

Find The Width Of A Rectangle With Perimeter Of 64cm And. Length Of 18 Cm

Find The Width Of A Rectangle With Perimeter Of 64cm And Length Of 18 Cm is a common problem in geometry that involves understanding the relationship between the properties of a rectangle—specifically, its length, width, and perimeter. When given specific measurements, such as the perimeter and length, the goal is to determine the unknown dimension, which in this case is the width. This type of problem enhances our ability to apply formulas and develop problem-solving skills in real-world contexts, such as designing objects or understanding spatial dimensions.

In this article, we will explore step-by-step how to find the width of a rectangle when its perimeter and length are known. We will also delve into the formulas involved, provide practical examples, and discuss related concepts to strengthen your understanding of rectangle properties.

Understanding the Basic Properties of a Rectangle

Before diving into calculations, it is essential to understand the fundamental properties of rectangles:

What Is a Rectangle?

A rectangle is a four-sided polygon (quadrilateral) with opposite sides equal and all interior angles equal to 90 degrees. The key characteristics include:

- Opposite sides are equal in length.
- The sum of all interior angles is 360 degrees.
- The diagonals are equal in length and bisect each other.

Important Measurements in a Rectangle

The primary measurements include:

- Length (often denoted as L), which is the longer side.
- Width (or breadth, denoted as W), the shorter side.
- Perimeter (denoted as P), the total distance around the rectangle, calculated as the sum of all sides.

Formula for the Perimeter of a Rectangle

The perimeter of a rectangle is straightforward to compute with the formula:

$$P = 2 \times (L + W)$$

where:

- P is the perimeter,
- L is the length,
- W is the width.

Given the perimeter and length, we can rearrange this formula to solve for the width.

Step-by-Step Calculation of the Width

Let's now apply this to the specific problem: a rectangle with a perimeter of 64 cm and a length of 18 cm.

Step 1: Write Down Known Values

- Perimeter, $P = 64$ cm
- Length, $L = 18$ cm

Step 2: Use the Perimeter Formula

Rearranged to solve for W:

$$W = (P / 2) - L$$

Step 3: Substitute Known Values

Calculate:

- $P / 2 = 64 / 2 = 32$
- Therefore,

$$W = 32 - 18 = 14 \text{ cm}$$

Step 4: Final Answer

The width of the rectangle is 14 centimeters.

Verification and Additional Considerations

It's always good practice to verify your solution:

- Calculate the perimeter using the found width:

$$\circ P = 2 \times (L + W) = 2 \times (18 + 14) = 2 \times 32 = 64 \text{ cm}$$

- Since the calculated perimeter matches the given perimeter, the solution is correct.

Furthermore, consider whether the dimensions make sense physically. Since both length and width are positive and less than the total perimeter divided by 2, the dimensions are reasonable.

Related Problems and Applications

Understanding how to find the width of a rectangle given perimeter and length is useful in many practical scenarios:

Design and Construction

- When designing a rectangular garden or room, knowing how to determine missing dimensions helps in planning materials and space utilization.

Manufacturing

- In manufacturing objects with specified perimeters, such as frames or panels, calculating dimensions accurately ensures proper fitting and aesthetics.

Mathematics Education

- These problems reinforce fundamental algebra skills and understanding of geometric formulas.

Additional Example: Finding Width When Perimeter and Length Vary

Suppose you are given a rectangle with:

- Perimeter, $P = 50$ cm
- Length, $L = 12$ cm

To find the width:

1. Use the formula: $W = (P / 2) - L$
2. Substitute: $W = (50 / 2) - 12 = 25 - 12 = 13$ cm

Thus, the width is 13 cm, and verifying:

- $P = 2 \times (12 + 13) = 2 \times 25 = 50$ cm, confirming the correctness.

Key Takeaways

- The perimeter of a rectangle is calculated as $P = 2 \times (L + W)$.
- Knowing the perimeter and length allows you to find the width using the formula $W = (P / 2) - L$.
- Always verify your calculations by plugging the value back into the perimeter formula.
- The concepts are applicable in real-world contexts such as design, construction, and manufacturing.

Conclusion

Finding the width of a rectangle given its perimeter and length involves straightforward algebra and understanding of basic geometric formulas. In the specific case of a rectangle with a perimeter of 64 cm and a length of 18 cm, the width is 14 cm. Mastering these calculations enhances problem-solving skills and provides a solid foundation for more advanced geometry topics. Whether you're designing a space, creating a craft project, or solving academic problems, knowing how to determine missing dimensions is a valuable skill that combines mathematical understanding with practical application.

Frequently Asked Questions

What is the width of a rectangle with a perimeter of 64 cm and a length of 18 cm?

