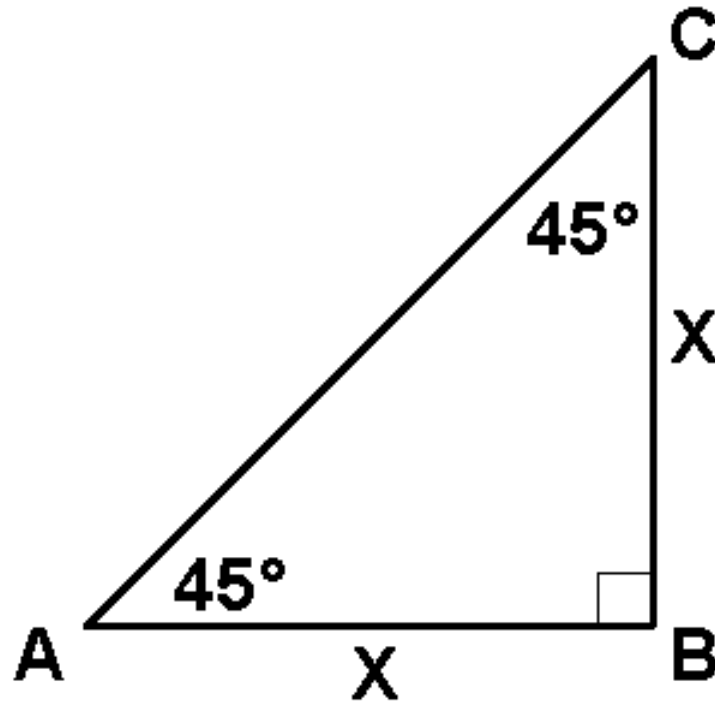
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Take a closer look at the triangle ABC,
it's a Right Triangle!



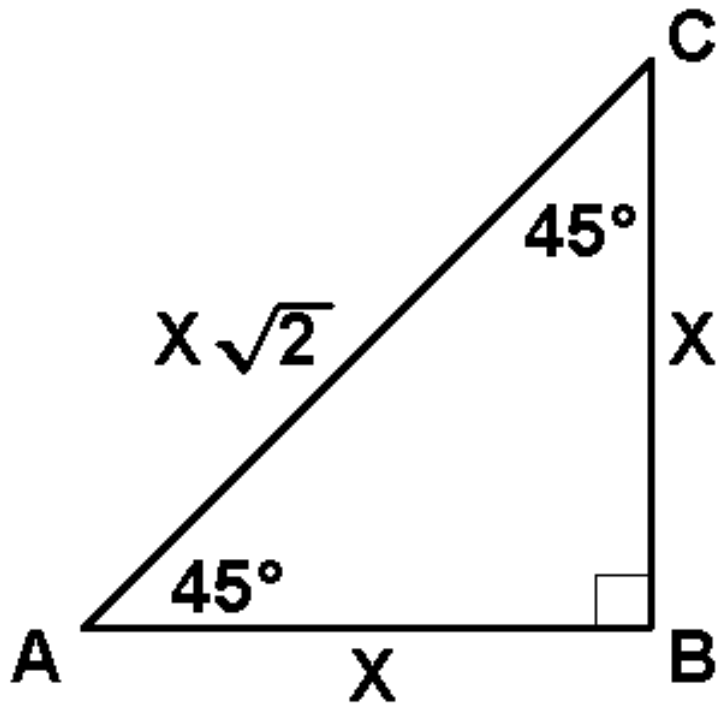
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Applying the Pythagorean Theorem, we obtain the length of our diagonal \overline{AC} .



Since $(\overline{AC})^2 = X^2 + X^2$

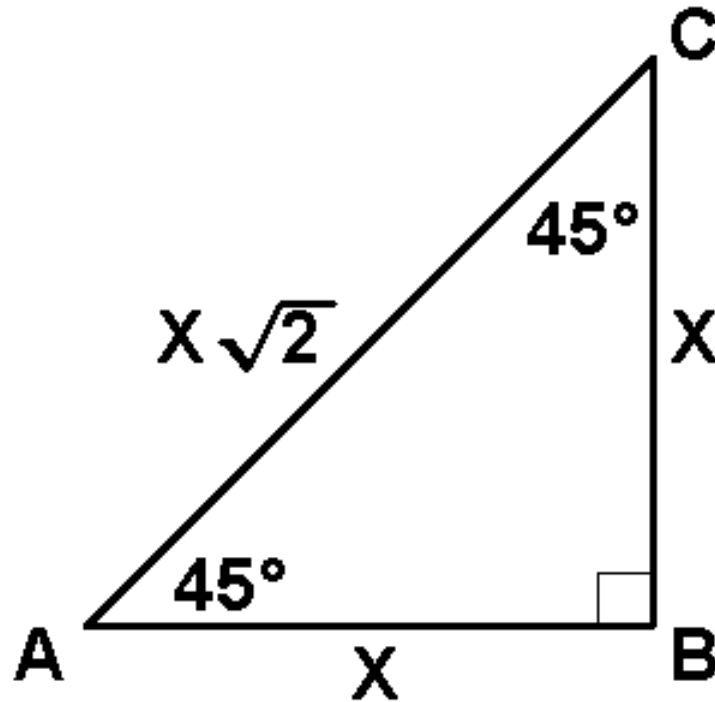
$$(\overline{AC})^2 = 2X^2$$

$$\overline{AC} = \pm\sqrt{2X^2}$$

$$\overline{AC} = \pm\sqrt{2} X$$

$$\boxed{\overline{AC} = X\sqrt{2}}$$

This is fundamental yet powerful result.



