

The Length Of A Rectangle Is 6 Inches More Than 3 Times Its Width. The Perimeter Is 84 Inches. Find The

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Understanding how to solve geometric problems involving rectangles is a fundamental skill in mathematics, especially in algebra. When given relationships between the dimensions of a rectangle and its perimeter, you can often find unknown measurements by setting up and solving equations. In this article, we will explore how to determine the length and width of a rectangle based on the given conditions: the length being 6 inches more than three times the width, and the perimeter being 84 inches.

Understanding the Problem

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

- The length of the rectangle is 6 inches more than three times its width.
- The perimeter of the rectangle is 84 inches.
- The goal is to find the dimensions of the rectangle, specifically its length and width.

These conditions can be translated into algebraic expressions, which will help us formulate an equation to find the unknowns.

Defining Variables

To model the problem mathematically, assign variables to the unknown dimensions:

- Let w represent the width of the rectangle (in inches).
- Let l represent the length of the rectangle (in inches).

Given the problem statement, we can express l in terms of w :

Expressing Length in Terms of Width

Since the length is 6 inches more than three times the width:

$$- l = 3w + 6$$

This is our first key equation.

Using the Perimeter Formula

The perimeter P of a rectangle is given by:

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

Given that the perimeter is 84 inches:

$$- 84 = 2(l + w)$$

Substituting the expression for l into this equation:

$$- 84 = 2((3w + 6) + w)$$

Now, simplify the expression inside the parentheses:

$$- 84 = 2(3w + 6 + w) = 2(4w + 6)$$

Formulating and Solving the Equation

Next, expand the right side:

$$- 84 = 2(4w + 6) = 8w + 12$$

To find w , subtract 12 from both sides:

$$- 84 - 12 = 8w$$

$$- 72 = 8w$$

Now, divide both sides by 8:

$$- w = 9$$

Having found w , we can now find l using the earlier expression:

$$- l = 3w + 6 = 3(9) + 6 = 27 + 6 = 33$$

Final Dimensions of the Rectangle

The dimensions are:

- Width: 9 inches
- Length: 33 inches

These satisfy the given conditions, but it's always good to verify by checking the perimeter:

- Perimeter = $2(l + w) = 2(33 + 9) = 2(42) = 84$ inches

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

Summary of the Solution Process

Here's a step-by-step overview:

1. Define variables for the dimensions.
2. Express the length in terms of width.
3. Use the perimeter formula to set up an equation.
4. Simplify and solve for the width.
5. Substitute back to find the length.
6. Verify the solution by calculating the perimeter.

Additional Tips for Solving Similar Problems

When tackling geometric problems involving rectangles, keep these strategies in mind:

- Always define variables clearly.
- Translate word problems into algebraic expressions.
- Use known formulas (perimeter, area, etc.) to set up equations.
- Double-check your solutions by substituting back into original conditions.
- Practice with various problem types to strengthen understanding.

Practice Problem for Readers

Try solving this similar problem on your own:

The length of a rectangle is 4 inches more than twice its width. If the perimeter is 68 inches, find the dimensions of the rectangle.

Hints:

- Let w be the width.
- Express length l in terms of w .
- Use the perimeter formula to set up the equation.
- Solve for w and then find l .

Conclusion

Understanding the relationship between a rectangle's dimensions and its perimeter allows for effective problem-solving using algebra. By translating word problems into equations and solving systematically, you can find unknown measurements accurately. The example discussed—finding the length and width given a specific perimeter and a relationship between dimensions—illustrates the importance of setting up correct equations and verifying your solutions. With practice, these types of problems become more manageable, enhancing your overall mathematical reasoning skills.

Keywords for SEO Optimization

- Rectangle perimeter problem
- Algebraic rectangle dimension calculation
- Finding length and width of a rectangle
- Solving rectangle problems in algebra
- Perimeter and dimension formulas
- Word problems involving rectangles
- Geometry problems with algebra solutions
- Step-by-step rectangle problem solving
- Practice algebra problems involving rectangles
- How to solve perimeter problems in math

This comprehensive guide aims to enhance your understanding of solving rectangle problems involving algebra and geometry, equipping you with the skills to tackle similar

questions confidently.

Frequently Asked Questions

What is the width of the rectangle if its length is 6 inches more than 3 times the width and the perimeter is 84 inches?

The width is 6 inches.

How do you set up an equation to find the dimensions of the rectangle given the length and perimeter?

Let the width be W . Then, the length is $3W + 6$. The perimeter formula is $2(\text{length} + \text{width}) = 84$, so: $2(3W + 6 + W) = 84$.

What is the process to solve for the width of the rectangle in this problem?

Simplify the perimeter equation to $2(4W + 6) = 84$, then divide both sides by 2 to get $4W + 6 = 42$, subtract 6 to get $4W = 36$, and finally divide both sides by 4 to find $W = 9$ inches.

What is the length of the rectangle if the width is 9 inches?

The length is 3 times the width plus 6 inches, so: $3 \cdot 9 + 6 = 27 + 6 = 33$ inches.

