45 45 90 triangle worksheet answer key

45-45-90 Triangle Worksheet Answer Key

Structure:

This document provides a comprehensive answer key for a worksheet focusing on 45-45-90 triangles. The worksheet itself (not included here) likely contains a series of problems requiring students to calculate side lengths, angles, and apply the properties of isosceles right-angled triangles. The answer key follows the same order as the problems in the worksheet, providing step-by-step solutions where appropriate, and highlighting key concepts used in the calculations. Each answer is clearly labeled, and diagrams may be included to aid understanding. The key may be divided into sections based on problem type (e.g., finding hypotenuse given leg, finding leg given hypotenuse, applying Pythagorean theorem, using trigonometric ratios in the context of a 45-45-90 triangle).

Description:

This 45-45-90 triangle worksheet answer key serves as a valuable resource for students, teachers, and parents. It provides detailed solutions to a set of exercises designed to reinforce understanding of the special properties of 45-45-90 triangles, including the 1:1:√2 ratio of side lengths. The step-by-step explanations facilitate self-assessment and identify areas where students might need further clarification. The key is designed to be easy to navigate, allowing quick access to the solution for each problem. It promotes independent learning and allows students to check their work and understand their mistakes. The rigorous approach ensures a solid grasp of the fundamental concepts related to 45-45-90 triangles, essential for further studies in geometry and trigonometry.

Author:

[Insert Author Name Here] – A qualified mathematics educator with [Number] years of experience teaching high school geometry and trigonometry. [Optional: Add a brief description of their qualifications, e.g., holds a Master's degree in Mathematics Education from [University Name], and is a member of [Professional Organization]].

Keywords:

45-45-90 triangle, isosceles right triangle, right triangle, trigonometry, geometry, worksheet, answer key, Pythagorean theorem, hypotenuse, legs, special right triangles, mathematics, education, problem solving, solutions, step-by-step, side lengths, angles, ratio, 1:1:√2

Summary:

This comprehensive answer key provides detailed solutions for a worksheet focused on 45-45-90 triangles. It covers a range of problems designed to strengthen students' understanding of this specific type of right-angled triangle. The key features step-by-step explanations, making it an excellent tool for self-assessment and clarifying any misconceptions. It's a valuable resource for students to check their work, identify areas for improvement, and solidify their understanding of key geometrical concepts and problem-solving techniques related to 45-45-90 triangles. The solutions are presented in a clear and concise manner, ensuring easy navigation and understanding.

Publisher:

[Insert Publisher Name Here] – [Optional: Add a brief description of the publisher, e.g., a leading provider of educational resources for secondary schools, committed to creating high-quality materials that support student learning].

Editor:

[Insert Editor Name Here] – [Optional: Add a brief description of the editor’s role and qualifications, e.g., a seasoned mathematics editor with expertise in ensuring accuracy and clarity in mathematical texts].

(The following section would contain the actual answer key, filling approximately 900 words. This would depend on the number and complexity of problems in the original worksheet. Below is an example of how a few answers might be structured):

Example Answers (Partial Answer Key):

Problem 1: Find the length of the hypotenuse of a 45-45-90 triangle with legs of length 5 cm each.

Solution: In a 45-45-90 triangle, the ratio of the legs to the hypotenuse is 1:1:√2. Therefore, if the legs are 5 cm each, the hypotenuse (h) can be calculated as follows:

h = leg √2 = 5 cm √2 ≈ 7.07 cm

Problem 2: A 45-45-90 triangle has a hypotenuse of length 12 cm. Find the length of each leg.

Solution: Using the 1:1:√2 ratio, we know that the length of each leg (l) is related to the hypotenuse (h) by the equation:

l = h / √2 = 12 cm / √2 ≈ 8.49 cm

Problem 3: A square has a diagonal of length 10 inches. Find the length of each side.

Solution: The diagonal of a square forms the hypotenuse of a 45-45-90 triangle, with the sides of the square as the legs. Therefore, we can use the same ratio as above:

side length = diagonal / √2 = 10 inches / √2 ≈ 7.07 inches

(The remaining problems and their solutions would continue in a similar format, providing step-by-step explanations and diagrams as needed. Remember to replace the bracketed information with actual details.)

Decoding the 45-45-90 Triangle: A Comprehensive Guide with Worksheet and Answer Key

Keywords: 45 45 90 triangle, 45-45-90 triangle worksheet, 45-45-90 triangle answer key, isosceles right triangle, special right triangle, trigonometry, geometry worksheet, math worksheet, Pythagorean theorem, triangle problems, math solutions

Are you struggling to understand 45-45-90 triangles? This comprehensive guide will walk you through everything you need to know about these special right triangles, providing you with a detailed explanation, practice problems, and, most importantly, a complete answer key. Mastering 45-45-90 triangles is crucial for success in geometry and trigonometry, opening doors to more complex mathematical concepts.

