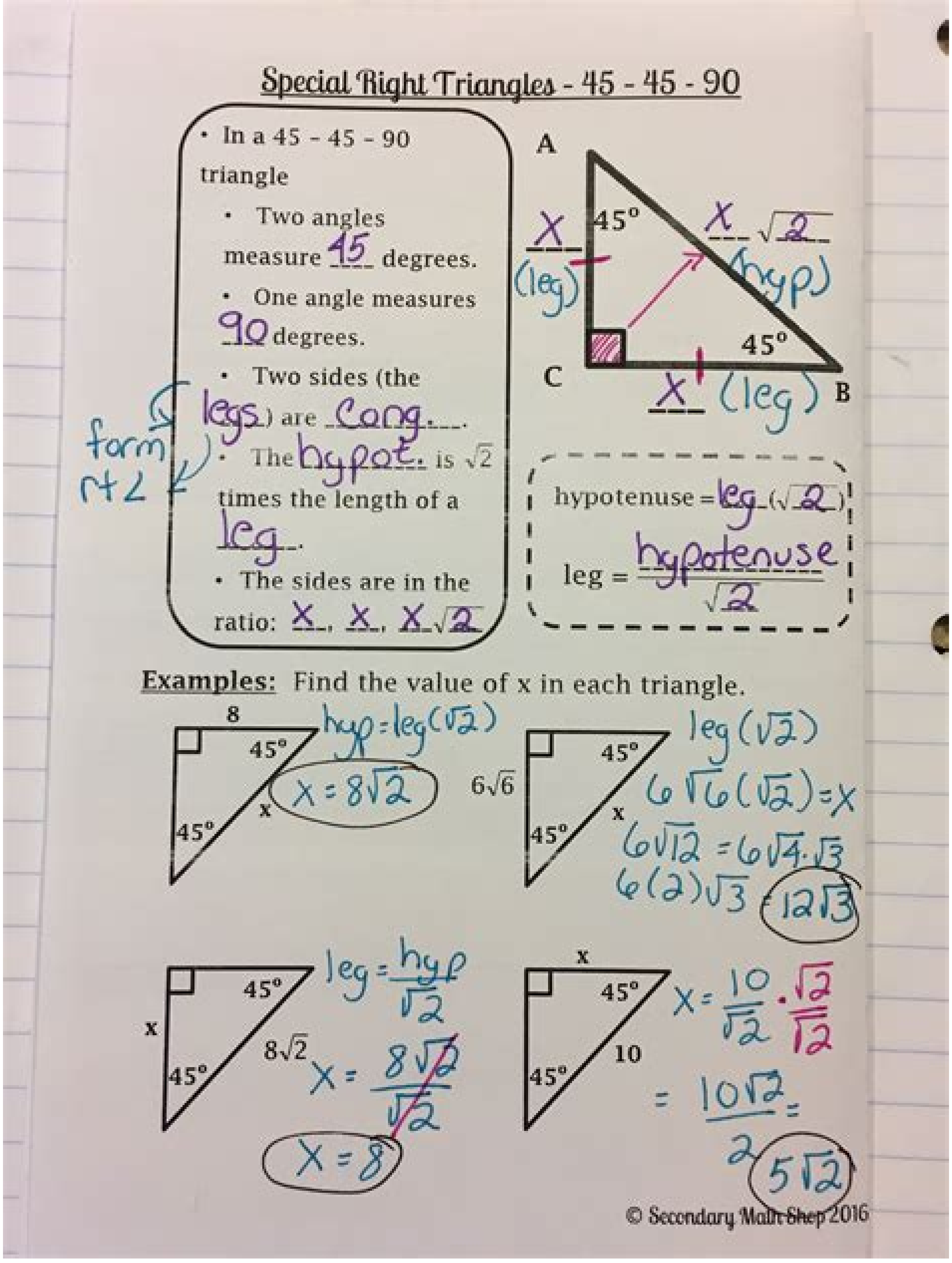
Special Right Triangles Worksheet With Answers



Special Right Triangles - 45 - 45 - 90

- In a 45 – 45 – 90 triangle
  - Two angles measure 45 degrees.
  - One angle measures 90 degrees.
  - Two sides (the legs) are Cong.
  - The hypot. is $\sqrt{2}$ times the length of a leg.
- The sides are in the ratio: x, x, $x\sqrt{2}$

form rt2

A
B
C
45°
45°
X (leg)
$x\sqrt{2}$ (hyp)
X (leg)

hypotenuse = leg $(\sqrt{2})$

leg = $\frac{\text{hypotenuse}}{\sqrt{2}}$

Examples: Find the value of x in each triangle.

8
45°
45°
x

hyp = leg$(\sqrt{2})$

$x = 8\sqrt{2}$

$6\sqrt{6}$
45°
45°
x

leg$(\sqrt{2})$

$6\sqrt{6}(\sqrt{2}) = x$

$6\sqrt{12} = 6\sqrt{4}\cdot\sqrt{3}$

$6(2)\sqrt{3} = 12\sqrt{3}$

leg = $\frac{hyp}{\sqrt{2}}$

$x = \frac{8\cancel{\sqrt{2}}}{\cancel{\sqrt{2}}}$

$x = 8$

$x = \frac{10}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}}$

$= \frac{10\sqrt{2}}{2} = 5\sqrt{2}$

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Special right triangles worksheet with answers provide an excellent resource for students to practice and solidify their understanding of the unique properties of these triangles. In geometry, special right triangles are defined as triangles that have specific angle measures and side ratios. The two most commonly studied special right triangles are the 45-45-90 triangle and the 30-60-90 triangle. This article will explore the characteristics, formulas, and applications of these triangles, provide example problems commonly found on worksheets, and include answers for self-assessment.

