

Pythagorean Theorem Word Problems


Answer Key

Name _____ Date _____

Pythagorean Theorem Word Problems- Matching Worksheet

Write the letter of the answer that matches the problem.

_____ 1. Daniel rides his bicycle 21 km west and then 18 km north. How far is he from his starting point?	a. 11.7 cm
_____ 2. A square is put together by two triangles. The hypotenuse is 11 cm and width of 8 cm. Find the height of the triangle.	b. 20.6 cm
_____ 3. Find the hypotenuse of an equilateral triangle that has a 13 cm leg and a height of 7 cm.	c. 7.55 cm
_____ 4. In a right-triangle shaped house, the roof is 51 feet long and the base of the house is 29 feet across. Calculate the height of the house.	d. 13.1 feet
_____ 5. John is trying to determine the length of the staircase he will need for a deck that is 12 feet high. He wants to start the stairs 21 feet from the deck.	e. 42 feet
_____ 6. A triangle shaped paper's height is 18 cm and width is 10 cm. Find the hypotenuse of the paper.	f. 27.7 km
_____ 7. Find the hypotenuse of a triangle that has an 8 cm width and a height of 12 cm.	g. 24.2 feet
_____ 8. The bottom of a ladder must be placed 5 feet from a building. The ladder is 14 feet long. How far above the ground does the ladder touch the wall?	h. 14.4 cm
_____ 9. Find the width of a triangle that has a 15 cm height and a hypotenuse of 19 cm.	i. 14.8 cm

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Pythagorean Theorem Word Problems: Answer Key & Solving Strategies

Are you wrestling with Pythagorean Theorem word problems? Feeling lost in a sea of right-angled triangles and hypotenuses? You're not alone! Many students struggle to apply the Pythagorean Theorem ($a^2 + b^2 = c^2$) to real-world scenarios. This comprehensive guide provides not just an answer key to common Pythagorean Theorem word problems, but also the step-by-step solutions and

strategies you need to master this crucial concept. We'll break down the process, making even the trickiest problems feel manageable. Get ready to conquer those word problems!

Understanding the Pythagorean Theorem in Word Problems

Before diving into the answer key, let's solidify our understanding of the theorem itself. The Pythagorean Theorem states that in a right-angled triangle, the square of the hypotenuse (the side opposite the right angle) is equal to the sum of the squares of the other two sides (called legs or cathetus). In simpler terms: $a^2 + b^2 = c^2$, where 'c' represents the hypotenuse.

The challenge with word problems lies in translating the real-world scenario into a mathematical equation. This requires careful reading, identifying the right-angled triangle, and assigning the correct values to 'a', 'b', and 'c'.

Pythagorean Theorem Word Problems: Sample Problems & Solutions

Let's tackle some common types of Pythagorean Theorem word problems. Each problem will include a detailed solution to help you understand the process.

Problem 1: The Ladder Problem

A ladder 10 meters long leans against a wall. The base of the ladder is 6 meters from the wall. How high up the wall does the ladder reach?

Solution:

1. Draw a diagram: Sketch a right-angled triangle with the ladder as the hypotenuse ($c = 10\text{m}$), the distance from the wall to the base of the ladder as one leg ($a = 6\text{m}$), and the height up the wall as the other leg ($b = ?$).

2. Apply the Pythagorean Theorem: $6^2 + b^2 = 10^2$

3. Solve for b: $36 + b^2 = 100 \Rightarrow b^2 = 64 \Rightarrow b = 8$ meters.

Answer: The ladder reaches 8 meters up the wall.

Problem 2: The Diagonal of a Rectangle

A rectangular garden is 12 meters long and 5 meters wide. What is the length of the diagonal path across the garden?

Solution:

1. Visualize the triangle: The diagonal forms the hypotenuse of a right-angled triangle with the length and width as the legs.
2. Apply the theorem: $12^2 + 5^2 = c^2$
3. Solve for c: $144 + 25 = c^2 \Rightarrow c^2 = 169 \Rightarrow c = 13$ meters.

Answer: The diagonal path is 13 meters long.

Problem 3: The Distance Problem

A bird flies from its nest to a point 3 km east and then 4 km north. How far is the bird from its nest in a straight line?

Solution:

1. Diagram: This forms a right-angled triangle with the east and north directions representing the legs.
2. Pythagorean Theorem: $3^2 + 4^2 = c^2$
3. Solve for c: $9 + 16 = c^2 \Rightarrow c^2 = 25 \Rightarrow c = 5$ km.

Answer: The bird is 5 km from its nest.

Strategies for Solving Pythagorean Theorem Word Problems

Draw a diagram: Always start by sketching the right-angled triangle. This helps visualize the problem and assign values correctly.

Identify the hypotenuse: The hypotenuse is always the longest side and opposite the right angle.

Label the sides: Clearly label the sides 'a', 'b', and 'c'.

Substitute and solve: Substitute the known values into the equation $a^2 + b^2 = c^2$ and solve for the unknown variable.

Check your answer: Ensure your answer makes sense in the context of the problem.

Beyond the Basics: More Challenging Problems

Some word problems may involve more complex geometric shapes or require multiple steps to solve. Remember to break down the problem into smaller, manageable parts. Look for right-angled triangles within the larger shapes and apply the Pythagorean Theorem accordingly.

Conclusion

Mastering Pythagorean Theorem word problems requires practice and a systematic approach. By understanding the theorem, drawing diagrams, and following the steps outlined above, you can confidently tackle even the most challenging problems. Remember to always check your work and ensure your answer makes logical sense within the context of the word problem. Now, go forth and conquer those triangles!

FAQs

1. What if the problem doesn't explicitly state it's a right-angled triangle? Look for keywords indicating a right angle (e.g., "square corner," "perpendicular"). Often, a diagram is provided which will clearly show the right angle.
2. Can the Pythagorean Theorem be used with triangles that are not right-angled? No, the Pythagorean Theorem only applies to right-angled triangles.
3. What if I get a negative number when solving for a side? A negative length is impossible. This indicates an error in your calculations; double-check your work.
4. Are there any online resources that can help me practice? Yes! Many websites and educational platforms offer practice problems and interactive lessons on the Pythagorean Theorem.
5. Is there a formula to find the area of the triangle once I've solved for the sides? Yes, the area of a right-angled triangle is $(1/2) \text{ base height}$, where the base and height are the two legs (a and b).

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