Understanding the 45-45-90 Triangle: The Basics

A 45-45-90 triangle, also known as an isosceles right triangle, is a special type of right-angled triangle where two of its angles measure 45 degrees each, and the third angle is the right angle (90 degrees). Because of its unique angles, it exhibits specific side relationships that simplify calculations significantly. This makes it a cornerstone in understanding more advanced geometric and trigonometric problems.

The defining characteristic of a 45-45-90 triangle is its isosceles nature. This means that the two legs (the sides opposite the 45-degree angles) are congruent, or equal in length. Let's represent the length of these legs as 'x'.

The Relationship Between Sides: A Simple Formula

The relationship between the sides of a 45-45-90 triangle can be easily remembered using a simple formula:

Legs: x
Hypotenuse: x√2

This formula states that the hypotenuse (the side opposite the 90-degree angle) is always √2 times the length of one of the legs. Understanding this relationship is key to solving problems involving 45-45-90 triangles. It bypasses the need for complex trigonometric functions or the Pythagorean theorem in many cases, offering a faster and more efficient solution.

Applying the 45-45-90 Triangle Formula: Worked Examples

Let's solidify our understanding with some worked examples.

Example 1:

A 45-45-90 triangle has legs of length 5 cm. Find the length of its hypotenuse.

Solution:

Since the legs have length x = 5 cm, the hypotenuse is x√2 = 5√2 cm.

Example 2:

The hypotenuse of a 45-45-90 triangle is 10√2 inches. Find the length of its legs.

Solution:

Let x be the length of a leg. Then the hypotenuse is x√2. We are given that the hypotenuse is 10√2 inches. Therefore, x√2 = 10√2. Dividing both sides by √2 gives x = 10 inches. The legs are each 10 inches long.

The Pythagorean Theorem and 45-45-90 Triangles

While the simple formula is usually sufficient, it's important to understand the connection between 45-45-90 triangles and the Pythagorean theorem ($a^2 + b^2 = c^2$, where a and b are the legs and c is the hypotenuse).

In a 45-45-90 triangle, since the legs are equal (a = b = x), the theorem becomes:

$x^2 + x^2 = c^2$

$2x^2 = c^2$

$c = x\sqrt{2}$

This confirms our earlier formula, demonstrating the inherent relationship between the Pythagorean theorem and the special properties of 45-45-90 triangles.

45-45-90 Triangle Worksheet: Practice Problems

Now it's your turn! Test your understanding with the following problems. Solutions are provided in the answer key below.

Problem 1: Find the length of the hypotenuse of a 45-45-90 triangle with legs of length 7 cm.

Problem 2: A 45-45-90 triangle has a hypotenuse of 12 inches. What is the length of each leg?

Problem 3: If one leg of a 45-45-90 triangle is 15 meters, what is the length of the other leg and the hypotenuse?

Problem 4: A square has a diagonal of 18 cm. Find the length of one of its sides. (Hint: consider the two 45-45-90 triangles formed by the diagonal).

Problem 5: A right-angled triangle has angles 45°, 45°, and 90°. Its area is 50 square meters. Find the lengths of all its sides.

45-45-90 Triangle Worksheet: Answer Key

Problem 1: Hypotenuse = $7\sqrt{2}$ cm

Problem 2: Leg length = $6\sqrt{2}$ inches

Problem 3: Other leg = 15 meters; Hypotenuse = $15\sqrt{2}$ meters

Problem 4: Side length = $9\sqrt{2}$ cm

Problem 5: Let x be the length of a leg. The area is $(1/2)x^2 = 50$. This means $x^2 = 100$, so $x = 10$ meters. Therefore, leg lengths are 10 meters and 10 meters, and the hypotenuse is $10\sqrt{2}$ meters.

Advanced Applications of 45-45-90 Triangles

Understanding 45-45-90 triangles is not just about solving simple geometry problems. They are frequently used in:

Trigonometry: They provide a foundation for understanding trigonometric ratios (sine, cosine, tangent) in specific angles.
Calculus: They appear in various applications related to derivatives and integrals.
Engineering and Physics: They are used in various calculations related to vectors, forces, and motion.
Computer Graphics: The principles of 45-45-90 triangles are applied in computer graphics and game development.

By mastering the concepts covered in this guide, you'll be well-prepared to tackle more challenging problems in mathematics and related fields. Remember to practice regularly and refer back to this guide as needed. Your ability to confidently solve problems involving 45-45-90 triangles is a significant step towards achieving success in higher-level mathematics.

Additional Resources

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