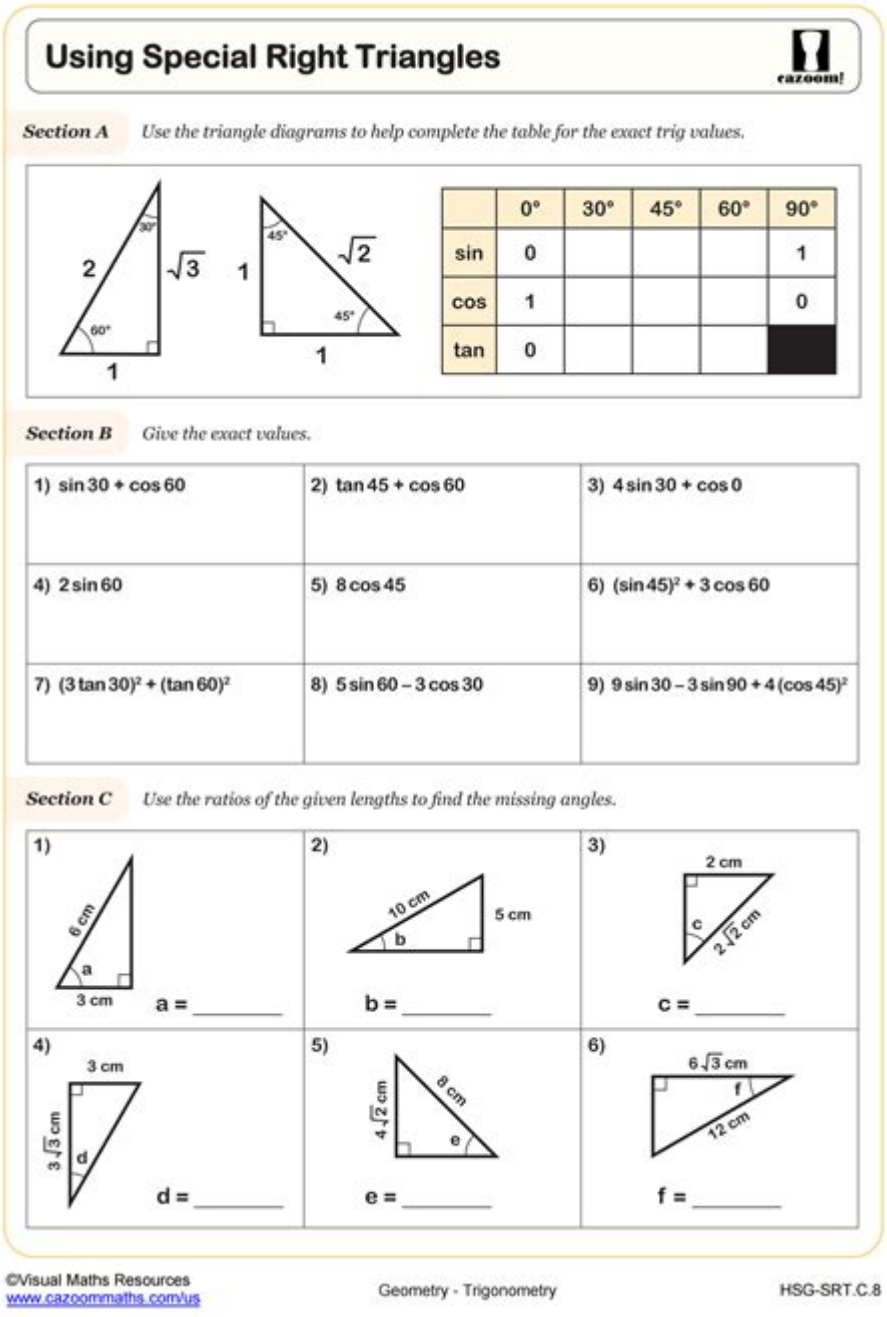
Special Right Triangles Geometry Worksheet Answers



Using Special Right Triangles

razoom!

Section A *Use the triangle diagrams to help complete the table for the exact trig values.*

	0°	30°	45°	60°	90°
sin	0				1
cos	1				0
tan	0				

Section B *Give the exact values.*

1) $\sin 30 + \cos 60$	2) $\tan 45 + \cos 60$	3) $4 \sin 30 + \cos 0$
4) $2 \sin 60$	5) $8 \cos 45$	6) $(\sin 45)^2 + 3 \cos 60$
7) $(3 \tan 30)^2 + (\tan 60)^2$	8) $5 \sin 60 - 3 \cos 30$	9) $9 \sin 30 - 3 \sin 90 + 4 (\cos 45)^2$

Section C *Use the ratios of the given lengths to find the missing angles.*

1)

a = _____

2)

b = _____

3)

c = _____

4)

d = _____

5)

e = _____

6)

f = _____

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Geometry - Trigonometry

HSG-SRT.C.8

Special right triangles geometry worksheet answers are a crucial aspect of understanding the properties and applications of specific types of triangles in geometry. Special right triangles, namely the 45-45-90 triangle and the 30-60-90 triangle, have unique characteristics that make them particularly useful in various mathematical contexts. This article will explore the properties of these triangles, the derivation of their side ratios, and how to solve related problems, including typical worksheet questions and their answers.

Understanding Special Right Triangles

Special right triangles are notable for their angles and side ratios. The two primary types of special right triangles are:

1. 45-45-90 Triangle
2. 30-60-90 Triangle

Each type has distinct properties that simplify calculations in geometry, trigonometry, and various applications in real-world scenarios.

Properties of the 45-45-90 Triangle

A 45-45-90 triangle is an isosceles right triangle, meaning it has two equal sides and a right angle. The angles in this triangle measure 45 degrees, 45 degrees, and 90 degrees.

