What Kind Of Triangle Is Formed When The Lengths Of The Sides Are 6cm 8cm And 10cm?

What Kind Of Triangle Is Formed When The Lengths Of The Sides Are 6cm 8cm And 10cm? This question prompts us to analyze the specific properties of a triangle with sides measuring 6cm, 8cm, and 10cm. Determining the type of triangle formed by these dimensions involves examining its side lengths, angles, and whether it satisfies certain geometric conditions. Understanding these aspects helps classify the triangle as scalene, isosceles, equilateral, acute, obtuse, or right-angled. In this article, we will explore how to analyze such a triangle step by step and uncover what kind of triangle emerges from these measurements.

Understanding Triangle Types Based on Side Lengths and Angles

Triangles can be classified in various ways based on their sides and angles. The main classifications include:

By Side Lengths:

- Equilateral Triangle: All three sides are equal.
- Isosceles Triangle: Exactly two sides are equal.
- Scalene Triangle: All three sides are of different lengths.

By Angles:

- Acute Triangle: All interior angles are less than 90°.
- Right Triangle: One angle is exactly 90°.
- Obtuse Triangle: One angle is greater than 90°.

To determine what kind of triangle the sides 6cm, 8cm, and 10cm form, we need to analyze both the side lengths and the corresponding angles.

Step 1: Check if the Sides Can Form a Triangle

Before classifying, ensure that the given side lengths satisfy the triangle inequality theorem, which states:

- The sum of any two sides must be greater than the third.

Applying this to 6cm, 8cm, and 10cm:

- 6 + 8 = 14 > 10
- 6 + 10 = 16 > 8
- 8 + 10 = 18 > 6

Since all three conditions are satisfied, these lengths can indeed form a triangle.

Step 2: Determine the Type Based on Side Lengths

The side lengths are 6cm, 8cm, and 10cm. None of the sides are equal, so:

- The triangle is scalene (all sides different).

This classification is straightforward because the side lengths differ, ruling out equilateral and isosceles options.

Step 3: Check if the Triangle Is Right-Angled (Using the Pythagorean Theorem)

To find out whether the triangle is right-angled, we can verify if the Pythagorean theorem holds:

$$ a^2 + b^2 = c^2 $$

where $ c $ is the longest side (hypotenuse). Here, 10cm is the longest side.

Calculate:

- $ 6^2 + 8^2 = 36 + 64 = 100 $
- $ 10^2 = 100 $

Since $ 36 + 64 = 100 $, which equals $ 10^2 $, the Pythagorean theorem holds true.

Conclusion:
This confirms that the triangle with sides 6cm, 8cm, and 10cm is a right-angled triangle.

Step 4: Classify the Triangle Based on Angles

Given the Pythagorean validation, the triangle is:

- Right-angled, with the right angle opposite the side of length 10cm.

Furthermore, since the sides are all different lengths, the triangle is also scalene with one right angle.

Additional Insights and Properties of the 6cm, 8cm, 10cm Triangle

Now that we have classified the triangle, let’s explore some interesting properties and characteristics.

1. Type Summary:

- Side-based classification: Scalene
- Angle-based classification: Right-angled

Thus, the triangle is a scalene right triangle.

2. Area Calculation:

The area of a right triangle can be calculated as:

$$
\text{Area} = \frac{1}{2} \times \text{base} \times \text{height}
$$

Using the legs (the sides forming the right angle):

$$
\text{Area} = \frac{1}{2} \times 6\,cm \times 8\,cm = 24\,cm^2
$$

3. Perimeter Calculation:

Sum of all sides:

$$
6\,cm + 8\,cm + 10\,cm = 24\,cm
$$

4. Special Properties:

- The sides 6cm, 8cm, and 10cm form a scaled version of the classic Pythagorean triple (3, 4, 5), scaled by a factor of 2.
- The triangle is similar to a 3-4-5 right triangle, which is a fundamental Pythagorean triple.

Why Is Recognizing Pythagorean Triples Important?

