

One Of The Acute Angles In A Right Triangle Measures 62. What Is The Measure Of The Other Acute Angle

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Understanding the intricacies of right triangles is fundamental in geometry, especially when dealing with the measures of their angles. Given that one of the acute angles measures 62 degrees, it prompts a simple yet essential question: what is the measure of the other acute angle? This question, while seemingly straightforward, opens the door to exploring the properties of right triangles, the sum of angles within triangles, and the methods used to calculate unknown angles. In this article, we will delve into the geometric principles that guide us to the answer, explore related concepts, and provide comprehensive explanations to enhance your understanding of right triangle angle relationships.

Fundamentals of Right Triangles

What Is a Right Triangle?

A right triangle is a type of triangle that has one angle measuring exactly 90 degrees, known as the right angle. The other two angles in the triangle are called acute angles because they measure less than 90 degrees each. The defining characteristic of a right triangle is the presence of this right angle, which influences the sum of the other angles.

The Sum of Angles in a Triangle

A key principle in geometry is that the sum of the interior angles of any triangle is always 180 degrees. This fundamental fact allows us to find unknown angles when the other angles are known. Mathematically, this is expressed as:

$$\angle A + \angle B + \angle C = 180^\circ$$

In the context of a right triangle, since one angle is 90 degrees, the sum of the other two angles must be:

$$\angle A + \angle B = 180^\circ - 90^\circ = 90^\circ$$

This simplifies the process of calculating the missing acute angle when one

is known.

Calculating the Other Acute Angle

Given Data

- One acute angle measures 62 degrees.
- The triangle is a right triangle, so one angle is 90 degrees.
- The sum of all angles in the triangle is 180 degrees.

Step-by-Step Calculation

1. Identify the known angles:

- $\angle_1 = 62^\circ$
- $\angle_{\text{Right angle}} = 90^\circ$

2. Express the sum of the unknown angles:

Since the sum of all three angles is 180 degrees:

$$62^\circ + \text{Unknown acute angle} + 90^\circ = 180^\circ$$

3. Solve for the unknown acute angle:

$$\begin{aligned}\text{Unknown acute angle} &= 180^\circ - 62^\circ - 90^\circ \\ \text{Unknown acute angle} &= 28^\circ\end{aligned}$$

Answer: The measure of the other acute angle is 28 degrees.

Understanding the Implications of the Result

Verification of the Calculation

Always verify your calculations to ensure accuracy:

- Sum of the angles:

$$62^\circ + 28^\circ + 90^\circ = 180^\circ$$

- Since the total equals 180 degrees, the calculation is correct.

Significance of the Result

Knowing both acute angles in a right triangle is essential for various applications:

- Solving for side lengths using trigonometry.
- Understanding geometric relationships.
- Applying the concepts to real-world problems such as construction, navigation, and design.

Related Concepts and Applications

Using Trigonometry to Find Side Lengths

Once the angles are known, trigonometric ratios (sine, cosine, tangent) can be employed to find side lengths:

- Sine: $\sin \theta = \frac{\text{opposite}}{\text{hypotenuse}}$
- Cosine: $\cos \theta = \frac{\text{adjacent}}{\text{hypotenuse}}$
- Tangent: $\tan \theta = \frac{\text{opposite}}{\text{adjacent}}$

For example, if the hypotenuse length is known, the side opposite the 62-degree angle can be calculated using:

$$\text{Opposite side} = \text{Hypotenuse} \times \sin 62^\circ$$

Real-World Examples

Understanding the angles in a right triangle has numerous practical applications:

- Engineering: Designing ramps or slopes where precise angles are necessary.
- Navigation: Calculating directions based on angles.
- Architecture: Ensuring structural integrity through accurate measurements.

Common Mistakes and Clarifications

Misconception: The Two Acute Angles in a Right Triangle Must Add Up to 180 Degrees

A common misunderstanding is confusing the sum of all three angles with the sum of the two acute angles. Remember:

- Total sum of all three angles in any triangle = 180°
- In a right triangle, the right angle is 90° , so the two acute angles sum to 90° .