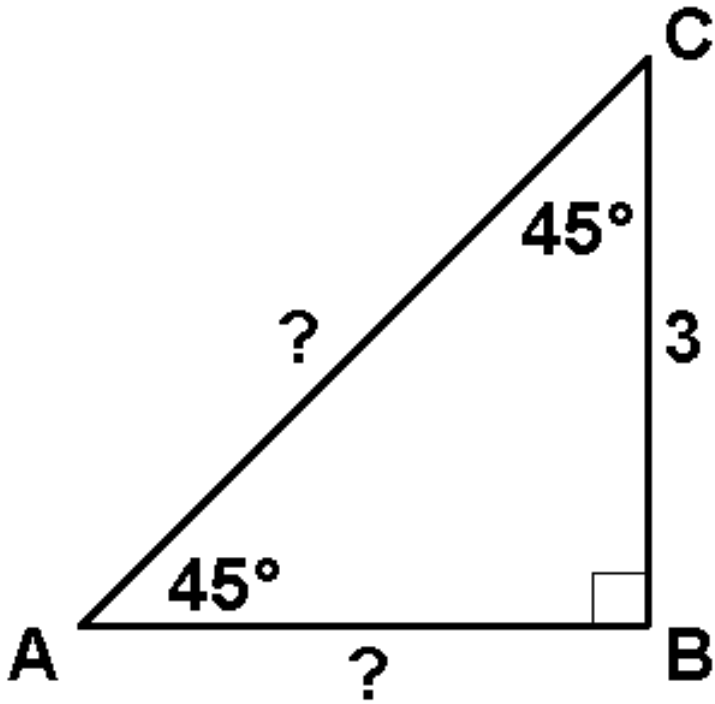
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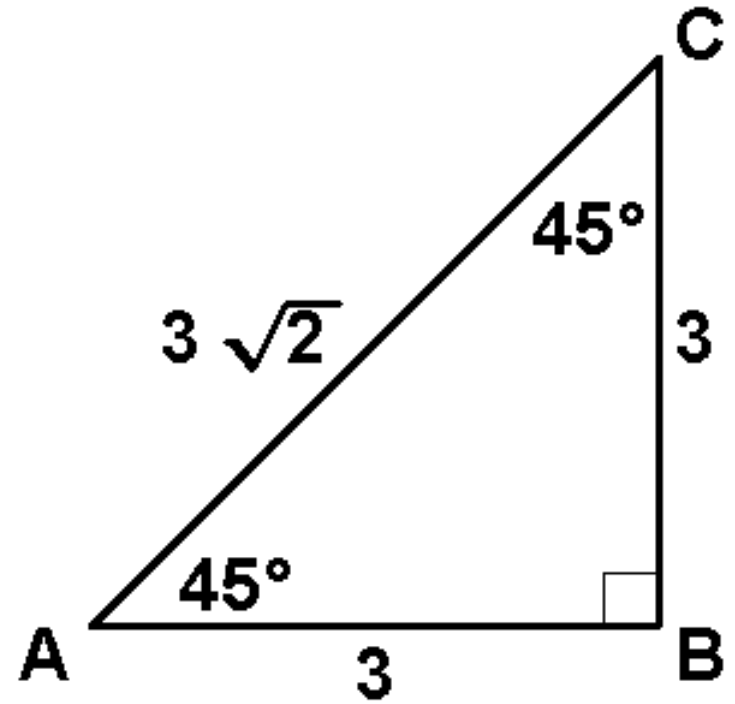
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Example 1)



