

The Measures Of Two Angles Of A Triangle Are 25 And 87. Is The Triangle Acute, Right, Or Obtuse? Explain.

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Understanding the types of triangles based on their angles is fundamental in geometry. When given specific angles within a triangle, such as 25 degrees and 87 degrees, it becomes crucial to analyze these angles to determine the nature of the triangle—whether it is acute, right, or obtuse. This article provides a comprehensive explanation of how to analyze these angles, the properties of different types of triangles, and the steps to determine the triangle's classification in terms of its angles. Whether you're a student learning geometry or someone seeking a refresher, this guide will clarify how to approach such problems effectively.

Understanding Triangle Angles and Their Properties

Before delving into the specific problem, it's essential to understand some fundamental concepts about triangles and their angles.

Sum of Angles in a Triangle

- The sum of the interior angles of any triangle always equals 180 degrees.
- This is a universal property applicable to all triangles, regardless of their shape or size.

Types of Triangles Based on Angles

Triangles are classified based on their angles into three main categories:

1. Acute Triangle

- All three interior angles are less than 90 degrees.
- Example: angles of 60° , 70° , and 50° .

2. Right Triangle

- Exactly one interior angle is exactly 90 degrees.
- The other two angles are acute (less than 90°).
- Example: angles of 90°, 45°, and 45°.

3. Obtuse Triangle

- Exactly one interior angle is greater than 90 degrees.
- The other two angles are acute.
- Example: angles of 100°, 40°, and 40°.

Analyzing the Given Angles: 25 Degrees and 87 Degrees

The problem states that two angles of a triangle measure 25° and 87°. To determine the nature of the triangle, we need to find the third angle and analyze the measurements.

Step 1: Calculate the Third Angle

Using the property that the sum of angles in a triangle is 180°, we can find the third angle:

$$\text{Third angle} = 180^\circ - (\text{First angle} + \text{Second angle})$$

Substituting the given angles:

$$\text{Third angle} = 180^\circ - (25^\circ + 87^\circ) = 180^\circ - 112^\circ = 68^\circ$$

So, the third angle measures 68°.

Step 2: Summarize the Angles

The three angles are:

- 25°
- 87°
- 68°

Classifying the Triangle Based on Its Angles

Now that we know all three angles, the next step is to classify the triangle as acute, right, or obtuse.

Key Observations:

- The largest angle among 25° , 87° , and 68° is 87° .
- Since 87° is less than 90° , and the other angles are also less than 90° , none of the angles qualify as a right or obtuse angle.

Classification Criteria:

- If any angle is exactly $90^\circ \rightarrow$ Right Triangle
- If any angle is greater than $90^\circ \rightarrow$ Obtuse Triangle
- If all angles are less than $90^\circ \rightarrow$ Acute Triangle

Applying these criteria:

- $25^\circ < 90^\circ$
- $87^\circ < 90^\circ$
- $68^\circ < 90^\circ$

Conclusion: All angles are less than 90° , so the triangle is an acute triangle.

Is the Triangle Acute, Right, or Obtuse? A Clear Explanation

Based on the calculations, the triangle with angles 25° , 87° , and 68° is classified as an acute triangle because all interior angles are less than 90 degrees. This classification has several implications:

- Angles: All are acute (less than 90°).
- Sides: In a triangle, the side opposite the largest angle is the longest. Since the largest angle here is 87° , the side opposite it (let's call it side 'a') is the longest side.
- Properties: Acute triangles tend to be more "regular" in shape, with no

angles approaching or exceeding 90° , resulting in a more "rounded" appearance.

Additional Insights and Related Topics

Understanding the nature of triangles based on their angles helps in numerous geometric applications, including construction, design, and problem-solving.

Related Concepts:

- Pythagorean Theorem: Only applies to right triangles; can be used to verify if a triangle with known sides is a right triangle.
- Triangle Inequality Theorem: The sum of the lengths of any two sides must be greater than the third side.
- Angle Sum Property: Reinforces the importance of the 180° sum in all triangle calculations.