- Side Ratios:
- If the lengths of the two legs (the sides opposite the 45-degree angles) are equal and denoted as x, the length of the hypotenuse (the side opposite the 90-degree angle) can be calculated using the formula:

$$
\text{Hypotenuse} = x\sqrt{2}
$$

- Example: If both legs are 5 units long, the hypotenuse will be:

$$
\text{Hypotenuse} = 5\sqrt{2} \approx 7.07
$$

Properties of the 30-60-90 Triangle

The 30-60-90 triangle is another special right triangle that is characterized by its angles of 30 degrees, 60 degrees, and 90 degrees.

- Side Ratios:
- If the shortest leg (the side opposite the 30-degree angle) is denoted as x, the lengths of the other sides can be expressed as follows:
- The length of the longer leg (the side opposite the 60-degree angle) is:

$$
\text{Longer Leg} = x\sqrt{3}
$$

- The hypotenuse is:

$$
\text{Hypotenuse} = 2x
$$

- Example: If the shortest leg is 4 units long, then:

$$
\text{Longer Leg} = 4\sqrt{3} \approx 6.93
$$

$$
\text{Hypotenuse} = 2 \times 4 = 8
$$

Solving Problems with Special Right Triangles

Understanding the properties and ratios of special right triangles allows students to solve various geometric problems effectively. Below are common types of problems found in worksheets, along with step-by-step solutions.

Example Problems

1. Problem 1: Given a 45-45-90 triangle where one leg is 10 units, find the length of the hypotenuse.

Solution:
- Since both legs are equal in a 45-45-90 triangle, we have:
$$
\text{Hypotenuse} = 10\sqrt{2} \approx 14.14
$$

2. Problem 2: In a 30-60-90 triangle, the longer leg measures 12 units. What is the length of the shorter leg and the hypotenuse?

Solution:
- Let the shorter leg be x.
- By the ratio, we know that:
$$
x\sqrt{3} = 12 \quad \Rightarrow \quad x = \frac{12}{\sqrt{3}} = 4\sqrt{3} \approx 6.93
$$
- Now, calculate the hypotenuse:
$$
\text{Hypotenuse} = 2x = 2 \times 4\sqrt{3} = 8\sqrt{3} \approx 13.86
$$

3. Problem 3: A ladder leans against a wall, forming a 30-60-90 triangle with the ground. If the length of the ladder (hypotenuse) is 20 units, what are the lengths of the legs?

Solution:
- Let the length of the shorter leg be x. The hypotenuse is $2x$:
$$
2x = 20 \quad \Rightarrow \quad x = 10
$$
- The longer leg:
$$
\text{Longer Leg} = x\sqrt{3} = 10\sqrt{3} \approx 17.32
$$

Worksheets and Practice

To reinforce the knowledge of special right triangles, many educational resources include worksheets with problems that test understanding and application of the properties discussed. Here are some examples of typical worksheet questions:

Worksheet Questions

- Question 1: For a 45-45-90 triangle, if one leg measures 8 units, find the hypotenuse.

- Question 2: A 30-60-90 triangle has a hypotenuse of 18 units. What are the lengths of the two legs?

- Question 3: Calculate the area of a 45-45-90 triangle with legs measuring 6 units.

- Question 4: In a 30-60-90 triangle, if the longer leg is 10 units, what is the length of the hypotenuse?

Worksheet Answers

1. Answer to Question 1:
$$
\text{Hypotenuse} = 8\sqrt{2} \approx 11.31
$$

2. Answer to Question 2:
- Shorter leg = 9 units; Longer leg = $9\sqrt{3} \approx 15.59$

3. Answer to Question 3:
$$
\text{Area} = \frac{1}{2} \times 6 \times 6 = 18 \text{ square units}
$$

4. Answer to Question 4:
$$
\text{Hypotenuse} = 10\sqrt{3} \approx 17.32
$$

Conclusion

In conclusion, special right triangles geometry worksheet answers highlight the unique properties and applications of 45-45-90 and 30-60-90 triangles. Understanding the ratios of their sides allows for quick and accurate problem-solving in various mathematical contexts. These triangles are not only essential in geometry but also serve as foundational concepts in trigonometry and real-world applications, making them vital for students to master. Regular practice with worksheets enhances familiarity and proficiency, allowing students to tackle more complex geometric problems with confidence.

Frequently Asked Questions

What are special right triangles and why are they important in geometry?

Special right triangles, specifically the 45-45-90 and 30-60-90 triangles, have specific ratios between their sides that simplify calculations. They are important because they frequently appear in geometry problems and real-world applications, allowing for easier problem-solving.

How do you find the lengths of the sides in a 45-45-90 triangle?

In a 45-45-90 triangle, the lengths of the legs are equal, and the hypotenuse is √2 times the length of a leg. If the legs are of length 'a', then the hypotenuse is 'a√2'.

What is the side length ratio for a 30-60-90 triangle?

The side lengths of a 30-60-90 triangle are in the ratio 1:√3:2. This means if the shortest side (opposite the 30-degree angle) is 'x', then the lengths of the other sides are 'x√3' (opposite the 60-degree angle) and '2x' (the hypotenuse).

How can I verify my answers on a special right triangles geometry worksheet?

To verify your answers, you can use the known ratios of the special right triangles and check your calculations against those ratios. Additionally, you can apply the Pythagorean theorem to ensure the relationships between the sides hold true.

Are there common mistakes to avoid when working with special right triangles?

Common mistakes include confusing the ratios of the sides, mislabeling the angles, and improper application of the Pythagorean theorem. Always double-check your angle measurements and side relationships to avoid these errors.

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