becomes



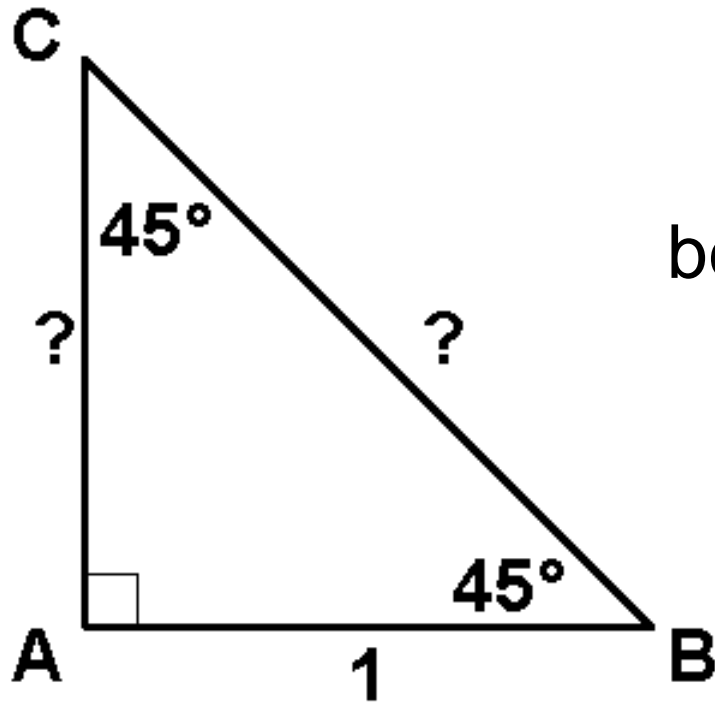
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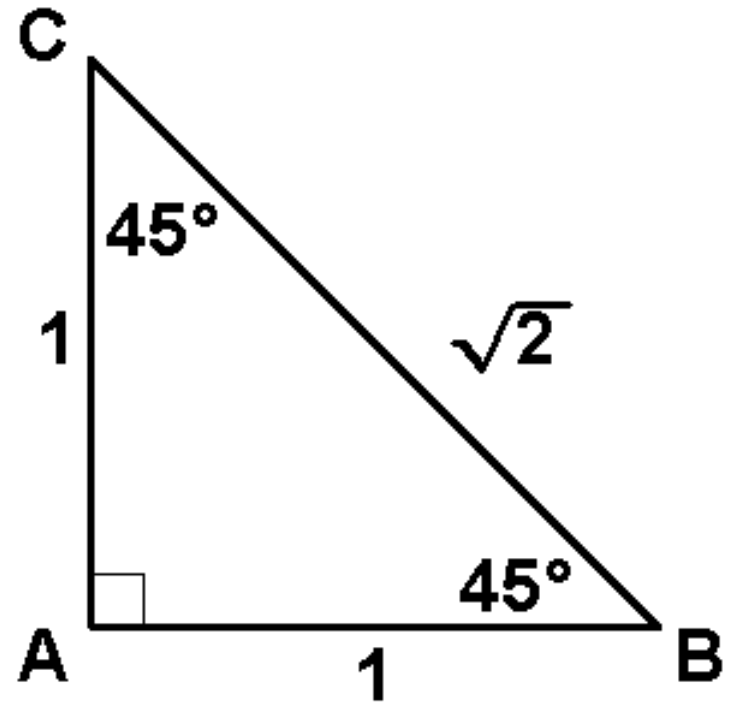
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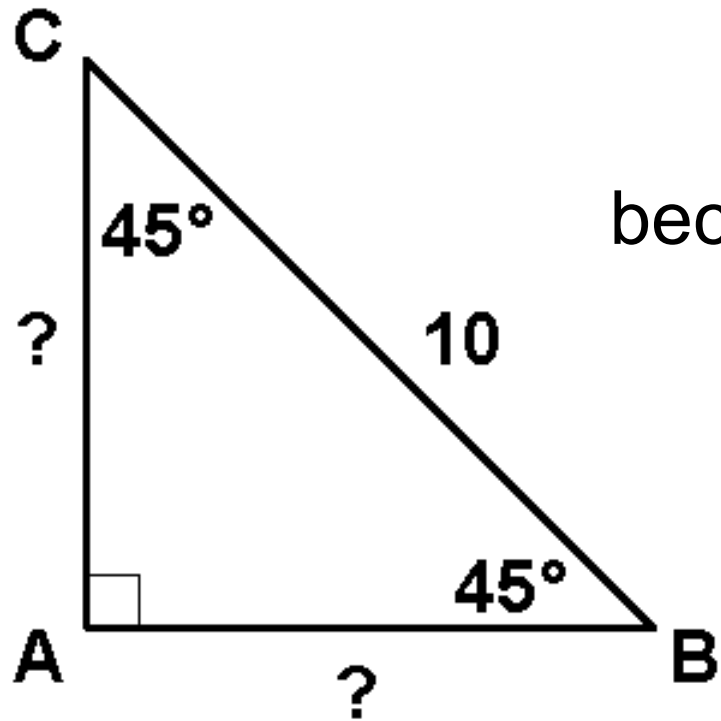
Example 2)



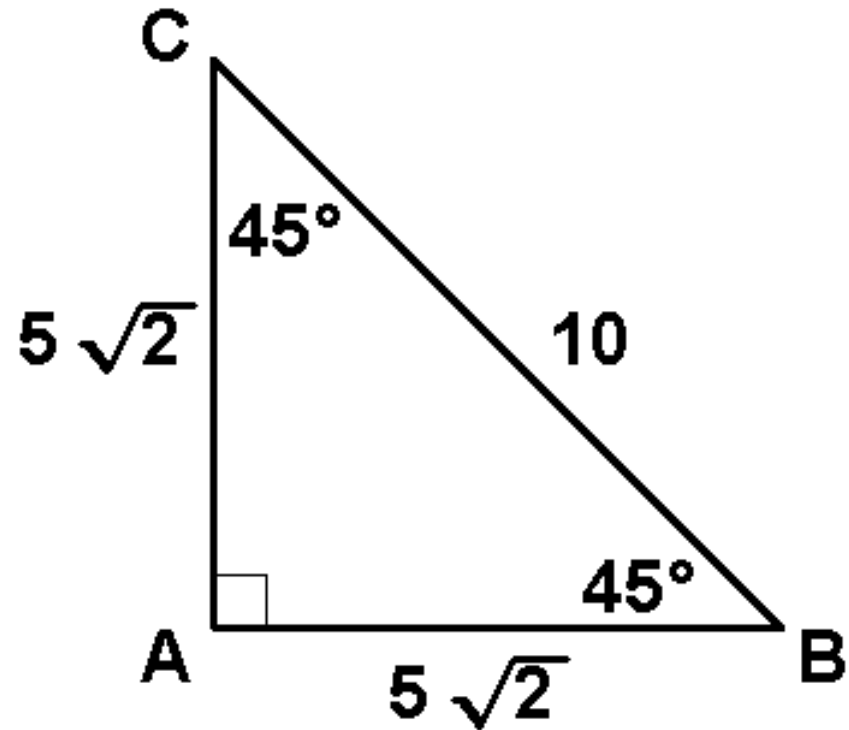
becomes



Example 3)



becomes



Why?

