Year 8 pythagoras' theorem worksheet

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Name: _____ Date: _____

Question 1

A triangle has sides of length 15 cm, 36 cm and 39 cm.

(a) If the triangle is right-angled, which side must be the hypotenuse?

(b) Use Pythagoras' theorem to show that the triangle is right-angled.

(c) Each side is doubled to give 30 cm, 72 cm and 78 cm. Show that this triangle is also right-angled.

Answer: _____

Question 2

A right-angled triangle has shorter sides of length 9 m and 12 m. Find the length of the hypotenuse.

Answer: _____

Question 3

A right-angled triangle has a hypotenuse of 10 m and one shorter side of 6 m. Find the exact length of the other shorter side, then round your answer to two decimal places.

Answer: _____

Question 4

A right-angled triangle has shorter sides of 5 cm and 12 cm. Find the value of c^2, where c is the length of the hypotenuse.

Answer: _____

Question 5

A ladder is leaning against a vertical wall. The base of the ladder is 1.5 m from the wall along flat ground, and the ladder reaches 3.6 m up the wall. Find the length of the ladder, correct to two decimal places.

Answer: _____

Question 6

A right-angled triangle has a hypotenuse of 15 cm and one shorter side of 9 cm. Find the length of the other shorter side, correct to two decimal places.

Answer: _____

Question 7

A triangle has sides of 8 cm, 15 cm and 17 cm. Calculate $8^2 + 15^2$.

Answer: _____

Question 8

A ladder leans against a wall. The base of the ladder is 1.8 m from the wall and the ladder reaches 2.4 m up the wall. How long is the ladder, correct to 2 decimal places? Give your answer in metres.

Answer: _____

Question 9

A garden bed is shaped as a rhombus PQRS with side length 8 m. The gardener stretches two string lines along the diagonals, which cross at point M. She measures PM = 6 m. Find the length of the other half-diagonal QM, and find the full length of diagonal QS.

Answer: _____

Question 10

Find the missing number in the Pythagorean triad 9, 40, $$, where the missing number is the largest.

Answer: _____

Year 8 pythagoras' theorem: answers and worked solutions

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Question 1

Key idea: The hypotenuse is the longest side. A triangle is right-angled exactly when $a^2 + b^2 = c^2$, where c is the longest side.

1. (a) The hypotenuse is always the longest side, so it is 39 cm 2. (b) $15^2 + 36^2 = 225 + 1296 = 1521$ and $39^2 = 1521$ 3. (b) The two values are equal, so the triangle is right-angled 4. (c) $30^2 + 72^2 = 900 + 5184 = 6084$ and $78^2 = 6084$, so it is right-angled too

Answer: (a) The 39 cm side (b) $15^2 + 36^2 = 225 + 1296 = 1521 = 39^2$ (c) $30^2 + 72^2 = 900 + 5184 = 6084 = 78^2$

Question 2

Key idea: In a right-angled triangle, $c^2 = a^2 + b^2$, where c is the hypotenuse.

1. Substitute the known sides: $c^2 = 9^2 + 12^2$ 2. Evaluate: $c^2 = 81 + 144 = 225$ 3. Take the square root: $c = \sqrt{(225)} = 15$

Answer: The hypotenuse is 15 m.

Question 3

Key idea: Rearrange $a^2 + b^2 = c^2$ to find a shorter side: $b^2 = c^2 - a^2$.

1. Substitute the known values: $b^2 = 10^2 - 6^2$ 2. Evaluate: $b^2 = 100 - 36 = 64$ 3. Take the square root: $b = \sqrt{(64)} = 8$ 4. The exact answer is 8 m, which rounds to 8.00 m.

Answer: The other shorter side is exactly 8 m (or 8.00 m to two decimal places).

Question 4

Key idea: Pythagoras' theorem: $c^2 = a^2 + b^2$.

1. $c^2 = 5^2 + 12^2 = 25 + 144 = 169$

Answer: 169

Question 5

Key idea: The ladder, wall, and ground form a right-angled triangle. The ladder is the hypotenuse.

1. Substitute into $c^2 = a^2 + b^2$: $c^2 = 1.5^2 + 3.6^2$ 2. Evaluate: $c^2 = 2.25 + 12.96 = 15.21$ 3. Take the square root: $c = \sqrt{(15.21)} \approx 3.90$

Answer: The ladder is approximately 3.90 m long.

Question 6

Key idea: Rearrange $a^2 + b^2 = c^2$ to find the unknown shorter side: $b^2 = c^2 - a^2$.

1. Substitute the known values: $b^2 = 15^2 - 9^2$ 2. Evaluate: $b^2 = 225 - 81 = 144$ 3. Take the square root: $b = \sqrt{(144)} = 12$ 4. The exact answer is 12 cm, which rounds to 12.00 cm.

Answer: The other shorter side is exactly 12 cm (or 12.00 cm to two decimal places).

Question 7

Key idea: Square each number, then add.

1. $8^2 = 64$ and $15^2 = 225$ 2. $64 + 225 = 289$ (which equals 17^2, so the triangle is right-angled)

Answer: 289

Question 8

Key idea: The ladder is the hypotenuse of a right-angled triangle with legs 1.8 m and 2.4 m.

1. Write Pythagoras' theorem: $c^2 = a^2 + b^2$ 2. Substitute the known values: $c^2 = 1.8^2 + 2.4^2$ 3. Evaluate the squares: $c^2 = 3.24 + 5.76 = 9.00$ 4. Take the square root: $c = \sqrt{(9.00)} = 3$ 5. Round to 2 decimal places: c = 3.00 m

Answer: 3.00 m

Question 9

Key idea: The diagonals of a rhombus bisect each other at right angles, so triangle PMQ is right-angled at M.

1. In right-angled triangle PMQ, the hypotenuse is the side of the rhombus:\ PQ = 8 m, PM = 6 m 2. Apply Pythagoras' theorem to find QM:\ $QM^2 = PQ^2 - PM^2 = 8^2 - 6^2 = 64 - 36 = 28$ QM = $\sqrt{(28)} = 2\sqrt{7} \approx 5.29$ m 3. The diagonals bisect each other, so SM = QM. The full length of diagonal QS is:\ QS = 2 × QM = $4\sqrt{7} \approx 10.58$ m

Answer: QM = $2\sqrt{7}$ m (approximately 5.29 m); diagonal QS = $4\sqrt{7}$ m (approximately 10.58 m).

Question 10

Key idea: In a Pythagorean triad, $a^2 + b^2 = c^2$.

1. $9^2 + 40^2 = 81 + 1600 = 1681$ 2. $\sqrt{(1681)} = 41$

Answer: 41