

The Area Of A Rectangular Field Is 3400 M And Its Length Is 68 M. Find- (i) Its Breadth. (ii) The Distance

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Understanding the dimensions of a rectangular field is essential for various agricultural, construction, and landscaping projects. When given specific measurements such as the area and length, calculating other parameters like breadth and the total distance (perimeter) becomes straightforward with the application of fundamental geometric formulas. In this article, we will explore how to determine the breadth of a rectangular field when the area and length are known, and subsequently, how to find the total distance around the field, often referred to as its perimeter.

Understanding the Basic Concepts

Before delving into the calculations, it's crucial to grasp the basic properties of rectangles related to area and perimeter.

What is the Area of a Rectangle?

The area of a rectangle is the total surface covered by the rectangle, measured in square units. It is calculated by multiplying its length by its breadth:

$$\text{Area} = \text{Length} \times \text{Breadth}$$

What is the Perimeter of a Rectangle?

The perimeter is the total distance around the rectangle. It can be found using the formula:

$$\text{Perimeter} = 2 \times (\text{Length} + \text{Breadth})$$

Knowing these formulas allows us to solve for unknown dimensions when some measurements are provided.

Given Data and What We Need to Find

Let's restate the problem with the given data:

- Area of the field = 3400 square meters
- Length of the field = 68 meters

Our objectives are:

1. To find the breadth of the field.

2. To find the distance around the field, i.e., its perimeter.

Calculating the Breadth of the Field

Since the area and length are given, we can find the breadth directly using the formula for the area of a rectangle.

Step-by-Step Calculation

Given:

$$\begin{aligned} \text{Area} &= 3400 \text{ m}^2 \\ \text{Length} &= 68 \text{ m} \end{aligned}$$

Using the area formula:

$$\text{Area} = \text{Length} \times \text{Breadth}$$

Rearranged to solve for breadth:

$$\text{Breadth} = \frac{\text{Area}}{\text{Length}}$$

Substitute the known values:

$$\text{Breadth} = \frac{3400}{68}$$

Performing the division:

$$\text{Breadth} = 50 \text{ m}$$

Therefore, the breadth of the rectangular field is 50 meters.

Finding the Total Distance Around the Field (Perimeter)

Now that we know both the length and the breadth, calculating the perimeter becomes straightforward.

Perimeter Formula:

$$\text{Perimeter} = 2 \times (\text{Length} + \text{Breadth})$$

Substitute the known values:

$$\text{Perimeter} = 2 \times (68 + 50)$$

Add inside the parentheses:

$$\text{Perimeter} = 2 \times 118$$

Multiply:

$$\text{Perimeter} = 236\text{ m}$$

Thus, the total distance around the field is 236 meters.

Summary of Findings

Parameter	Calculation	Result
Breadth	$\frac{3400}{68}$	50 meters
Perimeter	$2 \times (68 + 50)$	236 meters

Practical Applications of These Calculations

Knowing the dimensions of a rectangular field has practical significance across various sectors:

- Agriculture: Determining the amount of fencing needed to enclose the field.
- Construction: Planning for boundary walls or pathways.
- Landscaping: Designing irrigation systems or planting layouts.
- Real estate: Estimating land area and boundary length for sale or development purposes.

Additional Tips for Similar Calculations

- Always verify units before calculations to avoid errors.
- When only the area and one side are known, use the formula $\text{Breadth} = \frac{\text{Area}}{\text{Length}}$.
- To find the total fencing or boundary length, calculate the perimeter using $2 \times (\text{Length} + \text{Breadth})$.
- Remember that the perimeter provides the direct measurement of the boundary, which is essential for fencing or lining purposes.

Conclusion

Calculating the dimensions of a rectangular field from given measurements is a fundamental skill in geometry with wide-ranging applications. Given an area of 3400 square meters and a length of 68 meters, we determined the breadth to be 50 meters and the perimeter to be 236 meters. Mastery of these calculations enables efficient planning and resource management for land-based projects, ensuring precision and cost-effectiveness.

Whether you're a student learning basic geometry or a professional in land development, understanding how to derive unknown measurements from known data is invaluable. Always remember to apply the fundamental formulas carefully, double-check your calculations, and consider practical implications in real-world scenarios.

Frequently Asked Questions

What is the formula to find the area of a rectangular field?

The area of a rectangular field is found by multiplying its length by its breadth, i.e., $\text{Area} = \text{Length} \times \text{Breadth}$.

Given the area of the rectangular field is 3400 m^2 and its length is 68 m, how do you find its breadth?

$\text{Breadth} = \text{Area} \div \text{Length} = 3400 \div 68 = 50$ meters.

What is the breadth of the rectangular field if its area is 3400 m^2 and length is 68 m?

The breadth is 50 meters.

How do you calculate the distance across a field given its area and length?

If the distance refers to the breadth, it can be calculated by dividing the area by the length: $\text{Distance (breadth)} = \text{Area} \div \text{Length}$.

What is the second part of the problem asking for when it says 'Find the Distance'?

It is asking for the breadth of the rectangular field, which is the distance across its width.