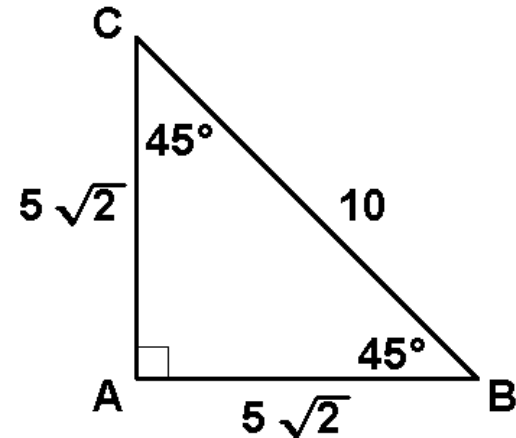
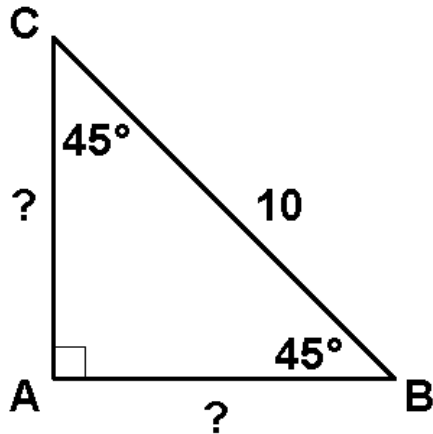
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Using the 45° - 45° - 90° relationship. . .



$$X\sqrt{2} = 10 \rightarrow X = \frac{10}{\sqrt{2}}; \quad X = \frac{10}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}}$$

$$X = \frac{10\sqrt{2}}{2}$$

$$\boxed{X = 5\sqrt{2}}$$

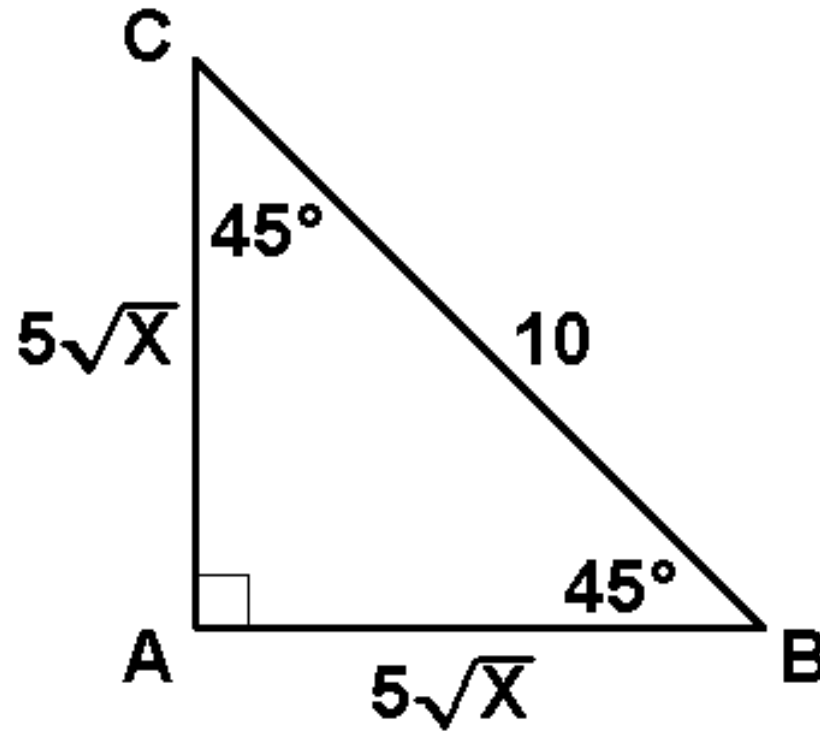
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Thus, if $\overline{BC} = 10$



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$30^\circ - 60^\circ - 90^\circ$ Triangle