Clarification: Are the Acute Angles Always Less Than 90° ?

Yes, by definition, acute angles are less than 90° . Since they are part of a right triangle, both must be strictly less than 90° , and their sum must be exactly 90° .

Summary and Final Thoughts

In conclusion, given that one of the acute angles in a right triangle measures 62 degrees, the other acute angle can be accurately determined by understanding the fundamental properties of triangles. The calculation involves subtracting the known angles from 180 degrees, considering the right angle's 90 degrees, and ensuring the sum of all angles adheres to the basic geometric principle. The other acute angle measures 28 degrees, completing the set of angles within the right triangle. This knowledge not only enhances geometric problem-solving skills but also forms the basis for more advanced topics such as trigonometry and coordinate geometry, which are vital in many scientific and engineering fields.

By mastering these basic concepts, you build a strong foundation for exploring more complex geometric relationships and their applications in real-world scenarios.

Frequently Asked Questions

In a right triangle, if one acute angle measures 62° , what is the measure of the other acute angle?

28° because the two acute angles in a right triangle add up to 90° , so $90^\circ - 62^\circ = 28^\circ$.

How do you find the measure of the other acute angle in a right triangle when one is given as 62° ?

Subtract the given angle from 90° since the two acute angles in a right triangle sum to 90° , so $90^\circ - 62^\circ = 28^\circ$.

If a right triangle has one acute angle measuring 62° , what is the measure of the remaining acute angle?

28° , because the sum of the two acute angles in a right triangle is always 90° , and $90^\circ - 62^\circ = 28^\circ$.

Is the sum of the two acute angles in a right triangle always 90° ? Why?

Yes, because the right angle is 90° , and the angles in a triangle sum to 180° , so the two remaining angles must sum to 90° .

Can the measure of the other acute angle in a right triangle be more than 90° if one angle is 62° ?

No, because all angles in a triangle sum to 180° , and the right angle is already 90° , leaving only 90° for the two acute angles combined.

What is the significance of knowing one acute angle in a right triangle regarding the other?

Knowing one acute angle allows you to find the other by subtracting from 90° , since the two acute angles are complementary.

If in a right triangle, one acute angle is 62° , what is the measure of the third (right) angle?

The right angle measures 90° , which is given by the definition of a right triangle; the other two angles are the acute angles.

How does understanding complementary angles help in solving for unknown angles in right triangles?

Since the acute angles in a right triangle are complementary, their measures add to 90° , allowing you to find the unknown angle by subtracting the known angle from 90° .

Are the acute angles in a right triangle always less than 90° ? Why?

Yes, because by definition, acute angles are less than 90° , and in a right triangle, the two acute angles are always less than 90° .

Additional Resources

One Of The Acute Angles In A Right Triangle Measures 62° : What Is The Measure Of The Other Acute Angle?

Understanding the properties of triangles is fundamental in geometry, especially when dealing with special types such as right triangles. When one of the acute angles in a right triangle measures 62° , it prompts a straightforward yet essential question: what is the measure of the other

acute angle? This question not only tests basic arithmetic skills but also reinforces concepts related to triangle properties, angle sum theorem, and the nature of right triangles. In this comprehensive review, we will explore the core concepts involved, demonstrate step-by-step calculations, analyze related topics, and discuss the practical significance of understanding such geometric problems.

Understanding Right Triangles and Their Properties

What Is a Right Triangle?

A right triangle is a type of triangle that has one angle measuring exactly 90° . The defining characteristic of a right triangle is this right angle, which makes it a fundamental shape in Euclidean geometry. The other two angles are known as the acute angles, and they are always less than 90° each.

The Sum of Angles in a Triangle

One of the key principles in triangle geometry is that the sum of the interior angles in any triangle always equals 180° . This is true for all triangles, including right triangles.

