

The Sides Of A Rectangle Are In The Ratio Of 5:6. If Its Longer Side Is 7.2 In., Find The Shorter Side,

The Sides Of A Rectangle Are In The Ratio Of 5:6. If Its Longer Side Is 7.2 In., Find The Shorter Side, is a classic problem in geometry that combines understanding ratios, proportions, and basic algebra. Such problems are common in math exams and serve as excellent exercises for developing problem-solving skills. In this article, we will explore how to approach this problem systematically, understand the concepts behind ratios, and apply algebraic methods to find the missing measurement.

Understanding Ratios and Their Significance in Geometry

Before delving into the specific problem, it is essential to understand what ratios are and how they are used in geometry.

What Is a Ratio?

A ratio is a comparison of two quantities expressing how many times one value contains or is contained within the other. It is generally written in the form of $a:b$, where a and b are numbers representing the quantities being compared.

Example:

If the sides of a rectangle are in the ratio 5:6, it means for every 5 units of one side, the other side measures 6 units.

Ratios in Geometric Figures

Ratios help describe the proportions of geometric figures, such as rectangles, triangles, and circles. Understanding ratios allows us to determine unknown lengths when the proportional relationship is known.

Problem Breakdown and Approach

Let's restate the problem for clarity:

> The sides of a rectangle are in the ratio 5:6. If its longer side measures 7.2 inches, find the length of the shorter side.

Step-by-step approach:

1. Identify the known and unknown quantities.
2. Set up the ratio as a proportion.
3. Create an algebraic equation based on the ratio and the known measurement.
4. Solve for the unknown side length.

Step 1: Assign Variables to the Sides

Let the shorter side be represented by x .

Since the ratio of the sides is 5:6, the longer side can be expressed as:

$$\text{Longer side} = \frac{6}{5} \times x$$

Alternatively, if we denote:

- Shorter side = $5k$
- Longer side = $6k$

where k is a common multiplier.

Given that the longer side is 7.2 inches, we set:

$$6k = 7.2$$

and solve for k .

Step 2: Setting Up the Equation

Using the ratio, the shorter side:

$$\text{Shorter side} = 5k$$

and from the given longer side:

$$6k = 7.2$$

Solve for k :

$$k = \frac{7.2}{6}$$

Step 3: Calculating the Shorter Side

Perform the division:

$$k = \frac{7.2}{6} = 1.2$$

Now, find the shorter side:

$$\text{Shorter side} = 5k = 5 \times 1.2 = 6 \text{ inches}$$

Thus, the shorter side measures 6 inches.

Summary of the Solution

- The ratio of sides is 5:6.
- The longer side (6 parts) measures 7.2 inches.
- Find the value of one part, k , by dividing 7.2 by 6.
- Multiply k by 5 to find the shorter side.

Final answer: The shorter side is 6 inches.

Additional Concepts and Variations

Understanding this problem opens up avenues to solve similar questions involving ratios and proportions in various geometric figures.

1. Ratios in Different Shapes

Ratios are not limited to rectangles. They are widely used in:

- Triangles: ratios of sides or angles.
- Circles: ratios of circumference to diameter (π).
- Similar figures: ratios of corresponding sides.

2. Proportional Reasoning

Proportional reasoning involves setting up equations where two ratios are equal, enabling the solving of unknown quantities.

Example:

If in a triangle, sides are proportional to 3:4:5, and one side is known, the others can be calculated using ratios.

3. Applying Ratios in Real-Life Contexts

Ratios are used in:

- Scale drawings and maps.
- Recipes, to maintain ingredient proportions.
- Construction, to ensure proper dimensions.

Practice Problems for Mastery

To reinforce your understanding, try solving these similar problems:

- In a rectangle, the ratio of length to width is 3:4. If the width is 8 inches, what is the length?
- A triangle has sides in the ratio 7:24:25. If the shortest side is 7 inches, what are the lengths of the other sides?
- The ratio of the circumference to diameter of a circle is π . If the diameter measures 10 meters, what is the circumference?