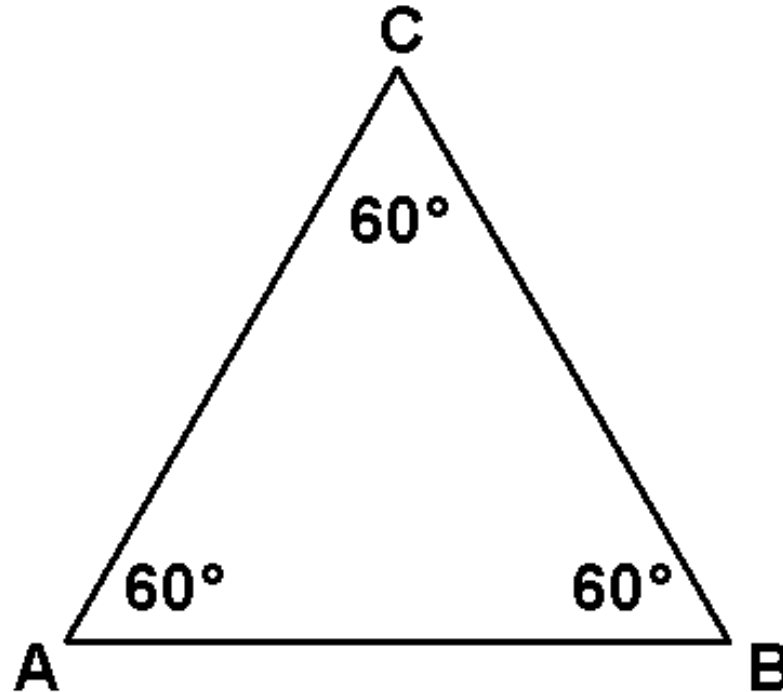
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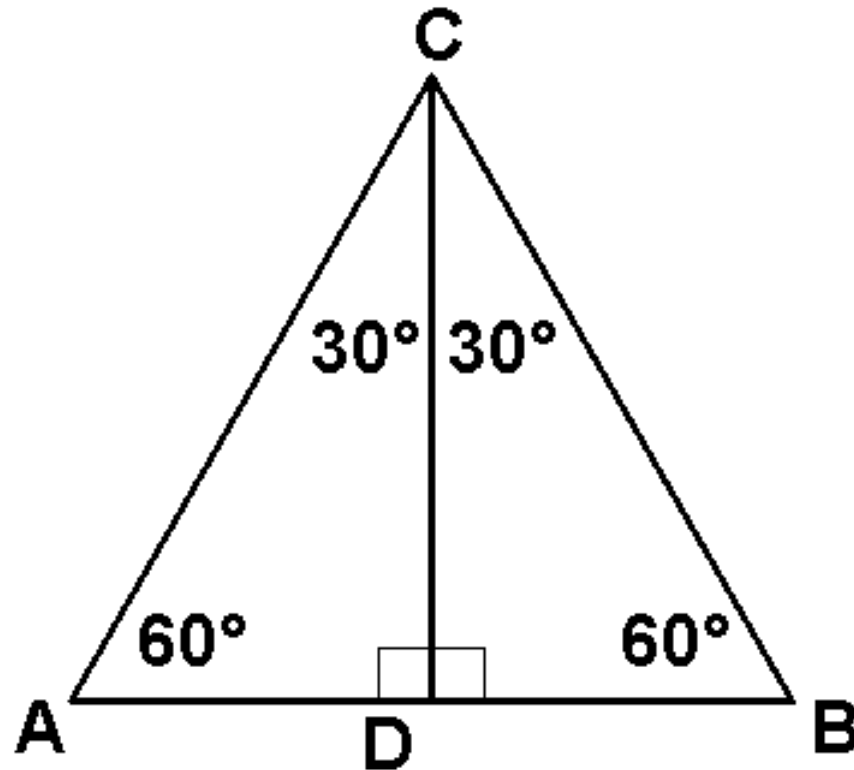
Consider an equilateral triangle.



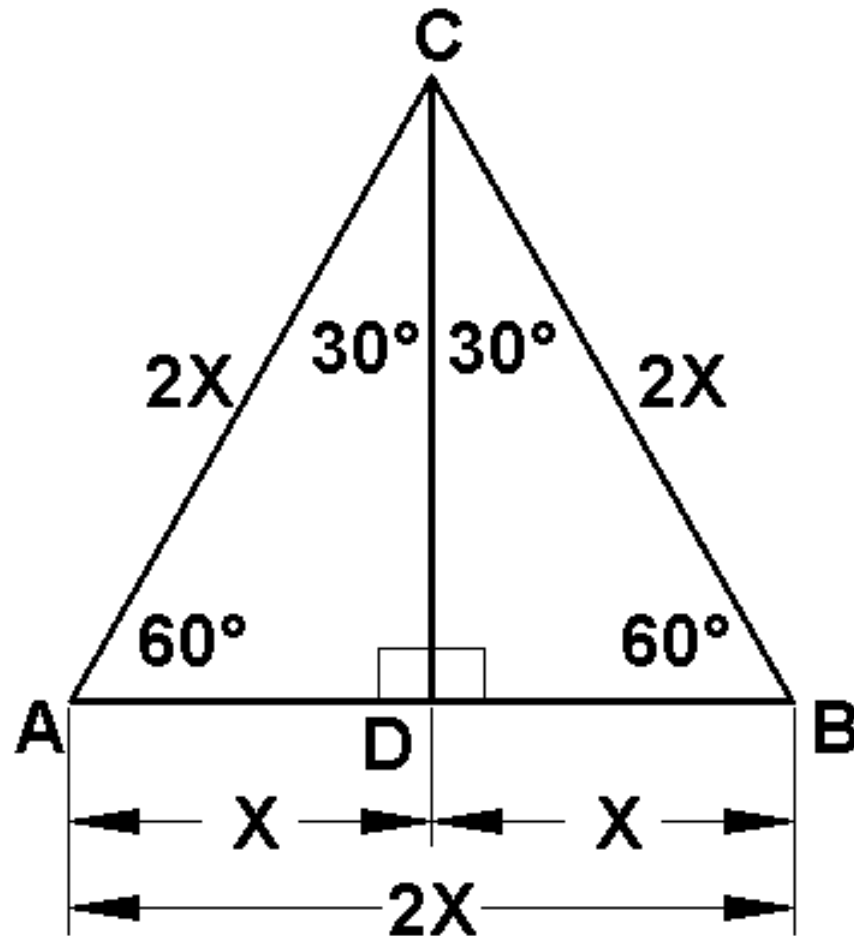
We know equilateral triangles have:

1. Interior angles each measuring 60° .
2. All three sides have equal length.

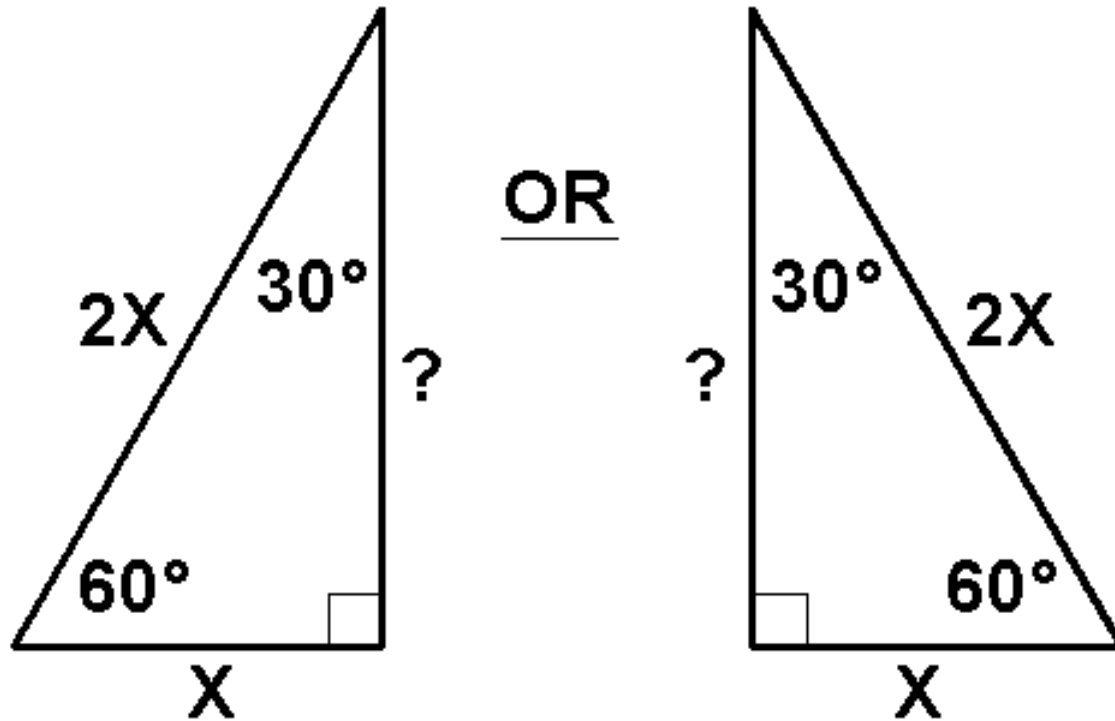
Bisecting angle ACB by drawing a line segment from vertex C to point D on side \overline{AB} , we obtain the following:



Now, represent the lengths of our equilateral triangle by $2X$.



We've created a 30° - 60° - 90° triangle.



We need to determine the length of one of our legs, it's represented by the ?

