

Geometry: The Pythagorean Theorem & Real-World Applications



Use the matching sheet ID when checking answers.

Part A: Apply the Pythagorean Theorem $a^2 + b^2 = c^2$ to solve each problem below. Select the best answer.

1. A firefighter leans a 13-foot ladder against the exterior wall of a building. If the base of the ladder is placed 5 feet away from the wall, how high up the wall does the top of the ladder reach?

Answer: B. 12 feet

Here the hypotenuse $c = 13$ ft and one leg $a = 5$ ft. $a^2 + b^2 = c^2 \Rightarrow 5^2 + b^2 = 13^2 \Rightarrow 25 + b^2 = 169 \Rightarrow b^2 = 144 \Rightarrow b = \sqrt{144} = 12$ feet.

2. What is the length of the diagonal of a rectangular television screen that measures 16 inches wide and 12 inches tall?

Answer: B. 20 inches

$c^2 = 16^2 + 12^2 = 256 + 144 = 400$. $c = \sqrt{400} = 20$ inches.

3. Find the straight-line distance between the coordinate points A(1, 2) and B(7, 10) on a Cartesian grid.

Answer: B. 10 units

Horizontal distance $\Delta x = 7 - 1 = 6$; vertical distance $\Delta y = 10 - 2 = 8$. Distance $d = \sqrt{(6^2 + 8^2)} = \sqrt{(36 + 64)} = \sqrt{100} = 10$ units.

Part B: Pythagorean Triple & Calculation Fluency. Complete each algebraic statement with the correct missing value.

1. In the foundational 3-4-5 right triangle, the sum of the leg squares is $3^2 + 4^2 = 9 + 16 = 25$, whose square root equals the hypotenuse 5.

2. For a right triangle with legs of length 9 cm and 12 cm, $c^2 = 81 + 144 = 225$, giving a hypotenuse of 15 cm.

3. In the 5-12-13 integer triple, the square of the 13-unit hypotenuse equals 169.

4. The distance between point (0, 0) and point (3, 4) on a coordinate plane is exactly 5 units.