The Relationship Between the Angles in a Right Triangle

Since a right triangle has one 90° angle, the sum of the other two angles must be $180^\circ - 90^\circ = 90^\circ$. This means that the two acute angles in a right triangle are complementary, adding up to 90° .

Pros and Cons of Understanding Triangle Properties

- Pros:
 - Fundamental for solving many geometric problems
 - Essential for understanding trigonometry and its applications
 - Helps in real-world problem-solving involving angles and distances
- Cons:
 - Can be confusing for beginners when dealing with multiple triangles and angle relationships
 - Misapplication of properties may lead to incorrect conclusions

Calculating the Other Acute Angle

Given the problem: one acute angle measures 62° , and we are asked to find the other.

Step-by-Step Calculation

1. Identify the known values:
 - First acute angle, $(A = 62^\circ)$
 - The right angle, $(C = 90^\circ)$ (by definition of right triangle)

2. Use the triangle angle sum property:
- Sum of angles $(A + B + C = 180^\circ)$

3. Set up the equation:
$$62^\circ + B + 90^\circ = 180^\circ$$

4. Solve for (B) :
$$B = 180^\circ - 62^\circ - 90^\circ = 28^\circ$$

Conclusion: The other acute angle measures 28° .

Significance of the Result

This calculation exemplifies a fundamental principle: in a right triangle, the two acute angles are always complementary, summing to 90° . Knowing one acute angle automatically determines the other, simplifying many geometric problems.

Real-World Applications

- Engineering: Designing structures where precise angles are crucial
- Navigation: Calculating bearings and directions using angles
- Architecture: Ensuring accurate construction of right-angled components

Related Concepts and Extensions

Trigonometry Basics

Understanding the measures of angles in right triangles is foundational for trigonometry. The sine, cosine, and tangent functions relate the angles to side lengths, enabling calculations of distances, heights, and other measurements.

Using the Result to Find Side Lengths

If additional information, such as side lengths, is provided, the angles can be used to determine lengths using trigonometric ratios. Conversely, knowing side lengths can help verify angles.

Generalization to Other Triangles

While right triangles have a 90° angle, similar principles apply to oblique triangles (acute or obtuse), where the Law of Sines and Law of Cosines are used to find unknown angles or sides.

Practical Exercises and Problem-Solving Strategies

Practice Problem 1

Given a right triangle where one acute angle measures 62° , find the other.

Solution:

As demonstrated, the other acute angle is 28° .

Practice Problem 2

If in a right triangle, one of the acute angles measures 45° , what is the measure of the other?

Solution:

$$\begin{aligned} & \backslash \\ & 90^\circ - 45^\circ = 45^\circ \\ & \backslash \end{aligned}$$

The other acute angle also measures 45° , indicating the triangle is isosceles.

Tips for Solving Similar Problems

- Always remember the sum of angles in a triangle is 180° .
- In right triangles, the two acute angles are complementary.
- Use algebra to set up simple equations based on angle relationships.

Limitations and Common Mistakes

Common Mistakes

- Forgetting that the right angle is 90° when calculating the other angles.
- Assuming the sum of the two non-right angles exceeds 90° , which is impossible in a right triangle.
- Confusing the angles with side lengths; angles are measured in degrees, sides are in units of length.

Limitations of the Approach

- This method applies only to triangles where the angles are known or can be deduced.
- When additional constraints exist (e.g., side lengths), more advanced methods like trigonometry are necessary.

Summary and Final Thoughts

Understanding that in a right triangle, the sum of the two acute angles is 90° , provides a simple yet powerful tool for solving related problems. When one acute angle measures 62° , the other must be 28° , ensuring the total sum of internal angles remains 180° . This concept is a cornerstone of geometric reasoning and underpins many applications across science, engineering, and everyday problem-solving.

By mastering these fundamental principles, learners can confidently approach more complex geometric problems, develop their spatial reasoning, and appreciate the elegant consistency of mathematical relationships within shapes. Remember, the key to success in geometry is understanding the properties, practicing problem-solving, and applying logical reasoning consistently.

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