Using the Pythagorean Theorem,

$$?^2 + X^2 = (2X)^2$$

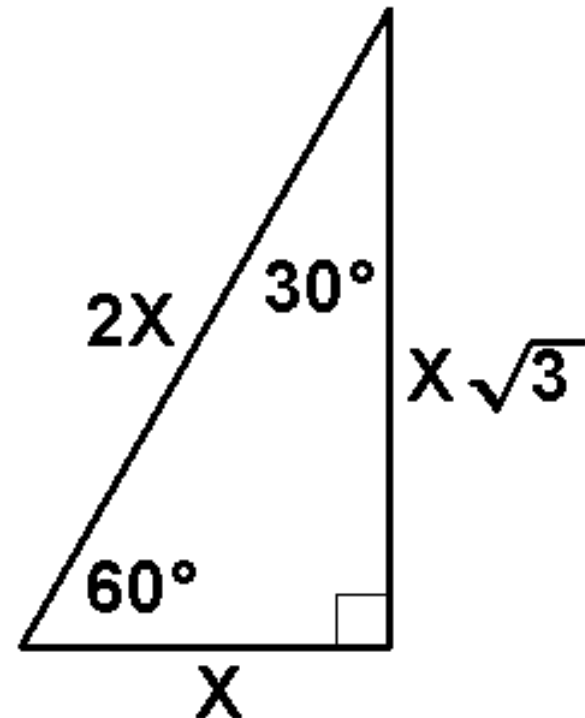
$$?^2 + X^2 = 4X^2$$

$$?^2 = 3X^2$$

$$? = \pm\sqrt{3X^2}$$

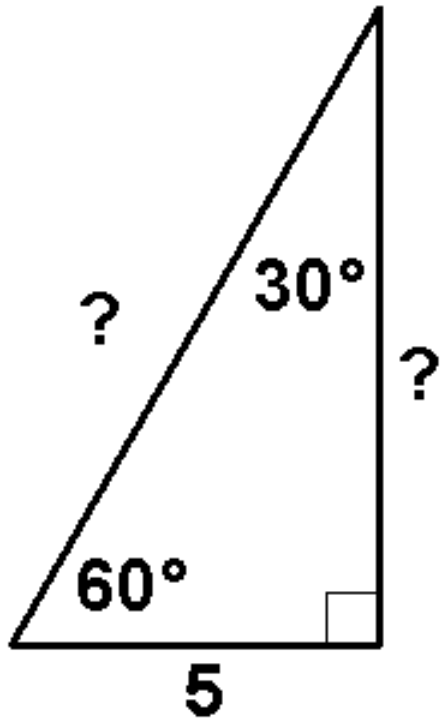
$$? = \pm\sqrt{3} X$$

$$\boxed{? = X\sqrt{3}}$$

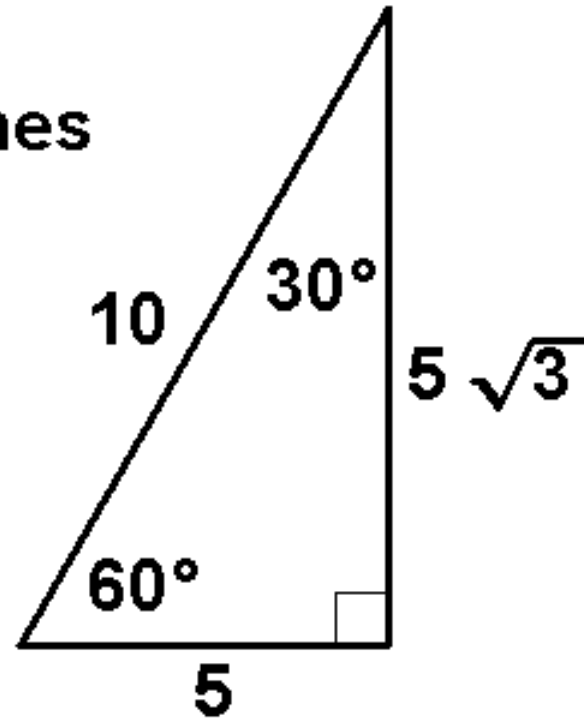


We can now apply this result.

Example 1)



becomes



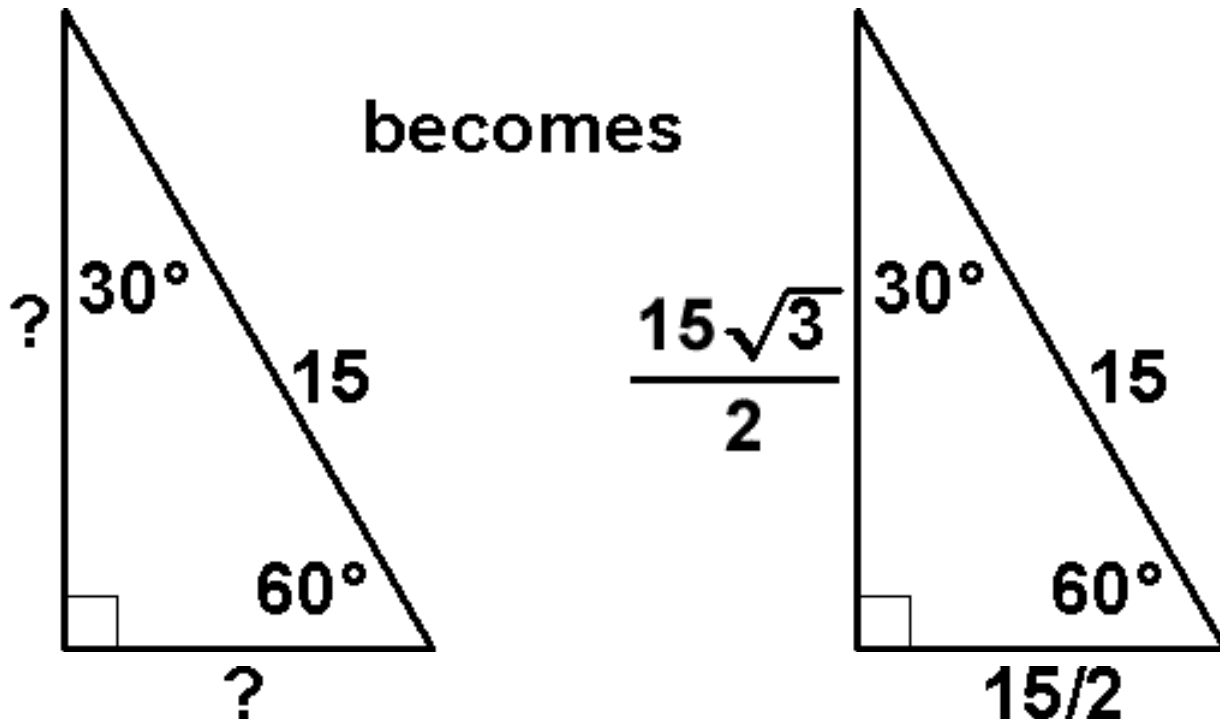
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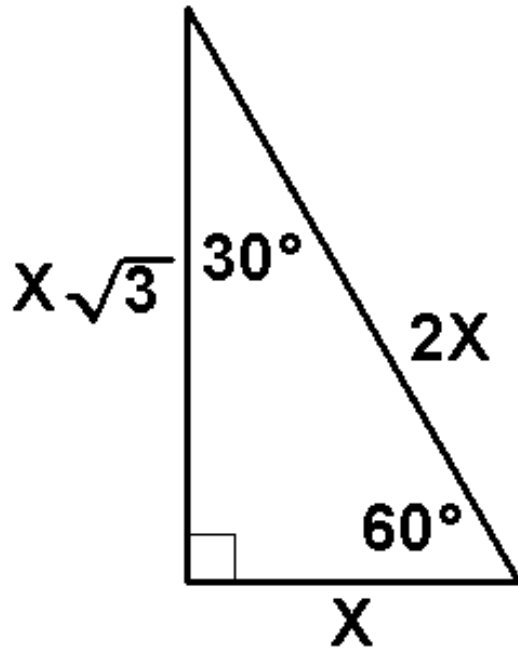
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Example 2)