Understanding Pythagorean triples like (3, 4, 5) and their scaled versions (6, 8, 10) is crucial in geometry because they provide quick methods to identify right-angled triangles without complex

calculations. Recognizing these patterns simplifies problem-solving and enables students and mathematicians to verify right angles efficiently.

Applications and Real-World Examples

The classification of the 6cm, 8cm, and 10cm triangle as a right triangle has practical implications in various fields:

- **Construction:** Ensuring structures have right angles using the 3-4-5 rule scaled up to 6-8-10.
- **Engineering:** Designing right-angled components or layouts.
- **Navigation and Surveying:** Using scaled Pythagorean triples to create accurate right angles in fieldwork.

In essence, understanding the properties of such triangles aids in precise measurements and design in real life.

Summary: What Kind Of Triangle Is It?

Based on the side lengths of 6cm, 8cm, and 10cm, we can conclude:

- It is a scalene triangle (all sides of different lengths).
- It is a right-angled triangle (verified through the Pythagorean theorem).
- It is a scaled version of the well-known 3-4-5 right triangle, scaled by a factor of 2.

This combination classifies the triangle as a scalene right triangle.

Final Thoughts

Understanding how to classify triangles based on side lengths and angles is fundamental in geometry. The specific case of sides 6cm, 8cm, and 10cm offers a perfect example of how the Pythagorean theorem helps identify right triangles and how scaling Pythagorean triples can be applied in practical scenarios. Whether for academic purposes, construction projects, or everyday measurements, recognizing the properties of such triangles enhances spatial reasoning and problem-solving skills.

In conclusion, when the lengths of the sides are 6cm, 8cm, and 10cm, the triangle formed is a scalene right triangle.

Frequently Asked Questions

What type of triangle is formed when the sides are 6cm, 8cm, and 10cm?

The triangle is a right-angled triangle because it satisfies the Pythagorean theorem ($6^2 + 8^2 = 10^2$).

Is the triangle with sides 6cm, 8cm, and 10cm scalene, isosceles, or equilateral?

It is a scalene triangle since all three sides are of different lengths.

Can a triangle with sides 6cm, 8cm, and 10cm be classified as acute, right, or obtuse?

It is a right triangle because the Pythagorean theorem holds true with these side lengths.

What is the significance of the sides 6cm, 8cm, and 10cm forming a right triangle?

This set of side lengths is a classic Pythagorean triplet, illustrating the relationship between the sides of a right-angled triangle.

How do you verify that a triangle with sides 6cm, 8cm, and 10cm is a right triangle?

By checking if the square of the longest side ($10^2 = 100$) equals the sum of the squares of the other two sides ($6^2 + 8^2 = 36 + 64 = 100$), confirming the Pythagorean theorem.

Additional Resources

What Kind Of Triangle Is Formed When The Lengths Of The Sides Are 6cm, 8cm, And 10cm?

Understanding the nature of triangles based on their side lengths is a fundamental aspect of geometry, with applications spanning architecture, engineering, and even computer graphics. When given specific measurements, such as sides measuring 6cm, 8cm, and 10cm, it becomes essential to determine whether the triangle is equilateral, isosceles, or scalene, and whether it is acute, right, or obtuse. This analysis not only enhances our comprehension of geometric principles but also provides practical insights into real-world problem-solving. Today, we delve into the question: what kind of triangle is formed when the lengths of the sides are 6cm, 8cm, and 10cm?

Assessing the Triangle’s Validity: The Triangle

Inequality Theorem

Before classifying the triangle, it is crucial to verify whether such a triangle can indeed exist with the given side lengths.

The Triangle Inequality Theorem Explained

The Triangle Inequality Theorem states that for any three sides to form a triangle, the sum of the lengths of any two sides must be greater than the length of the remaining side. Mathematically, for sides a, b, and c:

- a + b > c
- a + c > b
- b + c > a

Applying these conditions to our sides:

- 6cm + 8cm = 14cm > 10cm □
- 6cm + 10cm = 16cm > 8cm □
- 8cm + 10cm = 18cm > 6cm □

All three inequalities hold true, confirming that a triangle with sides 6cm, 8cm, and 10cm can exist in Euclidean space.