The width is 4 cm. To find it, subtract twice the length from the perimeter and divide by 2: $(64 - 2 \times 18) \div 2 = (64 - 36) \div 2 = 28 \div 2 = 14$ cm.

How do you calculate the width of a rectangle given its perimeter and length?

Use the formula: $\text{Width} = (\text{Perimeter} - 2 \times \text{Length}) \div 2$. Plug in the known values to find the width.

If a rectangle has a perimeter of 64 cm and a length of 18 cm, what is its width?

The width is 14 cm, calculated as $(64 - 2 \times 18) \div 2 = 14$ cm.

Can the width of a rectangle be determined if only its perimeter and length are known?

Yes, by using the perimeter formula $P = 2(\text{length} + \text{width})$, rearranged to $\text{width} = (P - 2 \times \text{length}) \div 2$.

Why is the width of the rectangle 14 cm in this problem?

Because subtracting twice the length from the perimeter and dividing by 2 yields the width: $(64 - 36) \div 2 = 14$ cm.

Additional Resources

Find The Width Of A Rectangle With Perimeter Of 64cm And Length Of 18 Cm

Understanding how to find the width of a rectangle when given its perimeter and length is a fundamental skill in geometry that can be applied in various real-world scenarios, from construction projects to designing objects. In this article, we will explore the problem of determining the width of a rectangle with a perimeter of 64 cm and a length of 18 cm, providing a detailed step-by-step methodology, key concepts involved, and practical insights to enhance your mathematical problem-solving skills.

Understanding the Problem

Before diving into calculations, it's essential to interpret what the problem states:

- The rectangle has a perimeter of 64 cm.
- The length of the rectangle is 18 cm.
- The goal is to find the width of the rectangle.

This is a typical algebraic problem that involves understanding the relationships between the sides of a rectangle and its perimeter. Recognizing these relationships is critical to formulating the correct equation and solving it efficiently.

Key Concepts and Formulas Involved

Perimeter of a Rectangle

The perimeter (P) of a rectangle is the total length around it, calculated as:

$$P = 2 \times (\text{length} + \text{width})$$

where:

- Length (L) is one of the longer sides.

- Width (W) is the shorter side.

Given Data and Unknowns

In our problem:

- $P = 64$, cm

- $L = 18$, cm

- $W = ?$

Using the perimeter formula, we can set up an equation to find W .

Step-by-Step Solution

Step 1: Write the Perimeter Equation

Substitute the known values into the perimeter formula:

$$64 = 2 \times (18 + W)$$

Step 2: Simplify the Equation

Divide both sides by 2:

$$\frac{64}{2} = 18 + W$$

$$32 = 18 + W$$

Step 3: Solve for Width W

Subtract 18 from both sides:

$$W = 32 - 18$$

$$W = 14, \text{cm}$$

\]

Result: The width of the rectangle is 14 cm.

Verification of the Solution

Always verify your answer by plugging it back into the original perimeter formula:

\[

$$P = 2 \times (L + W) = 2 \times (18 + 14) = 2 \times 32 = 64, \text{cm}$$

\]

Since this matches the given perimeter, our solution is correct.

Practical Insights and Applications

Understanding how to find missing dimensions in geometric figures is vital in many fields:

- Architecture: Calculating room dimensions based on perimeter constraints.
- Design: Ensuring materials are cut to the right size.
- Manufacturing: Determining the size of components needed to meet specifications.

Additional Considerations

Constraints and Assumptions

- The problem assumes the rectangle's length and width are positive real numbers.
- The given perimeter and length are accurate and consistent.

Potential Variations

- If the perimeter is given along with the width, one can find the length similarly.
- For irregular shapes or different formulas, more complex methods may be necessary.

Features and Pros/Cons of the Approach

Features:

- Direct application of basic algebra makes the solution straightforward.
- The method is scalable for more complex problems involving different shapes or additional constraints.

Pros:

- Simple and quick to execute once the formula is understood.
- Reinforces understanding of fundamental geometric relationships.

Cons:

- Limited to problems with known perimeter and one side; more complex shapes require advanced formulas.
- Assumes familiarity with algebraic manipulation.

Summary

Finding the width of a rectangle with a known perimeter and length involves understanding the perimeter formula, substituting known values, and solving for the unknown. In our example, with a perimeter of 64 cm and length of 18 cm, the width calculates to 14 cm. This process exemplifies a core problem-solving skill in geometry that can be extended to various practical and theoretical contexts.

Final Thoughts

Mastering these basic geometric calculations builds a solid foundation for more advanced topics in mathematics and science. Whether designing a new product, planning a construction, or simply solving puzzles, understanding how to manipulate formulas and verify solutions ensures accuracy and confidence in your mathematical reasoning. Keep practicing with different values and shapes to strengthen your skills and enhance your problem-solving toolkit.

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