Using,



$$2X = 15;$$

$$X = \frac{15}{2}$$

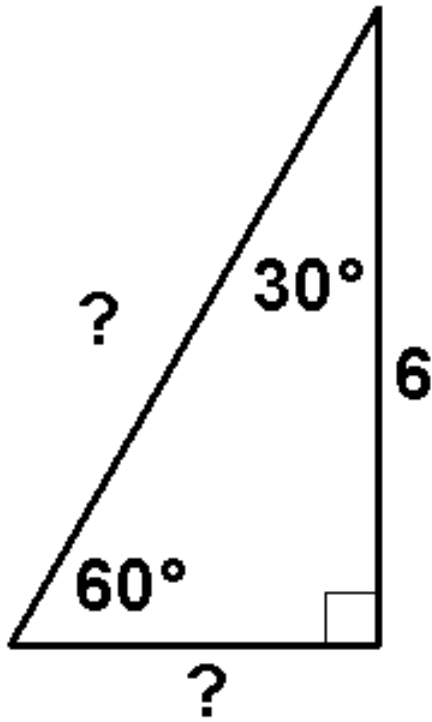
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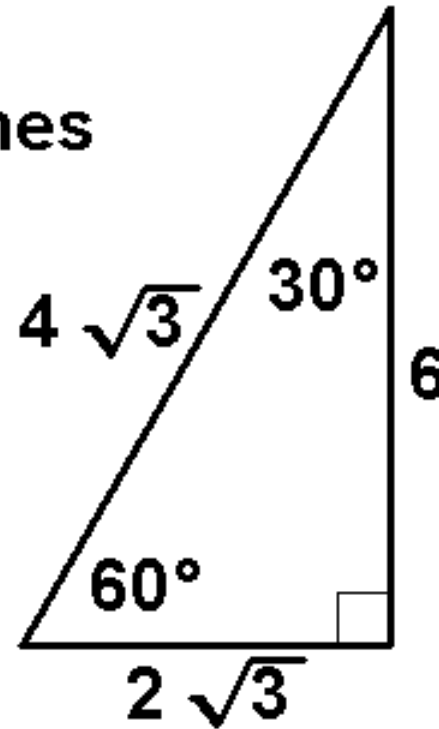
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Example 3)



becomes



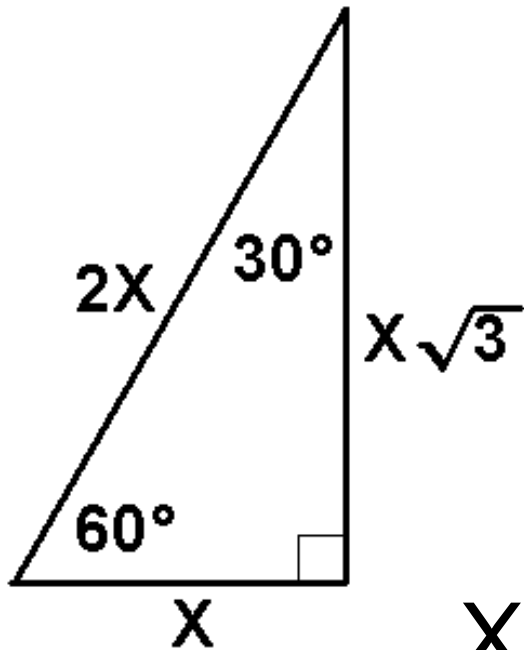
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Using,



$$X\sqrt{3} = 6 \text{ or } X = \frac{6}{\sqrt{3}}$$

$$X = \frac{6}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}}; \quad X = \frac{6\sqrt{3}}{3}$$

$$\boxed{X = 2\sqrt{3}}$$

End of Special Triangles

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