Name: Key Hour: _____ Seat: _____

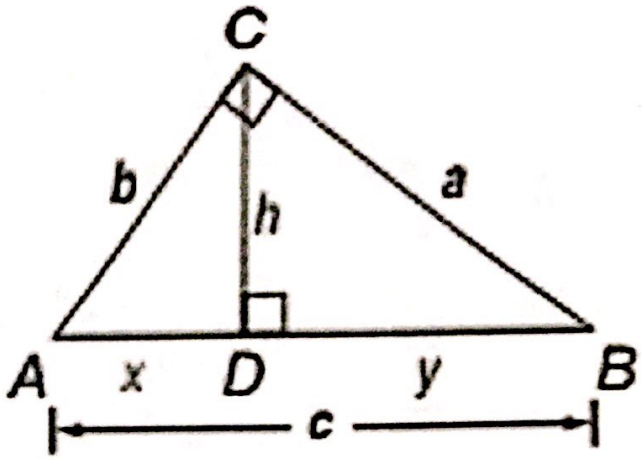
Section 8.2: The Pythagorean Theorem and Its Converse

Notecard addition:

$h = \sqrt{xy}$.

$a = \sqrt{yc}$.

$b = \sqrt{xc}$.



Objectives

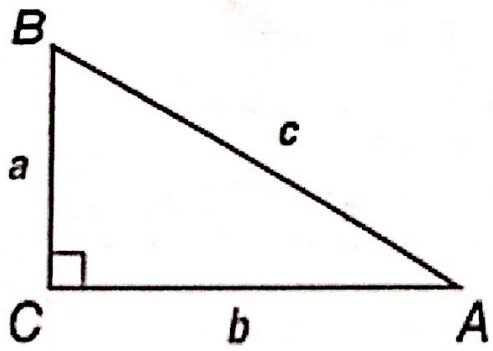
1. Use the Pythagorean Thm
2. Use the Converse of the Pythagorean Thm

New Vocabulary

Pythagorean Triple(p. 548):

→ a set of three nonzero whole numbers a, b, c such that $a^2 + b^2 = c^2$

Theorem 8.4 Pythagorean Theorem



If $\triangle ABC$ is a right triangle with right angle C, then $a^2 + b^2 = c^2$.

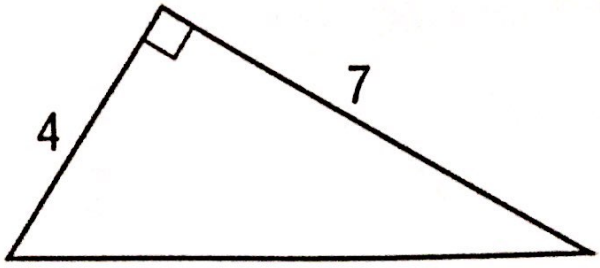
EXAMPLE 1 Find Missing Measures Using the Pythagorean Theorem