Practical Applications:

- Architectural Design: Ensuring angles are suitable for structural stability.
- Navigation and Surveying: Calculating distances and angles for precise mapping.
- Geometry Problems: Solving for missing angles or sides in various geometric contexts.

Summary: Determining the Nature of a Triangle with Given Angles

To recap, when given two angles of a triangle:

1. Calculate the third angle using the angle sum property.
2. Analyze all three angles to determine the triangle's classification:
 - All less than 90° → Acute
 - Exactly one 90° → Right
 - One greater than 90° → Obtuse

In this specific case, with angles measuring 25° , 87° , and 68° , the triangle

is acute because all angles are less than 90° .

Final Thoughts

Understanding how to classify triangles based on their angles is a fundamental skill in geometry. By applying basic properties, such as the angle sum theorem, and analyzing the individual angles, one can accurately determine whether a triangle is acute, right, or obtuse. The example of angles 25° and 87° demonstrates the importance of calculating the missing angle and assessing each angle's measure. This approach not only helps in academic problems but also in real-world applications where geometric reasoning is essential.

Remember: Always verify the sum of angles and compare each to 90° to classify your triangle correctly. With practice, these assessments become quick and intuitive, enhancing your overall understanding of geometric concepts.

Keywords: Triangle angles, acute triangle, right triangle, obtuse triangle, triangle classification, geometry, angle sum property, how to classify a triangle, triangle problem solving, triangle with given angles

Frequently Asked Questions

What are the given angles of the triangle in the problem?

The two given angles of the triangle are 25 degrees and 87 degrees.

How do you find the third angle of the triangle?

You add the two known angles and subtract from 180 degrees: $180 - (25 + 87) = 68$ degrees.

What is the measure of the third angle in the triangle?

The third angle measures 68 degrees.

Based on the angles, what type of triangle is it: acute, right, or obtuse?

Since all angles are less than 90 degrees, the triangle is acute.

Why is the triangle classified as acute?

Because all three angles are less than 90 degrees, which is the defining characteristic of an acute triangle.

Could the triangle be a right triangle? Why or why not?

No, because none of the angles is exactly 90 degrees; the angles are 25, 87, and 68 degrees.

Could the triangle be an obtuse triangle? Why or why not?

No, because an obtuse triangle has one angle greater than 90 degrees, but all angles here are less than 90 degrees.

What is the importance of knowing the angles when classifying a triangle?

Knowing the angles helps determine whether the triangle is acute, right, or obtuse, which is essential for understanding its properties and solving related problems.

Additional Resources

Understanding the nature of triangles based on their angles is fundamental in geometry, offering insights into their properties, classifications, and applications. When given two angles of a triangle, determining whether the third angle completes the figure as an acute, right, or obtuse triangle involves basic yet crucial mathematical reasoning. In this article, we analyze a triangle with two known angles measuring 25° and 87° , exploring the implications of these measures, and providing a comprehensive explanation on how to classify the triangle accordingly.

Introduction to Triangle Angles and Their Significance

Triangles are among the simplest geometric shapes, yet their internal angles

reveal a wealth of information about their structure and classification. The sum of interior angles in any triangle always equals 180° , a fundamental rule in Euclidean geometry. This property forms the cornerstone for analyzing triangles when partial information about their angles is known.

Understanding whether a triangle is acute, right, or obtuse hinges upon the measures of its internal angles:

- Acute Triangle: All three angles are less than 90° .
- Right Triangle: Exactly one angle is exactly 90° .
- Obtuse Triangle: One angle exceeds 90° .

Given two angles, the third can be deduced using the angle sum property, which then allows us to classify the triangle accordingly.

Given Data: Two Angles of the Triangle

The problem specifies that two angles of the triangle measure 25° and 87° . To analyze the nature of this triangle, the initial steps involve calculating the third angle and understanding how these angles influence the overall classification.