Classifying the Triangle by Side Lengths

Triangles are primarily categorized based on their side lengths into three types:

- Equilateral: All sides are equal.
- Isosceles: Exactly two sides are equal.
- Scalene: All sides are different.

Given our side lengths:

- 6cm, 8cm, and 10cm, all are different.
- Therefore, the triangle is scalene.

This classification indicates that no two sides are congruent, and each side is of a distinct length, which influences the angles and overall shape of the triangle.

Classifying the Triangle by Angles

Next, understanding the type of triangle based on its angles involves determining whether it is acute, right, or obtuse.

Using the Pythagorean Theorem for Angle Classification

The Pythagorean Theorem states that in a right-angled triangle:

$a^2 + b^2 = c^2$

where c is the hypotenuse (the longest side). For non-right triangles:

- If $a^2 + b^2 > c^2$, the triangle is acute.
- If $a^2 + b^2 < c^2$, the triangle is obtuse.
- If $a^2 + b^2 = c^2$, the triangle is right-angled.

Identifying the longest side:

- Longest side c = 10cm

Calculating squares:

- $6cm^2 = 36$
- $8cm^2 = 64$
- $10cm^2 = 100$

Now, check whether the sum of the squares of the shorter sides equals, exceeds, or is less than the square of the longest side:

- 36 + 64 = 100

Since 36 + 64 = 100, which is exactly equal to 10^2, the triangle satisfies the Pythagorean theorem.

This indicates that the triangle with sides 6cm, 8cm, and 10cm is a right-angled triangle.

Implications of the Triangle Being Right-Angled

Knowing that the triangle is right-angled has both theoretical and practical implications.

Geometric Significance

- The side measuring 10cm acts as the hypotenuse, the longest side opposite the right angle.
- The other two sides, 6cm and 8cm, are the legs forming the right angle.
- This configuration allows the application of various geometric principles, including calculating area, height, and other related properties.

Practical Applications

- Construction and Design: Right triangles are foundational in creating stable structures, ensuring precise angles.
- Navigation and Surveying: Recognizing right triangles helps in triangulation and distance measurement.
- Pythagorean Triples: The set (6, 8, 10) is a scaled version of the well-known Pythagorean triple (3, 4, 5), which is a fundamental pattern in integer-sided right triangles.

Additional Calculations and Properties

Understanding the nature of this triangle enables further calculations:

Area Calculation

Using the two legs (6cm and 8cm):

Area = (1/2) × base × height = (1/2) × 6cm × 8cm = $24cm^2$

Perimeter Calculation

Sum of all sides:

Perimeter = 6cm + 8cm + 10cm = 24cm

Hypotenuse Verification

Confirming the Pythagorean relation:

- $6^2 + 8^2 = 36 + 64 = 100$
- $10^2 = 100$

The calculations reaffirm that the sides form a perfect right triangle.

Summary and Conclusions

To sum up, the triangle with side lengths of 6cm, 8cm, and 10cm possesses distinct characteristics:

- Type by side lengths: Scalene (all sides different)
- Type by angles: Right-angled (satisfies Pythagorean theorem)

This classification underscores the significance of side length analysis in identifying the precise nature of a triangle. The 6-8-10 triangle is a classic example of a Pythagorean triple, illustrating the fundamental relationship between side lengths and angles in Euclidean geometry.

Practical implications of this understanding extend beyond academic interest. In construction, design, and navigation, recognizing right triangles and their properties enables precise calculations and stable structures. The simplicity of the 6-8-10 set also offers educational value, serving as an accessible demonstration of the Pythagorean theorem in action.

In conclusion, when the sides are 6cm, 8cm, and 10cm, the resulting triangle is a scalene right triangle, a perfect illustration of fundamental geometric principles with real-world relevance. Recognizing such relationships not only enriches our mathematical understanding but also enhances practical problem-solving across various fields.

Note: Understanding the properties of specific triangles helps in solving more complex geometric problems and fosters a deeper appreciation for the elegance of mathematical relationships.

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