

The Pythagorean Theorem and Its Converse

Grade 8 math · Worksheet Answer Key · Standards: 8.G.B.6, 8.G.B.7

Each solution identifies the hypotenuse, writes the equation, and finishes with a root. Compare your sketch and your equation with the key, and check the final length: the hypotenuse must be longer than either leg.

Standards: 8.G.B.6, 8.G.B.7 · **Level:** Grade 8

Problem 1 Find the hypotenuse

$$20^2 + 21^2 = 400 + 441 = 841.$$

$$c = \sqrt{841} = 29.$$

The hypotenuse is **29**.

Problem 2 Find a leg

$$b^2 = 17^2 - 8^2 = 289 - 64 = 225.$$

$$b = \sqrt{225} = 15.$$

The other leg is **15**.

Problem 3 Irrational hypotenuse

$$c^2 = 6^2 + 7^2 = 36 + 49 = 85.$$

$$c = \sqrt{85} \approx 9.22.$$

The hypotenuse is about **9.2**.

Problem 4 Leg to the nearest tenth

$$b^2 = 13^2 - 9^2 = 169 - 81 = 88.$$

$$b = \sqrt{88} \approx 9.38.$$

The leg is about **9.4**.

Problem 5 Is it a right triangle?

The longest side is 41. $9^2 + 40^2 = 81 + 1,600 = 1,681$, and $41^2 = 1,681$.

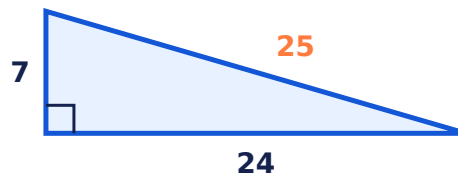
The sums are equal, so the converse applies.

Yes, it is a right triangle

Problem 6 Read the figure

$$7^2 + 24^2 = 49 + 576 = 625.$$

$$\sqrt{625} = 25.$$



The hypotenuse is 25.

Hypotenuse: **25**

Problem 7 Not a right triangle

$$10^2 + 11^2 = 100 + 121 = 221, \text{ but } 15^2 = 225.$$

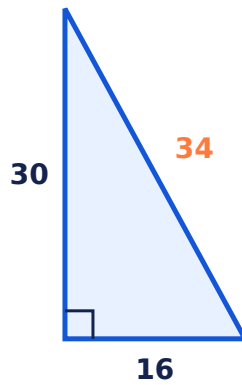
The sums are not equal.

No, it is not a right triangle

Problem 8 Find x

$$x^2 = 34^2 - 16^2 = 1,156 - 256 = 900.$$

$$x = 30.$$



$$x = 30.$$

$$x = 30$$

Problem 9 Areas of squares

The square on the hypotenuse has area $25 + 144 = 169$.

Its side is $\sqrt{169} = 13$.

The hypotenuse is **13**.

Problem 10 Short ladder

$$h^2 = 10^2 - 3.5^2 = 100 - 12.25 = 87.75.$$

$$h = \sqrt{87.75} \approx 9.37.$$

It reaches about **9.4 feet**.

Problem 11 TV size

$$48^2 + 27^2 = 2,304 + 729 = 3,033.$$

$$\sqrt{3,033} \approx 55.07.$$

The diagonal is about **55 inches**.

Problem 12 Right or not?

$$1.5^2 + 2^2 = 2.25 + 4 = 6.25, \text{ and } 2.5^2 = 6.25.$$

Yes, it is a right triangle

Problem 13 Across the field

$$45^2 + 108^2 = 2,025 + 11,664 = 13,689.$$

$$\sqrt{13,689} = 117.$$

The diagonal is **117 yards**.

Problem 14 Isosceles right triangle

$$c^2 = 12^2 + 12^2 = 288, \text{ so } c = \sqrt{288} = 12\sqrt{2}.$$

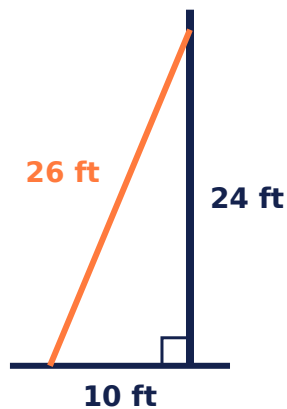
$$12\sqrt{2} \approx 16.97.$$

$$12\sqrt{2} \text{ cm} \approx \mathbf{17.0 \text{ cm}}$$

Problem 15 Fire truck ladder

$$h^2 = 26^2 - 10^2 = 676 - 100 = 576.$$

$$h = 24.$$



The ladder reaches 24 ft.

The ladder reaches **24 feet**.

Problem 16 Baseball throw

Home plate to second base is the diagonal of the square: $d^2 = 60^2 + 60^2 = 7,200$.

$$d = \sqrt{7,200} \approx 84.85.$$

The throw is about **84.9 feet**.

Problem 17 Wheelchair ramp

$$\text{Length}^2 = 30^2 + 2.5^2 = 900 + 6.25 = 906.25.$$

$$\text{Length} = \sqrt{906.25} \approx 30.10.$$

The ramp is about **30.1 feet** long.

Problem 18 Shipping box

$$d^2 = 12^2 + 16^2 + 21^2 = 144 + 256 + 441 = 841.$$

$$d = 29.$$

The longest rod is **29 inches**.

Problem 19 Drone flight

$$\text{Horizontal distance: } \sqrt{(36^2 + 15^2)} = \sqrt{(1,296 + 225)} = \sqrt{1,521} = 39.$$

$$\text{Straight-line distance: } \sqrt{(39^2 + 20^2)} = \sqrt{(1,521 + 400)} = \sqrt{1,921} \approx 43.83.$$

The drone is about **43.8 meters** from the start.

Problem 20 Is the deck square?

$$2.4^2 + 3.2^2 = 5.76 + 10.24 = 16, \text{ so a right angle needs a diagonal of } \sqrt{16} = 4.$$

The measured $4.1^2 = 16.81$, which does not equal 16.

No; the diagonal should be 4.0 meters