Understanding Special Right Triangles

Special right triangles are significant in geometry because they simplify the process of calculating side lengths and angles. The two main types include:

1. 45-45-90 Triangle

A 45-45-90 triangle is an isosceles right triangle, meaning that its two legs are of equal length, and the angles opposite those legs are both 45 degrees. The properties of a 45-45-90 triangle can be summarized as follows:

- The legs are equal in length.
- The length of the hypotenuse is \(\sqrt{2} \) times the length of each leg.

If we denote the length of each leg as \(x \), the relationship can be expressed mathematically:

- Hypotenuse = \(x\sqrt{2} \)

2. 30-60-90 Triangle

A 30-60-90 triangle has angles measuring 30 degrees, 60 degrees, and 90 degrees. The properties of this triangle are distinct and can be summarized in the following way:

- The length of the side opposite the 30-degree angle is half the length of the hypotenuse.
- The length of the side opposite the 60-degree angle is \(\sqrt{3} \) times the length of the shorter leg.

Using \(x \) to denote the length of the side opposite the 30-degree angle, we can express the relationships as follows:

- Hypotenuse = \(2x \)
- Side opposite 60 degrees = \(x\sqrt{3} \)

Creating a Special Right Triangles Worksheet

To create a comprehensive worksheet that focuses on special right triangles, include a mix of problems that cover both triangle types. Here are some examples of problems that can be included:

Worksheet Problems

1. 45-45-90 Triangle Problems
- If each leg of a 45-45-90 triangle is 5 cm, what is the length of the hypotenuse?

- A 45-45-90 triangle has a hypotenuse of 10 cm. What are the lengths of the legs?
- Calculate the area of a 45-45-90 triangle with legs measuring 8 cm.

2. 30-60-90 Triangle Problems
- If the shorter leg of a 30-60-90 triangle is 4 cm, what are the lengths of the other two sides?
- A 30-60-90 triangle has a hypotenuse of 12 cm. What are the lengths of the legs?
- Find the perimeter of a 30-60-90 triangle with the shorter leg measuring 3 cm.

3. Mixed Problems
- A right triangle has one angle measuring 45 degrees and a leg of 7 cm. Calculate the length of the hypotenuse.
- Given a 30-60-90 triangle where the longer leg measures 5 cm, find the lengths of the other sides.

Answers to the Worksheet Problems

Providing answers to the worksheet problems allows students to verify their work and learn from their mistakes. Below are the solutions to the problems listed above.

1. Answers for 45-45-90 Triangle Problems

- Problem 1: Hypotenuse = $5\sqrt{2} \approx 7.07$ cm
- Problem 2: Each leg = $\frac{10}{\sqrt{2}} = 5\sqrt{2} \approx 7.07$ cm
- Problem 3: Area = $\frac{1}{2} \times 8 \times 8 = 32$ cm²

2. Answers for 30-60-90 Triangle Problems

- Problem 1: Hypotenuse = $2 \times 4 = 8$ cm, Longer leg = $4\sqrt{3} \approx 6.93$ cm
- Problem 2: Shorter leg = 6 cm, Longer leg = $6\sqrt{3} \approx 10.39$ cm
- Problem 3: Perimeter = $3 + 3\sqrt{3} + 6 = 3 + 5.20 + 6 \approx 14.20$ cm

3. Answers for Mixed Problems

- Problem 1: Hypotenuse = $7\sqrt{2} \approx 9.9$ cm
- Problem 2: Shorter leg = $\frac{5}{\sqrt{3}} \approx 2.89$ cm, Hypotenuse = 5 cm, Longer leg = $5\sqrt{3} \approx 8.66$ cm

Applications of Special Right Triangles

Special right triangles are used extensively in various fields of study and everyday applications. Here are a few examples:

- Architecture and Engineering: Understanding the properties of special right triangles helps architects and engineers design structures with precise angles and dimensions.
- Art and Design: Artists often use geometric principles, including special right triangles, to create visually appealing designs and compositions.
- Navigation and Surveying: Surveyors use special right triangles to calculate distances and angles when mapping land and designing roads.
- Physics: In physics, special right triangles are useful in solving problems involving forces, projectiles, and vectors.

Conclusion

In summary, a special right triangles worksheet with answers is a valuable tool for students to enhance their understanding of geometry. By practicing problems involving 45-45-90 and 30-60-90 triangles, learners can master the unique properties of these triangles and apply this knowledge in various real-world contexts. With consistent practice, students can develop confidence in their problem-solving abilities and deepen their appreciation for the beauty of geometry.

Frequently Asked Questions

What are special right triangles?

Special right triangles refer to specific types of triangles that have unique ratios between their sides, particularly the 45-45-90 triangle and the 30-60-90 triangle.

How do you find the length 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.

What are the side ratios for a 30-60-90 triangle?

In a 30-60-90 triangle, the side lengths are in the ratio 1:√3:2, where 1 is the length of the side opposite the 30-degree angle, √3 is the length of the side opposite the 60-degree angle, and 2 is the hypotenuse.

Where can I find a worksheet on special right triangles?

Worksheets on special right triangles can be found on educational websites, math resource sites, or by searching for 'special right triangles worksheet' in search engines.

Are there answer keys available for special right triangles worksheets?

Yes, many educational resources provide answer keys for special right triangles worksheets to help students check their work.

What skills can be practiced with a special right triangles worksheet?

A special right triangles worksheet can help students practice calculating side lengths, applying the Pythagorean theorem, and understanding the properties of angles in special triangles.

How can I create my own special right triangles worksheet?

You can create your own worksheet by generating various problems that involve finding the lengths of sides in 45-45-90 and 30-60-90 triangles, along with some application problems.

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