Calculating the Unknown Angle

Using the fundamental property of triangles:

- Sum of interior angles = 180°

Given angles: 25° and 87°

Third angle can be calculated as:

$$\text{Third angle} = 180^\circ - (25^\circ + 87^\circ)$$

$$\text{Third angle} = 180^\circ - 112^\circ$$

$$\text{Third angle} = 68^\circ$$

Therefore, the three angles of the triangle are 25° , 87° , and 68° .

Classifying the Triangle Based on Its Angles

Now that all three angles are known, we can classify the triangle based on their measures.

1. Analysis of the Angles

Angle	Measure	Classification
25°	Less than 90°	Acute
87°	Less than 90°	Acute
68°	Less than 90°	Acute

All three angles are less than 90°, which indicates that the triangle is an acute triangle.

2. Is the Triangle Right, Obtuse, or Acute?

- Right Triangle?

To be a right triangle, one angle must be exactly 90°. Since none of the angles measure 90°, it is not a right triangle.

- Obtuse Triangle?

To be obtuse, one angle must be greater than 90°. Since all angles are less than 90°, it is not an obtuse triangle.

- Acute Triangle?

All angles are less than 90°, fitting the criteria for an acute triangle. Therefore, the triangle is classified as an acute triangle.

Implications of the Triangle's Classification

Understanding that the triangle is acute has several geometric and practical implications:

- Properties of Acute Triangles:

- All angles are less than 90°.
- The triangle is typically more "pointed" with no right or obtuse angles, resulting in a more "balanced" shape.
- The altitudes, medians, and angle bisectors are all inside the triangle, which can simplify certain calculations and constructions.

- Applications:

- Acute triangles are often encountered in structural engineering, art, and architecture where uniform stress distribution and aesthetic symmetry are desired.
- They are also significant in trigonometry, where sine and cosine values are all positive, facilitating calculations involving these functions.

Further Analytical Considerations

Beyond simple classification, examining the properties related to the given angles offers deeper insights into the nature of the triangle.

1. The Triangle's Side Lengths

- The angles are directly related to the side lengths via the Law of Sines:

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

where (a, b, c) are side lengths opposite angles (A, B, C) , respectively.

- Since the angles are 25° , 87° , and 68° , we can determine side ratios, which can help in constructing the triangle or solving related problems.

2. Geometric Constructions and Properties

- An acute triangle with these angles can be constructed using compass and straightedge, ensuring precise angles through angle bisectors or other classical techniques.
- The interior angles being less than 90° suggest that the orthocenter, centroid, and circumcenter are all located inside the triangle, a property unique to acute triangles.

Mathematical Significance and Real-World Context

Classifying triangles based on angles isn't just a theoretical exercise – it has tangible implications across various disciplines.

Engineering and Design

- Engineers often rely on the properties of acute triangles when designing structures that require uniform stress distribution, such as in trusses and bridges.
- Architectural aesthetics sometimes favor acute angles for dynamic and modern designs, emphasizing sharpness and agility.

Navigation and Geometry in Nature

- Nature frequently exhibits structures approximating acute triangles, such as in certain crystalline formations and biological structures.
- Navigation algorithms and computer graphics utilize triangle classifications for rendering and spatial calculations.

Summary and Final Remarks

In conclusion, given the two angles of 25° and 87° , the third angle measures 68° , resulting in a triangle where all interior angles are less than 90° . This fundamental calculation confirms that the triangle is acute. The classification is grounded in the basic properties of triangle angles and their sum, which serve as powerful tools for geometric analysis.

Understanding the nature of this triangle extends beyond academic curiosity; it informs practical applications in engineering, design, and various scientific fields. Recognizing whether a triangle is acute, right, or obtuse enables mathematicians, engineers, and architects to predict behavior, optimize designs, and solve complex problems efficiently.

In essence, the triangle with angles 25° , 87° , and 68° exemplifies the elegance of geometric principles and underscores the importance of foundational mathematical reasoning in comprehending the shapes that shape our world.

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