Conclusion

Understanding ratios and their application in geometry allows for quick and effective problem solving. In the case of the rectangle with sides in the ratio 5:6, knowing one side's measurement enables us to find the other using simple algebra. Mastery of such concepts enhances mathematical reasoning and

prepares students for more complex geometric problems.

Whether you're preparing for exams or solving real-world measurement challenges, grasping the concept of ratios is fundamental. Remember, always identify the ratio, assign variables, set up proportions, and solve systematically.

In summary:

- The sides of the rectangle are in the ratio 5:6.
- The longer side (6 parts) is 7.2 inches.
- Calculated the value of one part, $\left(\frac{7.2}{6} \right)$, as 1.2 inches.
- Found the shorter side (5 parts) as 6 inches.

This approach exemplifies the power of ratios and algebra in solving geometric problems efficiently and accurately.

Frequently Asked Questions

What is the ratio of the sides of the rectangle in the problem?

The ratio of the sides is 5:6.

If the longer side of the rectangle is 7.2 inches, how do we find the shorter side based on the ratio?

Since the ratio of longer to shorter side is 6:5, we set the longer side as 6 parts and find the value of one part, then multiply by 5 to get the shorter side.

What is the value of one part in the ratio given the longer side?

One part equals 7.2 inches divided by 6, which is 1.2 inches.

How do you calculate the shorter side of the rectangle?

Multiply the value of one part (1.2 inches) by 5 to get the shorter side: $1.2 \times 5 = 6$ inches.

What is the shorter side of the rectangle in this problem?

The shorter side is 6 inches.

Can this problem be solved using the concept of ratios and proportions?

Yes, by setting up a proportion based on the ratio 5:6 and the given longer side, we can find the shorter side.

Why is understanding ratios important in solving this type of problem?

Ratios help relate the sides of the rectangle, allowing us to find unknown lengths when one side is known.

What is the key step to solving for the shorter side when the longer side and ratio are given?

The key step is dividing the longer side by the ratio component (6) to find the value of one part, then multiplying by the ratio's other component (5) to find the shorter side.

Additional Resources

The Sides of a Rectangle Are in the Ratio of 5:6. If Its Longer Side Is 7.2 Inches, Find the Shorter Side

Introduction: Understanding the Geometry of Rectangles and Ratios

Rectangles are fundamental geometric shapes characterized by four sides with opposite sides equal and four right angles. Their properties are widely used in various fields, from architecture and engineering to design and mathematics. One intriguing aspect of rectangles is when their sides are proportional, meaning the ratio of their lengths remains constant. This proportionality plays a pivotal role in understanding relationships within the shape, especially when specific dimensions are known.

In the problem at hand, the rectangle's sides are in the ratio of 5:6, with the longer side measuring 7.2 inches. This scenario provides an excellent

opportunity to explore ratios, algebraic expressions, and problem-solving techniques to determine the unknown shorter side. Such exercises not only reinforce fundamental mathematical concepts but also demonstrate real-world applications, including scaling, modeling, and proportionate design.

Understanding Ratios in Rectangles

What Does a Ratio of 5:6 Mean?

A ratio of 5:6 indicates that for every 5 units of length on one side, the adjacent side measures 6 units. This proportional relationship is essential because it maintains the shape's similarity when scaled. In our context, if the shorter side of the rectangle corresponds to the '5' part, then the longer side is associated with the '6' part.

Key points:

- Ratios express relative sizes, not absolute lengths.
- They maintain shape similarity during scaling.
- The ratio 5:6 suggests the sides are proportional to these parts.

Implications of the Ratio in Our Problem

Given the ratio 5:6, the rectangle's sides can be expressed as:

- Shorter side = $5x$
- Longer side = $6x$

where ' x ' is a positive scaling factor. Once ' x ' is known, determining the actual lengths becomes straightforward.

