Resource Locker

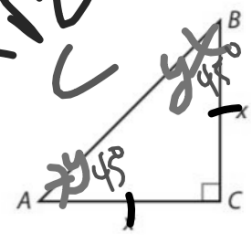
Explore 1 Investigating an Isosceles Right Triangle

45-45-90

Discover relationships that always apply in an isosceles right triangle.

A The figure shows an isosceles right triangle. Identify the base angles, and use the fact that they are complementary to write an equation relating their measures.

$\angle A \cong \angle B$ $\angle A + \angle B = 90$



$x\sqrt{2}$

B Use the Isosceles Triangle Theorem to write a different equation relating the base angle measures.

$y + y = 90$ $\frac{2y}{2} = \frac{90}{2}$ $y = 45$

C What must the measures of the base angles be? Why?

45° $180 - 90 = 90 \div 2 = 45$

D Use the Pythagorean Theorem to find the length of the hypotenuse in terms of the length of each leg, x.

$c^2 = a^2 + b^2$

$c^2 = x^2 + x^2$

$c^2 = 2x^2$

$c = \sqrt{2x^2}$

$c = x\sqrt{2}$

x·x

·x·x

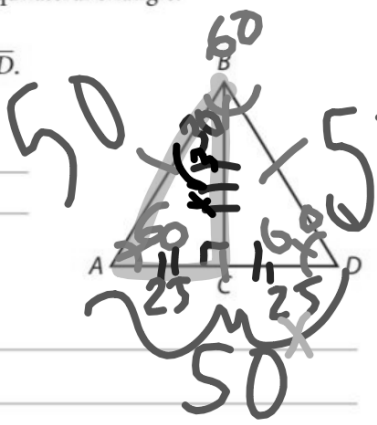
x

Explore 2 Investigating Another Special Right Triangle

Discover relationships that always apply in a right triangle formed as half of an equilateral triangle.

(A) $\triangle ABD$ is an equilateral triangle and $\overline{BC}$ is a perpendicular from B to $\overline{AD}$. Determine all three angle measures in $\triangle ABC$.

$\frac{180}{3} = 60$

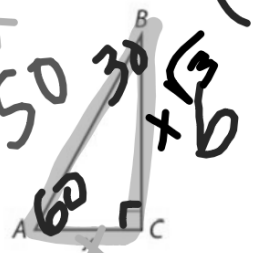


(B) Explain why $\triangle ABC \cong \triangle DBC$.

ASA SAS AAS SSS

(C) Let the length of $\overline{AC}$ be x. What is the length of $\overline{AB}$, and why?

$2x$



(D) Using the Pythagorean Theorem, find the length of $\overline{BC}$.

$(2x)^2 = x^2 + b^2$

$4x^2 = x^2 + b^2$

$-1x^2 = -1x^2$

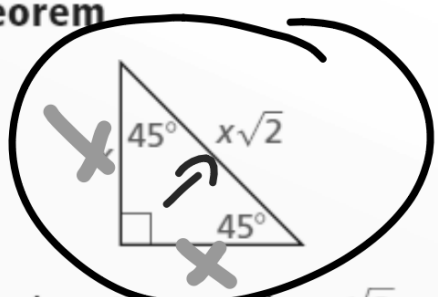
$3x^2 = b^2$

$x\sqrt{3} = b$

Theorem

Theorem 9.4 45°-45°-90° Triangle Theorem

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



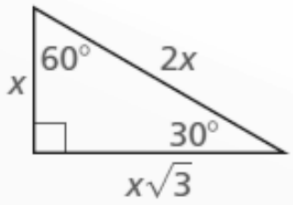
hypotenuse = leg • $\sqrt{2}$

Proof Ex. 19, p. 476

Theorem

Theorem 9.5 30°-60°-90° Triangle Theorem

In a 30°-60°-90° triangle, the hypotenuse is twice as long as the shorter leg, and the longer leg is $\sqrt{3}$ times as long as the shorter leg.

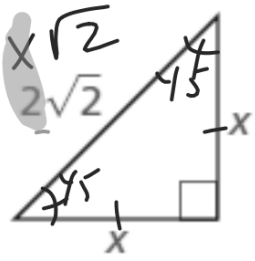


hypotenuse = shorter leg • 2
longer leg = shorter leg • $\sqrt{3}$

Proof Ex. 21, p. 476

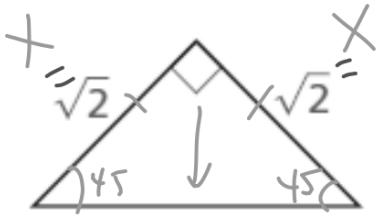
Find the value of the variable. Write your answer in simplest form.

1.



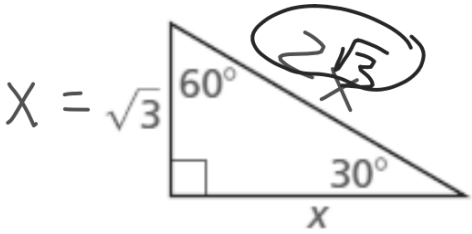
$x = 2$

2.



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

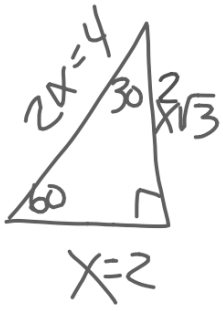
3.



