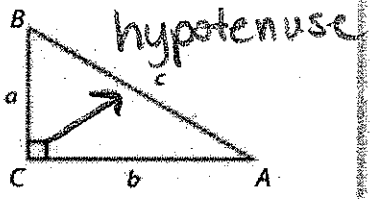
January 24, 2014

8.2 The Pythagorean Theorem and Its Converse

Target: Use the pythagorean theorem to find the missing side of a triangle.

Theorem 8.4 Pythagorean Theorem

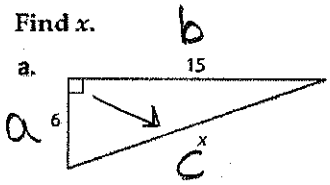
Words	In a right triangle, the sum of the squares of the lengths of the legs is equal to the square of the length of the hypotenuse.
Symbols	If $\triangle ABC$ is a right triangle with right angle C, then $a^2 + b^2 = c^2$.



Example 1 Find Missing Measures Using the Pythagorean Theorem

Find x.

a.



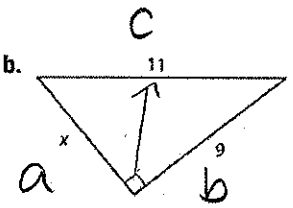
$6^2 + 15^2 = x^2$

$36 + 225 = x^2$

$\sqrt{261} = \sqrt{x^2}$

$x = 16.2$

b.



$x^2 + 9^2 = 11^2$

$x^2 + 81 = 121$

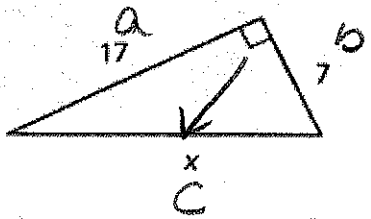
$-81 \quad -81$

$\sqrt{x^2} = \sqrt{40}$

$x = 6.3$

Guided Practice

1A.

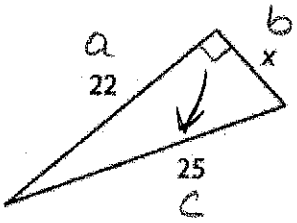


$17^2 + 7^2 = x^2$

$289 + 49 = x^2$

$\sqrt{338} = \sqrt{x^2}$ $\quad x = 18.4$

1B.



$22^2 + x^2 = 25^2$

$484 + x^2 = 625$

$-484 \quad -484$

$\sqrt{x^2} = \sqrt{141}$ $\quad x = 11.9$

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
$3x$, $4x$, $5x$	$5x$, $12x$, $13x$	$8x$, $15x$, $17x$	$7x$, $24x$, $25x$

Standardized Test Example 3 Use the Pythagorean Theorem

Damon is locked out of his house. The only open window is on the second floor, which is 12 feet above the ground. He needs to borrow a ladder from his neighbor. If he must place the ladder 5 feet from the house to avoid some bushes, what length of ladder does Damon need?

A 7 feet

C 13 feet

B 11 feet

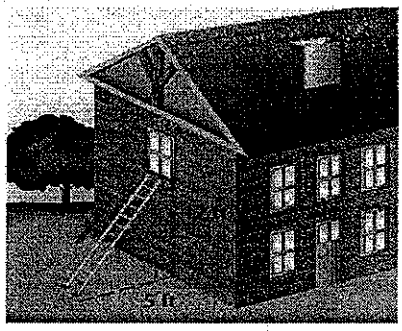
D 17 feet

$12^2 + 5^2 = x^2$

$144 + 25 = x^2$

$\sqrt{x^2} = \sqrt{169}$

$x = 13$ ft



Note: Not drawn to scale.

Guided Practice

3. According to your company's safety regulations, the distance from the base of a ladder to a wall that it leans against should be at least one fourth of the ladder's total length. You are given a 20-foot ladder to place against a wall at a job site. If you follow the company's safety regulations, what is the maximum distance x up the wall the ladder will reach, to the nearest tenth?

F 12 feet

H 20.6 feet

G 19.4 feet

J 30.6 feet

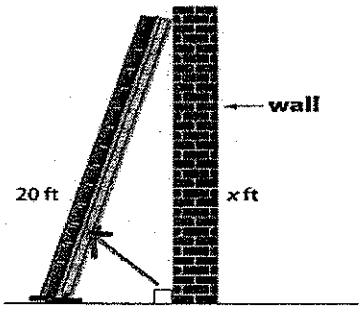
$x^2 + 5^2 = 20^2$

$x^2 + 25 = 400$

$-25 \quad -25$

$\sqrt{x^2} = \sqrt{375}$

$x = 19.4$



Note: Not drawn to scale.

$\frac{1}{4}(20) =$

5 ft

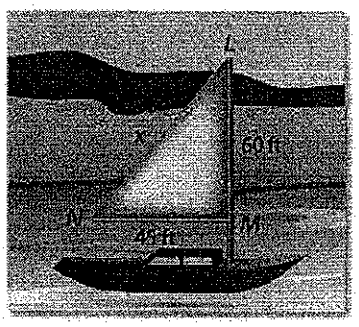
4. **MULTIPLE CHOICE** The mainsail of a boat is shown. What is the length, in feet, of $\overline{LN}$?

A 52.5

C 72.5

B 65

D 75



$60^2 + 45^2 = x^2$

$3600 + 2025 = x^2$

$\sqrt{5625} = \sqrt{x^2}$

$x = 75$