Special Right Triangles P2

Tuesday, April 04, 2023 7:48 PM

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Special Right

Special Right Triangles

Workbook pages 135-137

Florida's B.E.S.T. Standards for Mathematics

MA.912.T.1.2

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

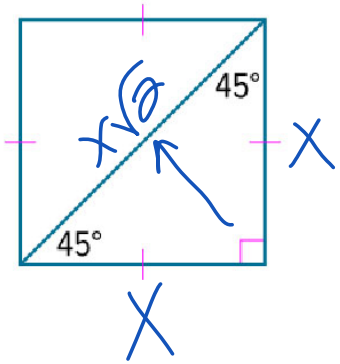
Content Objective

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.**

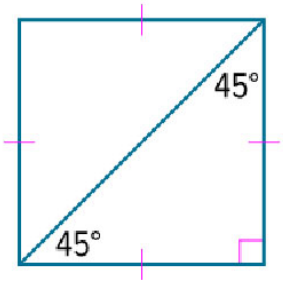


Learn

$45° - 45° - 90°$ Triangles

Theorem 9.5: $45° - 45° - 90°$ Triangle Theorem

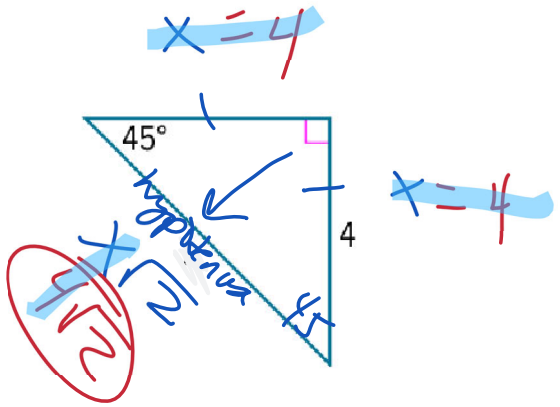
In a $45° - 45° - 90°$ triangle, the legs ℓ are congruent and the length of the hypotenuse h is $\sqrt{2}$ times the length of a leg.



Example 1

Find the Hypotenuse Length Given an Angle Measure

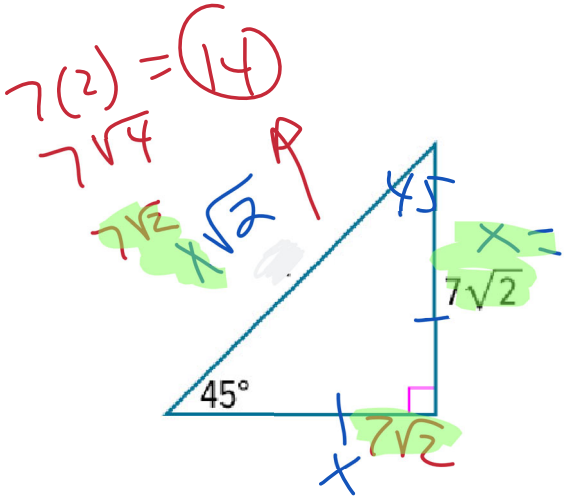
Find the value of *x*.



Example 1
Find the Hypotenuse Length Given an Angle Measure

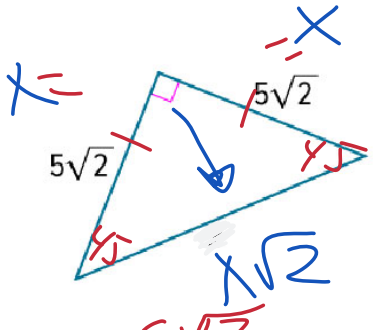
Check

Find the value of *x*.



Example 2
Find the Hypotenuse Length Given a Side Measure

Find the value of *x*.

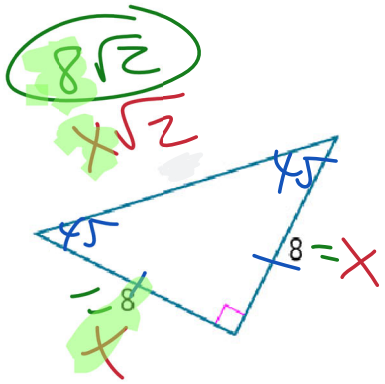


$5\sqrt{4}$
$5(2) = 10$

Example 2
Find the Hypotenuse Length Given a Side Measure

Check

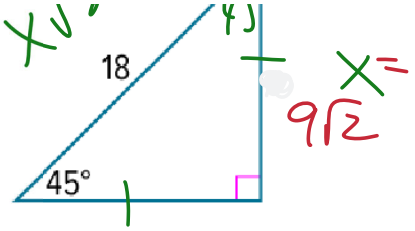
Find the value of *x*.



Example 3
Find Leg Lengths in a $45° - 45° - 90°$ Triangle

Find the value of *x*.

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

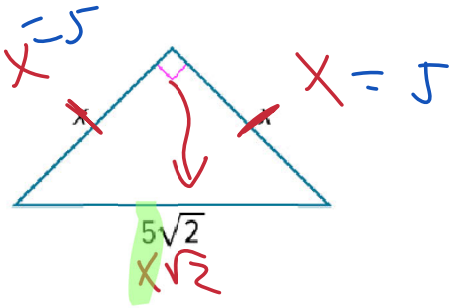


Example 3

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

Check

Find the value of *x*.



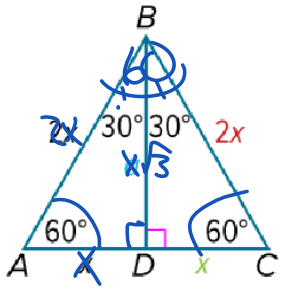
Learn

$30° - 60° - 90°$ 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 $BC = 2x$.



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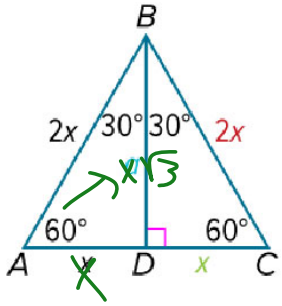
Learn

$30° - 60° - 90°$ 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.
$a^2 = 3x^2$	Subtract x^2 from each side.
$a = x\sqrt{3}$	Simplify.



Example 4

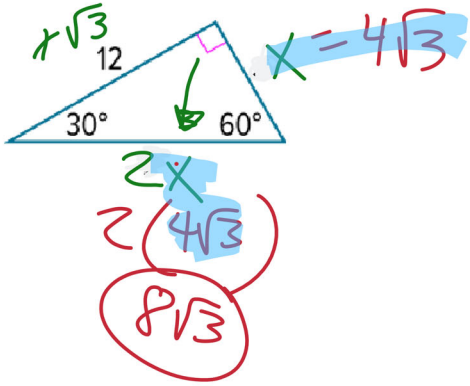
Find Leg Lengths in a $30° - 60° - 90°$ Triangle

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

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

$\frac{2}{3} \cdot \frac{4}{4} = \frac{8}{12}$

$x = 4\sqrt{3}$



Example 4

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

$\frac{10}{5} \div \frac{5}{5} =$

$x^{-5} \quad \frac{1}{x^5}$

Check

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

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

$\frac{5x}{5} = \frac{10}{5}$

$x = 5\sqrt{3}$