Lesson 9.2 Special Right Triangles

Wednesday, April 02, 2025 10:25 PM

Click link below for interactive Pear Deck PowerPoint Lesson:

https://app.peardeck.com/student/tdfpgtxaa

Lesson 9.2 Special Right

Lesson 9.2 Special Right Triangles

Workbook Pages 135-137

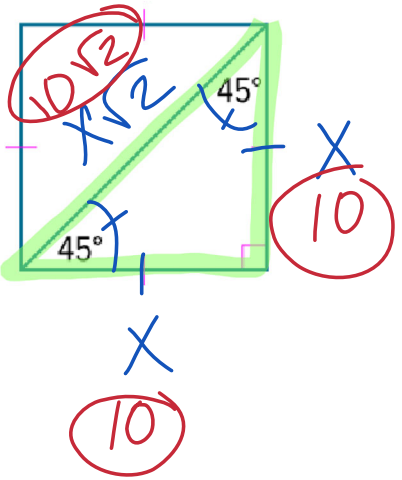
MA.912.T.1.2
Solve mathematical and real-world problems involving right triangles using trigonometric ratios and the Pythagorean Theorem.

Content Objective
Students will solve problems by using the properties of $45° - 45° - 90°$ and $30° - 60° - 90°$ triangles.

Learn

$45° - 45° - 90°$ Triangles

The diagonal of a square forms two congruent isosceles right triangles. Because the base angles of an isosceles triangle are congruent, the measure of each acute angle is $90° \div 2$ or $45°$. Such a special right triangle is known as a **$45° - 45° - 90°$ triangle.**

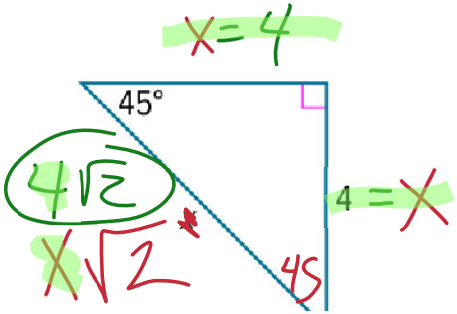


In a $45° - 45° - 90°$ triangle, the legs ℓ are congruent and the length of the hypotenuse h is $\sqrt{2}$ times the length of a leg.

Example 1

Find the Hypotenuse Length Given an Angle Measure

Find the value of x.



Example 1
Find the Hypotenuse Length Given an Angle Measure

Check

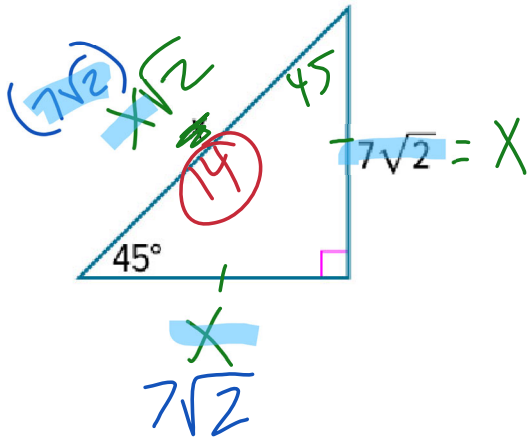
Find the value of x.

$(7\sqrt{2})\sqrt{2}$

$7\sqrt{4}$

$7(2)$

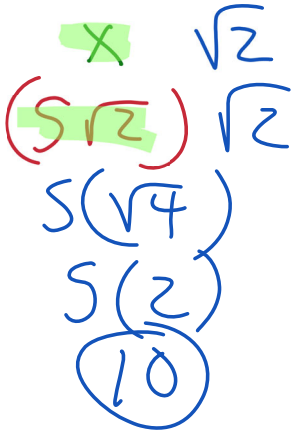
14

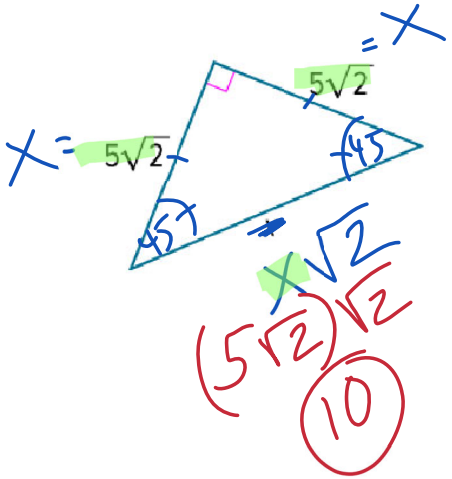


Example 2

Find the Hypotenuse Length Given a Side Measure

Find the value of x.



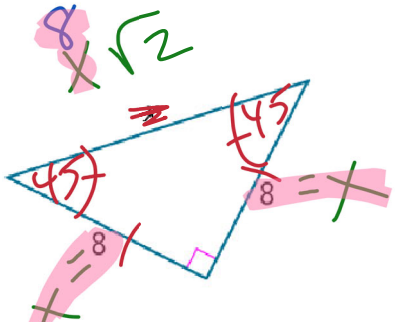


Example 2

Find the Hypotenuse Length Given a Side Measure

Check

Find the value of x.