If the area is 3400 m^2 and length is 68 m, what is the missing dimension called?

The missing dimension is called the breadth.

Can you verify the calculations for the breadth of the rectangular field?

Yes, dividing the area (3400 m^2) by the length (68 m) gives the breadth: $3400 \div 68 = 50$ meters, which is correct.

Additional Resources

The Area Of A Rectangular Field Is 3400 M And Its Length Is 68 M. Find- (i) Its Breadth. (ii) The Distance

Understanding the dimensions of a rectangular field is fundamental not just in the realm of mathematics but also in practical applications such as agriculture, construction, and land surveying. When given specific measurements like area and length, calculating the missing parameters—such as

breadth and sometimes the diagonal distance—becomes a straightforward yet essential task. In this article, we will explore the problem: "The area of a rectangular field is 3400 meters, and its length is 68 meters. Find the breadth and the distance," providing a comprehensive, step-by-step approach to solving these questions.

Understanding the Basics: Rectangular Field Dimensions

Before delving into calculations, it is important to understand the fundamental properties of a rectangle:

- Length (L): The longer side of the rectangle.
- Breadth (B): The shorter side of the rectangle.
- Area (A): Total surface covered, calculated as $A = L \times B$.
- Perimeter (P): Total boundary length, $P = 2(L + B)$.
- Diagonal (D): Distance between opposite corners, $D = \sqrt{L^2 + B^2}$.

Given the area and length, the goal is to find the breadth (B), which is straightforward using the area formula. Additionally, the "distance" often refers to the diagonal length, which offers insight into the overall size of the field.

Calculating the Breadth of the Field

Step 1: Recall the Area Formula

The area (A) of a rectangle is given by:

$$A = L \times B$$

Where:

- A = 3400 meters (given)
- L = 68 meters (given)
- B = ?

Step 2: Rearrange the Formula to Solve for B

To find the breadth:

$$B = A / L$$

Step 3: Substitute the Known Values

$$B = 3400 / 68$$

Step 4: Perform the Calculation

Dividing 3400 by 68:

$$- 68 \times 50 = 3400$$

Therefore,

$$B = 50 \text{ meters}$$

Conclusion: The breadth of the field is 50 meters.

This result completes the first part of the problem, providing the missing dimension of the rectangle.

Determining the Diagonal Distance of the Field

The second part involves calculating the "distance," which in the context of a rectangular field generally refers to the diagonal length. The diagonal is the straight-line distance between two opposite corners, and its calculation uses the Pythagorean theorem.

Step 1: Recall the Pythagorean Theorem

For a rectangle, the diagonal D relates to length and breadth as:

$$D = \sqrt{L^2 + B^2}$$

Step 2: Substitute Known Values

$$D = \sqrt{68^2 + 50^2}$$

Calculate each term:

$$- 68^2 = 4624$$

$$- 50^2 = 2500$$

Therefore,

$$D = \sqrt{4624 + 2500}$$

$$D = \sqrt{7124}$$

Step 3: Calculate the Square Root

To find $\sqrt{7124}$:

$$- 84^2 = 7056$$

- $85^2 = 7225$

Since 7124 lies between 7056 and 7225, the square root will be between 84 and 85.

Interpolate:

- Difference from 7056: $7124 - 7056 = 68$
- Difference from 7225: $7225 - 7124 = 101$

Approximate:

$$D \approx 84 + (68 / (68 + 101)) \approx 84 + (68 / 169) \approx 84 + 0.402$$

Thus,

$$D \approx 84.4 \text{ meters}$$

Final Result: The diagonal (or the "distance") across the rectangular field is approximately 84.4 meters.

Practical Significance of the Calculations

Understanding both the breadth and the diagonal length of a field has practical implications:

- Land Measurement: Precise knowledge of dimensions aids in land management, fencing, and boundary setting.
- Construction Planning: For constructing fences, pathways, or structures, knowing the diagonal helps in planning materials and layout.
- Agricultural Use: Calculating the size of the field ensures accurate application of fertilizers, water, and other resources.

Additional Considerations and Related Calculations

While the primary focus was on the breadth and diagonal, other related measurements might include:

- Perimeter: $P = 2(L + B) = 2(68 + 50) = 2(118) = 236$ meters
- Area verification: $68 \times 50 = 3400$ sq. meters, confirming the given area.
- Shape irregularities: Real-world fields might not be perfect rectangles, but these calculations serve as a good approximation.

Conclusion

By applying fundamental geometric principles, we have successfully determined the missing parameters of the rectangular field:

- The breadth is 50 meters.
- The diagonal distance is approximately 84.4 meters.

These calculations exemplify how straightforward mathematical formulas can provide essential information about physical spaces, aiding in planning and resource management. Whether in agriculture, engineering, or land surveying, mastering these basic yet vital computations ensures accuracy and efficiency in real-world applications.

Summary:

Parameter	Value
Breadth (B)	50 meters
Diagonal (D)	approximately 84.4 meters

Through understanding and applying the principles outlined above, individuals and professionals can confidently analyze and interpret the dimensions of rectangular fields and similar structures, bridging the gap between theoretical mathematics and practical needs.

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