A. Find *x*.

$a = 4$

$b = 7$

$c = x$



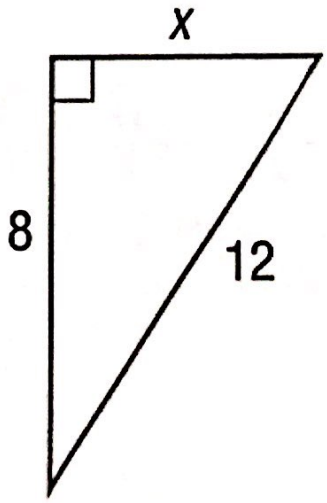
$a^2 + b^2 = c^2$

$4^2 + 7^2 = x^2$

$x = \sqrt{65}$

EXAMPLE 1 Find Missing Measures Using the Pythagorean Theorem

B. Find *x*.



$a = x$

$b = 8$

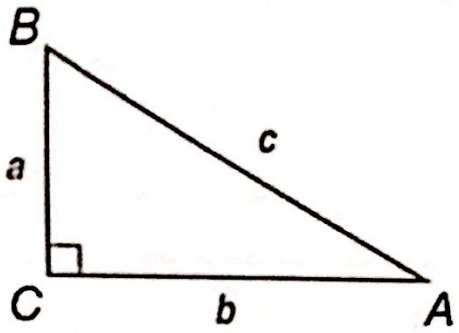
$c = 12$

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

$x^2 + 8^2 = 12^2$

$x^2 = 12^2 - 8^2$

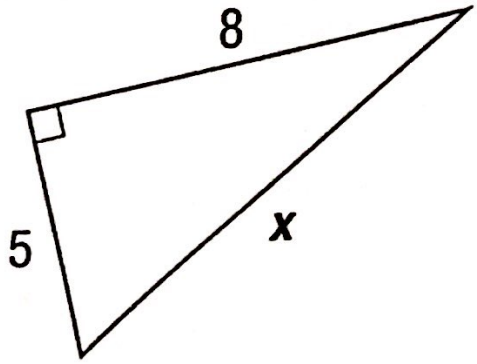
$x = \sqrt{80} = 4\sqrt{5}$



If $\triangle ABC$ is a right triangle with right angle C, then $a^2 + b^2 = c^2$.

EXAMPLE 1 ☑ **Check Your Progress**

A. Find x.



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

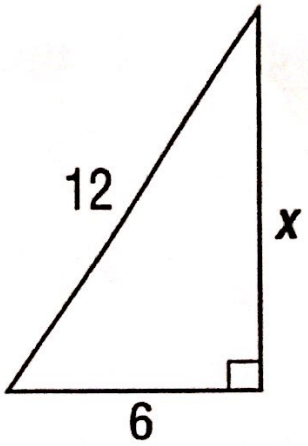
$5^2+8^2=x^2$

$x=\sqrt{89}$

Answer: C

EXAMPLE 1 ☑ **Check Your Progress**

B. Find x.



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

$6^2+x^2=12^2$

$x^2=12^2-6^2$

$x=\sqrt{108}=6\sqrt{3}$

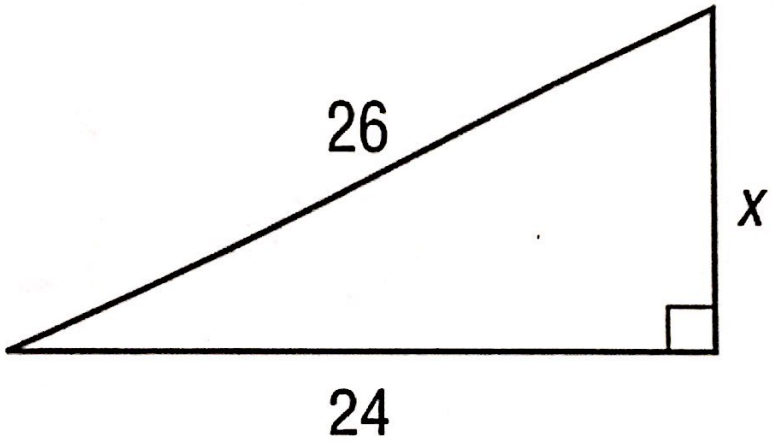
Answer: B

KeyConcept Common Pythagorean Triples

3, 4, 5	5, 12, 13	8, 15, 17	7, 24, 25
6, 8, 10	10, 24, 26	16, 30, 34	14, 48, 50
9, 12, 15	15, 36, 39	24, 45, 51	21, 72, 75
$3x, 4x, 5x$	$5x, 12x, 13x$	$8x, 15x, 17x$	$7x, 24x, 25x$

EXAMPLE 2 Use a Pythagorean Triple

Use a Pythagorean triple to find *x*. Explain your reasoning.



Check out the chart!

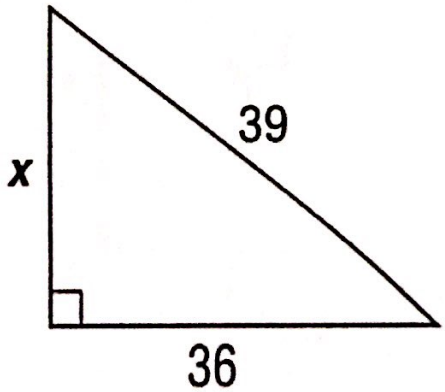
$a = x = 10$

$b = 24$

$c = 26$

EXAMPLE 2 Check Your Progress

Use a Pythagorean triple to find *x*.