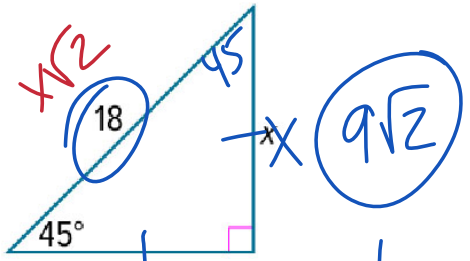
Example 3

Find Leg Lengths in a $45° - 45° - 90°$ Triangle

Find the value of *x*.

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

$9\sqrt{2}$



$x\sqrt{2}$

$9\sqrt{2}$

x

$9\sqrt{2}$

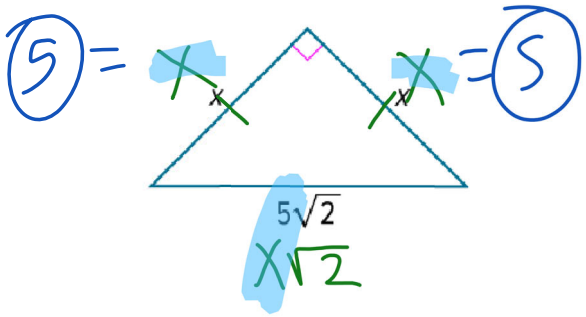
Example 3

Example 3

Find Leg Lengths in a $45° - 45° - 90°$ Triangle

Check

Find the value of *x*.

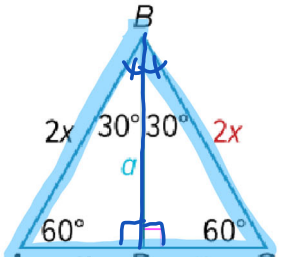


Learn

$30° - 60° - 90°$ Triangles

A **$30° - 60° - 90°$ triangle** is a special right triangle or right triangle with side lengths that share a special relationship. You can use an equilateral triangle to find this relationship.

When an altitude is drawn from any vertex of an equilateral triangle, two congruent $30° - 60° - 90°$ triangles are formed. In the figure,



$\triangle ABD \cong \triangle CBD$, so $\overline{AD} \cong \overline{CD}$. If $AD = x$, then $CD = x$ and $AC = 2x$. Because $\triangle ABC$ is equilateral, $AB = 2x$ and $BC = 2x$.

(*continued on the next slide*)

Learn

$30° - 60° - 90°$ Triangles

Use the Pythagorean Theorem to find *a*, the length of the altitude $\overline{BD}$, which is also the longer leg of $\triangle BDC$.

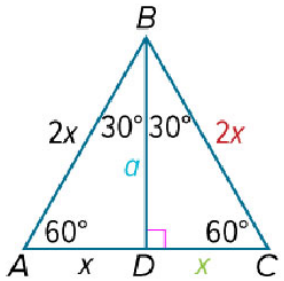
$a^2 + x^2 = (2x)^2$ Pythagorean Theorem

$a^2 + x^2 = 4x^2$ Simplify.

$-x^2 \quad -x^2$ Subtract x^2 from each side.

$\sqrt{a^2} = \sqrt{3x^2}$ Simplify.

$a = x\sqrt{3}$

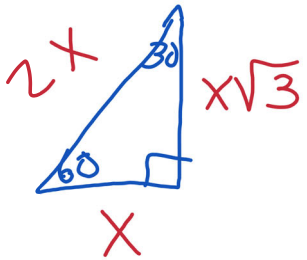


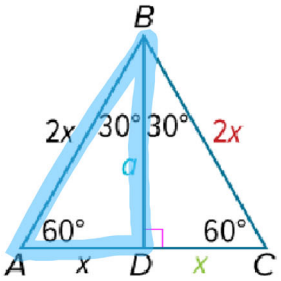
Learn

$30° - 60° - 90°$ Triangles

Theorem 9.6: $30° - 60° - 90°$ 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 longer leg ℓ is $\sqrt{3}$ times the length of the shorter leg.





Example 4

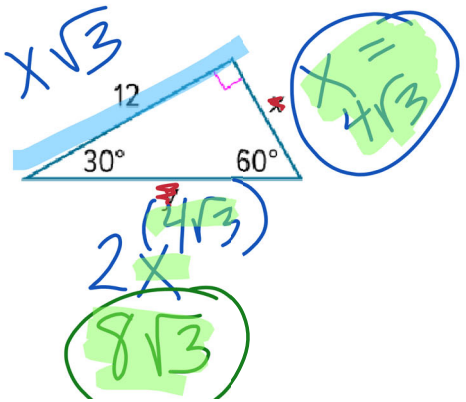
Find Leg Lengths in a $30° - 60° - 90°$ Triangle

Find the values of ~~x~~ and ~~y~~.

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

$\sqrt{9}$

$x = 4\sqrt{3}$



Example 4

Find Leg Lengths in a $30° - 60° - 90°$ Triangle

Check

Find the values of x and y.

$\frac{x\sqrt{3}}{\sqrt{3}} = \frac{15}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{15\sqrt{3}}{3}$

$x = 5\sqrt{3}$