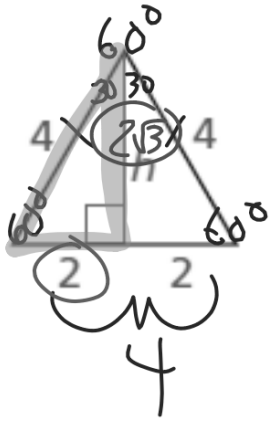
$\frac{x\sqrt{3}}{\sqrt{3}} = \sqrt{9} = 3$

4.

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



$x = 2$



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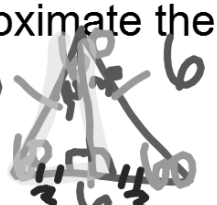
5. The logo on a recycling bin resembles an equilateral triangle with side lengths of 6 centimeters. Approximate the area of the logo.



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

$A = \frac{1}{2}(6)(3)$

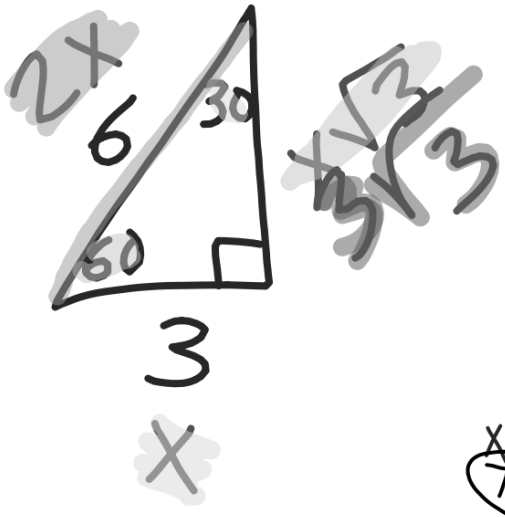
(3)

6. The body of a dump truck is raised to empty a load of sand. How high is the 14-foot-long body from the frame when it is tipped upward by a 60° angle?

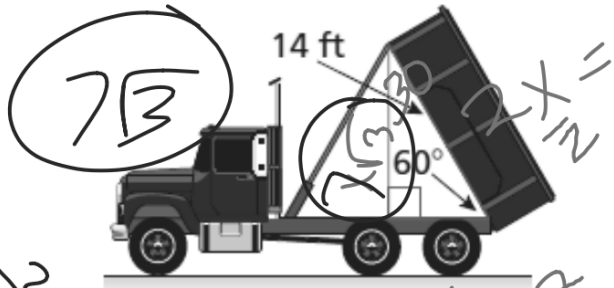
$A = 9\sqrt{3}$

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

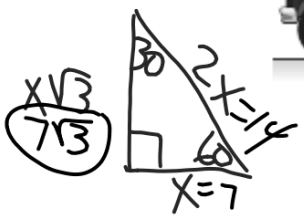
$x = 3$



$7\sqrt{3}$



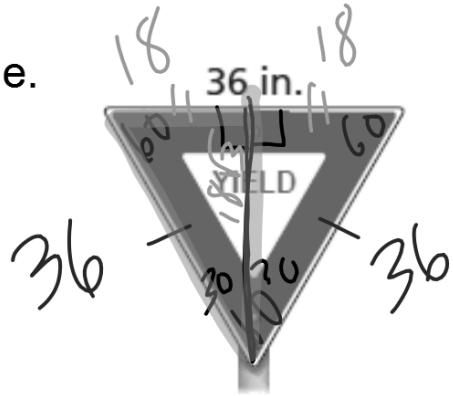
$x = 7$

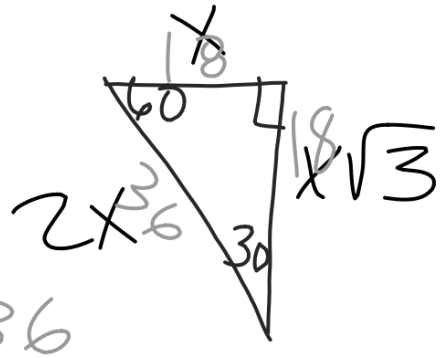


$\frac{2x}{2} = \frac{14}{2}$

$x = 7$

The road sign is shaped like an equilateral triangle. Estimate the area of the sign by finding the area of the equilateral triangle.





$\frac{2x}{2} = \frac{36}{2}$

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

$\frac{1}{2}(36)(18\sqrt{3})$

$(18)(18\sqrt{3})$

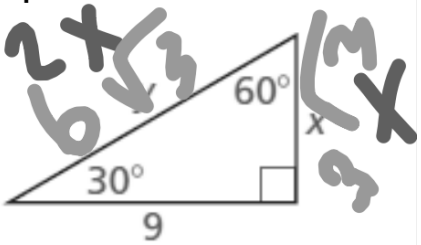
$324\sqrt{3}$

Find the values of x and y . Write your answer in simplest form.

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

$\sqrt{9}$

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

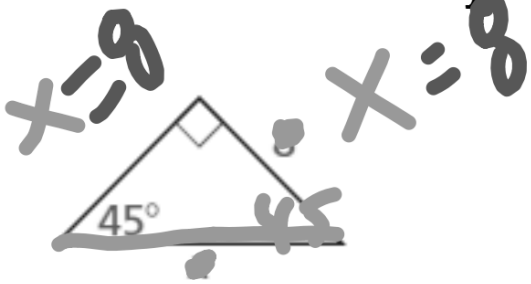


$x\sqrt{3}$

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

Find the value of x . Write your answer in simplest form.

a.



b.