Check out the chart!

$a = x = 15$

$b = 36$

$c = 39$

STANDARDIZED TEST EXAMPLE 3

Use the Pythagorean Theorem

A 20-foot ladder is placed against a building to reach a window that is 16 feet above the ground. How many feet away from the building is the bottom of the ladder?

$x^2 + 16^2 = 20^2$

$x = \sqrt{20^2 - 16^2}$

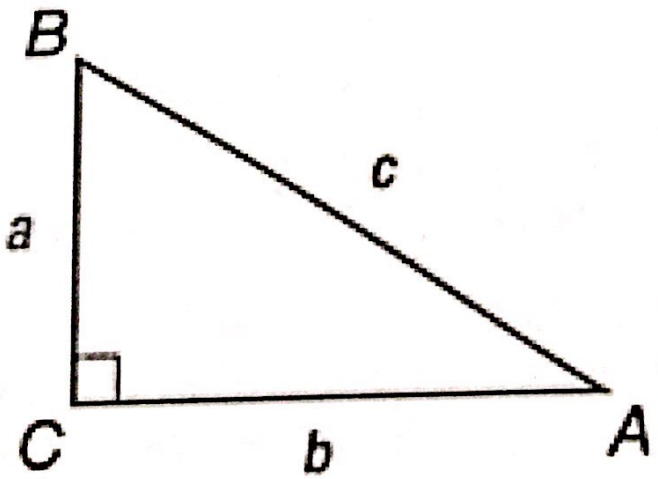
$x = \sqrt{144}$

$x = 12$

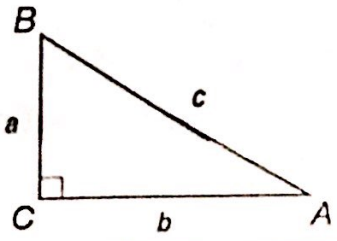
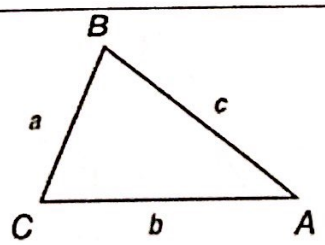
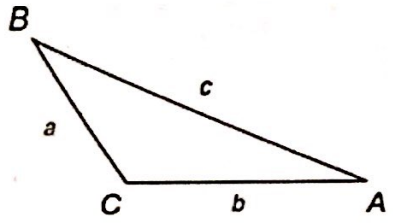
C

Theorem 8.5 Converse of the Pythagorean Theorem

If $a^2 + b^2 = c^2$, then $\triangle ABC$ is a right triangle.



Theorems Pythagorean Inequality Theorems

Type of Triangle	Equation	Example
Right Triangle	$a^2 + b^2 = c^2$,	
Acute Triangle	$c^2 < a^2 + b^2$,	
Obtuse Angle	$c^2 > a^2 + b^2$,	

EXAMPLE 4 Classify Triangles

A. Determine whether 9, 12, and 15 can be the measures of the sides of a triangle. If so, classify the triangle as *acute*, *right*, or *obtuse*. Justify your answer.

Triangle or nah?
$9+12>15$ ✓
$9+15>12$ ✓
$12+15>9$ ✓
Yes!

$c=15$ (longest)
$b=12$
$a=9$

$15^2 \stackrel{?}{=} 12^2+9^2$
$225 = 225$ ✓
Right Triangle

B. Determine whether 10, 11, and 13 can be the measures of the sides of a triangle. If so, classify the triangle as *acute*, *right*, or *obtuse*. Justify your answer.

Triangle or nah?
$10+11>13$ ✓
$10+13>11$ ✓
$11+13>10$ ✓
Yes!

$c=13$ (longest)
$b=11$
$a=10$

$13^2 = 11^2+10^2$
$169 < 221$ ✓
Acute ✓