How can you verify the dimensions satisfy the perimeter condition?

Calculate the perimeter: $2(\text{length} + \text{width}) = 2(33 + 9) = 2 \cdot 42 = 84$ inches, which matches the given perimeter, confirming the solution.

What is the importance of understanding the relationship between length and width in solving rectangle problems?

It helps set up correct equations to find unknown dimensions efficiently and ensures the solution accurately reflects the problem's conditions.

Additional Resources

The Length Of A Rectangle Is 6 Inches More Than 3 Times Its Width. The Perimeter Is 84 Inches. Find The

Understanding the dimensions of a rectangle is a fundamental aspect of geometry that finds applications in various fields, from architecture to design. In this comprehensive guide, we will analyze a classic problem involving the length and width of a rectangle, where the length is described as being 6 inches more than three times its width, and the perimeter is given as 84 inches. The goal is to find the specific measurements of the rectangle's length and width. This problem exemplifies how algebraic modeling can solve real-world geometric questions efficiently.

Introduction to the Problem

Imagine you come across a rectangular garden or a piece of fabric with certain constraints: its length exceeds a certain multiple of its width, and the total perimeter is fixed. Specifically, the problem states:

> The length of a rectangle is 6 inches more than 3 times its width. The perimeter is 84 inches. Find the length and width of the rectangle.

This problem requires translating word descriptions into algebraic equations, then solving those equations to find the unknown measurements.

Breaking Down the Problem: Key Details

Before diving into solving, it's essential to identify and understand the key pieces of information:

1. Relationship Between Length and Width

- The length (L) is 6 inches more than 3 times the width (W).
- Mathematically: $L = 3W + 6$

2. Perimeter of the Rectangle

- The perimeter (P) is 84 inches.
- Recall that the perimeter of a rectangle is given by: $P = 2 \times (\text{Length} + \text{Width})$.

Step-by-Step Approach to Solution

Step 1: Express the Known Relationship Mathematically

From the problem statement:

- $L = 3W + 6$

This formula links the length directly to the width, which simplifies the problem to solving for W first.

Step 2: Write the Perimeter Equation

Using the perimeter formula:

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

- Given $P = 84$ inches:

$$84 = 2 \times (L + W)$$

Step 3: Substitute the Expression for L into the Perimeter Equation

Replace L with $3W + 6$:

$$84 = 2 \times ((3W + 6) + W)$$

Simplify inside the parentheses:

$$84 = 2 \times (4W + 6)$$

Distribute the 2:

$$84 = 8W + 12$$

Step 4: Solve for W

Subtract 12 from both sides:

$$84 - 12 = 8W$$

$$72 = 8W$$

Divide both sides by 8:

$$W = 9$$

Now that the width is known, find the length.

Step 5: Find the Length

Recall the relationship:

$$L = 3W + 6$$

Substitute $W = 9$:

$$L = 3 \times 9 + 6 = 27 + 6 = 33$$

Final Answer: Dimensions of the Rectangle

- Width (W): 9 inches
- Length (L): 33 inches

Verification of the Solution

It's always good practice to verify the solution:

- Calculate perimeter using the found dimensions:

$$\text{Perimeter} = 2 \times (L + W) = 2 \times (33 + 9) = 2 \times 42 = 84 \text{ inches}$$

- The perimeter matches the given value, confirming the correctness.

Additional Insights and Applications

This problem exemplifies how algebra simplifies the process of solving real-world problems involving geometric figures. Here are some key insights:

Understanding Relationships

- Recognizing how the length relates to the width is crucial.
- Expressing one variable in terms of another reduces complexity.

Building Equations from Word Problems

- Carefully translating words into algebraic expressions prevents errors.
- Always double-check the relationships before solving.

Verifying Solutions

- Plugging back into the original equations ensures accuracy.
- It's a good habit to verify the solution against all given conditions.

Common Variations and Extensions

The problem can be extended or modified in multiple ways:

1. Changing the Perimeter

- What if the perimeter were different? How would that affect the dimensions?

2. Different Relationships

- If the length were less than or equal to a different multiple of the width, how would the equations change?

3. Area Calculation

- Once dimensions are known, calculating the area ($A = L \times W$) provides further insights.

4. Real-World Contexts

- Applying these calculations to fields like construction, fabric cutting, or landscaping.

Summary and Key Takeaways

- The length of a rectangle is 6 inches more than 3 times its width.
- The perimeter is 84 inches.
- By translating the relationships into algebraic equations, we found that:
- Width = 9 inches
- Length = 33 inches

This problem demonstrates the power of algebra in solving geometric problems, emphasizing the importance of understanding relationships and methodical problem-solving techniques.

Final Thoughts

Mastering problems like The length of a rectangle is 6 inches more than 3 times its width. The perimeter is 84 inches. Find the not only builds algebraic skills but also enhances spatial understanding. Whether you're a student preparing for exams or a professional applying geometry in practical scenarios, developing a structured approach to such problems is invaluable. Practice with variations to strengthen your problem-solving toolkit and gain confidence in applying algebra to real-world contexts.

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