Applying Given Data to the Ratio: Finding the Shorter Side

Step 1: Expressing Sides in Terms of the Variable

'x'

Based on the ratio:

- Shorter side = $5x$
- Longer side = $6x$

Since the problem states that the longer side is 7.2 inches, we set:

$$6x = 7.2$$

Step 2: Solving for 'x'

To find the value of 'x':

$$x = 7.2 / 6$$

Calculating:

$$x = 1.2 \text{ inches}$$

This value of 'x' scales the ratio to actual measurements.

Step 3: Finding the Shorter Side

Now, substitute 'x' back into the expression for the shorter side:

$$\text{Shorter side} = 5x = 5 \cdot 1.2 = 6 \text{ inches}$$

Result: The shorter side of the rectangle measures 6 inches.

Deeper Analysis and Mathematical Framework

Understanding the Proportional Relationships

The problem exemplifies proportional reasoning, a fundamental concept in mathematics that involves understanding how quantities relate to each other through ratios. Recognizing that sides of rectangles in a given ratio can be represented algebraically simplifies solving for unknown dimensions.

Mathematically:

- If the ratio of sides is $a:b$, then:
- Side 1 = $a \cdot k$
- Side 2 = $b \cdot k$

where ' k ' is the scaling factor.

- Given one side's length, the other can be found using:
- $k = (\text{known side length}) / b$

In our case:

- $a = 5$, $b = 6$
- Known longer side = 7.2 inches
- Calculated ' k ' = $7.2 / 6 = 1.2$ inches
- Shorter side = $5 \cdot 1.2 = 6$ inches

This approach emphasizes the importance of ratios and algebra in geometric problem-solving.

Visual Representation and Graphical Perspective

Visualizing the rectangle with sides proportional to 5 and 6 can aid comprehension. Imagine a rectangle divided into parts:

- The shorter side (6 inches) along the width
- The longer side (7.2 inches) along the length

Plotting these dimensions on graph paper or using geometric software can reinforce the understanding of proportional relationships.

Real-World Applications of Such Calculations

Understanding ratios and applying them to real measurements have numerous practical applications:

- Architecture: Designing rooms where proportional relationships are crucial for aesthetic or structural reasons.
- Manufacturing: Scaling prototypes or parts based on ratios.
- Art and Design: Creating proportional layouts or compositions.
- Engineering: Calculating dimensions for components that need to maintain specific ratios for functionality or aesthetics.

Extended Considerations and Related Problems

What If the Longer Side Was Different?

Suppose the longer side was not 7.2 inches, but some other value, say 'L'. The process remains the same:

- Find 'x' as $L / 6$
- Calculate the shorter side as $5x$

This general approach demonstrates the flexibility of ratio-based problem-solving.

Other Ratios and Shape Similarity

While this problem deals specifically with a rectangle, ratios are fundamental in similar shapes across geometry:

- Similar triangles with proportional sides.
- Scaling figures in graphics design.
- Maintaining aspect ratios in digital images.

Understanding the principles in this problem extends beyond rectangles to broader geometric contexts.

Limitations and Assumptions

- The problem assumes the ratio of sides remains constant, which is valid for similar shapes.
- It presumes exact measurements without considering measurement errors or tolerances.
- The calculation is straightforward because the ratio is simple and the given side is exact.

Conclusion: The Significance of Ratios in

Geometric Problem-Solving

In summary, the problem of determining the shorter side of a rectangle when the longer side and the ratio are known exemplifies the power of algebraic reasoning and proportional relationships. Recognizing the ratio of 5:6 allowed for a straightforward calculation, leading to the conclusion that the shorter side measures 6 inches when the longer side is 7.2 inches.

This exercise underscores several important lessons:

- The utility of ratios in simplifying complex problems.
- The importance of algebraic expressions in geometric contexts.
- The relevance of these concepts in real-life applications, from architecture to design.

Ultimately, mastering ratio-based problem-solving enhances mathematical literacy and equips individuals with tools to approach a wide array of geometric and quantitative challenges with confidence and clarity.

References:

- Geometry textbooks and resources on ratios and proportions.
- Mathematical problem-solving guides.
- Practical applications of ratios in engineering and design fields.

End of Article

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