

perimeter circumference and area answer key Reference

perimeter circumference and area answer key are fundamental concepts in geometry that help students and professionals understand the properties and measurements of various shapes. Mastering these topics is essential for solving numerous mathematical problems, designing objects, and understanding real-world applications such as architecture, engineering, and navigation. In this comprehensive guide, we will explore the definitions, formulas, methods for calculations, and practical tips related to perimeter, circumference, and area, along with an answer key to common problems.

Understanding Perimeter, Circumference, and Area

What is Perimeter?

Perimeter refers to the total length around a two-dimensional shape. It is a linear measurement and is expressed in units such as centimeters, meters, inches, or feet. For polygons, the perimeter is calculated by summing the lengths of all sides.

Example:

A rectangle with length 8 cm and width 5 cm has a perimeter of

$$\text{Perimeter} = 2 \times (\text{length} + \text{width}) = 2 \times (8 + 5) = 26 \text{ cm.}$$

What is Circumference?

Circumference is the perimeter of a circle?the total distance around the circle. It is related to the diameter or radius of the circle and is calculated using specific formulas involving pi (?).

Example:

A circle with radius 7 cm has a circumference

$$\text{Circumference} = 2 \times ? \times \text{radius} = 2 \times 3.1416 \times 7 ? 43.98 \text{ cm.}$$

What is Area?

Area measures the surface space occupied by a two-dimensional shape. It is expressed in square units such as square centimeters (cm²), square meters (m²), or square inches (in²). The formulas vary depending on the shape.

Example:

A rectangle with length 8 cm and width 5 cm has an area of

Area = length × width = 8 × 5 = 40 cm².

Formulas for Perimeter, Circumference, and Area

Perimeter Formulas

For common polygons and shapes:

- **Rectangle:** $P = 2 \times (\text{length} + \text{width})$
- **Square:** $P = 4 \times \text{side}$
- **Triangle:** $P = \text{sum of all three sides}$
- **Regular Polygon (n sides):** $P = n \times \text{side length}$

Circumference of a Circle

The two main formulas are:

- $C = 2 \times \pi \times r$ (where r is radius)
- $C = \pi \times d$ (where d is diameter)

Area Formulas

Depending on the shape:

- **Rectangle:** $A = \text{length} \times \text{width}$
- **Square:** $A = \text{side}^2$
- **Triangle:** $A = (\text{base} \times \text{height}) / 2$
- **Circle:** $A = \pi \times r^2$
- **Ellipse:** $A = \pi \times a \times b$ (a and b are the semi-major and semi-minor axes)

Calculating Perimeter, Circumference, and Area: Step-by-Step Methods

Step 1: Identify the Shape and Gather Measurements

Before calculations, determine the shape you are working with and gather necessary measurements such as side lengths, radius, diameter, base, height, etc.

Step 2: Use the Correct Formula

Apply the relevant formula based on the shape. Ensure units are consistent.

Step 3: Substitute Known Values

Insert the measurements into the formula.

Step 4: Perform Calculations

Carry out the arithmetic operations carefully, rounding off values if necessary.

Step 5: Interpret and Verify Results

Check if the calculated values make sense in context.

Practical Examples and Answer Key

Example 1: Find the perimeter of a rectangle with length 12 cm and width 7 cm.

Solution:

$$\text{Perimeter} = 2 \times (12 + 7) = 2 \times 19 = 38 \text{ cm.}$$

Example 2: Calculate the circumference of a circle with a radius of 9 inches.

Solution:

$$\text{Circumference} = 2 \times \pi \times 9 \approx 2 \times 3.1416 \times 9 \approx 56.55 \text{ inches.}$$

Example 3: Find the area of a triangle with a base of 10 meters and a height of 6 meters.

Solution:

$$\text{Area} = (10 \times 6) / 2 = 60 / 2 = 30 \text{ m}^2.$$

Example 4: Determine the area and circumference of a circle with a diameter of 14 meters.

Solution:

$$\text{Radius} = d / 2 = 7 \text{ meters.}$$

$$\text{Circumference} = 2 \times \pi \times 7 \approx 43.98 \text{ meters.}$$

$$\text{Area} = \pi \times 7^2 \approx 3.1416 \times 49 \approx 153.94 \text{ m}^2.$$

Example 5: Find the perimeter of a regular hexagon with each side measuring 5 cm.

Solution:

$$\text{Perimeter} = 6 \times 5 = 30 \text{ cm.}$$

Common Mistakes to Avoid

- Mixing units (e.g., using meters and centimeters without conversion).
- Forgetting to square the radius in the area formula for circles.
- Confusing diameter and radius in circumference calculations.
- Not summing all sides in polygons when calculating perimeter.
- Using the wrong formula for the shape.

Tips for Accurate Calculations

- Always double-check measurements and units.
- Use a calculator carefully, especially with π .
- Memorize key formulas, but verify their applicability to the shape.
- Draw diagrams to visualize the problem.
- Practice with diverse problems to build confidence.

Conclusion

Understanding the concepts of perimeter, circumference, and area, along with their formulas, is crucial for solving geometric problems efficiently. The **perimeter circumference and area answer key** provides a quick reference to ensure accuracy and consistency. By practicing various examples and avoiding common pitfalls, learners can strengthen their geometry skills and apply these concepts effectively in academic and real-world scenarios.

Additional Resources

- Geometry textbooks and workbooks for practice problems.
- Online calculators for quick verification.
- Educational videos explaining concepts visually.
- Geometry apps and tools for interactive learning.

Mastering perimeter, circumference, and area calculations opens the door to a deeper understanding of shapes and their properties, fostering analytical thinking and problem-solving skills essential in many fields.

Perimeter, Circumference, and Area Answer Key: A Comprehensive Guide for Students and Educators

Understanding the fundamental concepts of perimeter, circumference, and area is essential for mastering geometry. These concepts form the basis for solving numerous mathematical problems involving shapes and figures. An answer key that thoroughly explains these topics is invaluable for students, teachers, and anyone looking to strengthen their mathematical foundation. In this detailed review, we will explore each concept in depth, provide explanations, formulas, examples, and tips to ensure clarity and mastery.

Understanding Perimeter, Circumference, and Area

Before delving into the specifics, it's important to clarify what each term means and how they differ from one another.

Perimeter

- Definition: The total length of all sides of a polygon. It is a measure of the distance around a two-dimensional shape.
- Units: Usually expressed in units such as centimeters (cm), meters (m), inches (in), or feet (ft).
- Calculation: Sum of the lengths of all sides of the shape.

Circumference

- Definition: The perimeter of a circle, representing the total length around a circular shape.
- Units: Same as perimeter, in cm, m, in, ft, etc.
- Calculation: It depends on the circle's radius or diameter.

Area

- Definition: The measure of the space enclosed within a shape. It quantifies how much surface a shape covers.
- Units: Square units such as square centimeters (cm²), square meters (m²), square inches (in²), etc.
- Calculation: Based on the shape's dimensions and relevant formulas.

Perimeter: Concepts, Formulas, and Examples

Perimeter calculation varies depending on the shape.

Perimeter of Common Geometric Shapes

- Rectangle

- Formula: $P = 2 \times (\text{length} + \text{width})$
- Example: For a rectangle with length = 8 cm and width = 5 cm:
- $P = 2 \times (8 + 5) = 2 \times 13 = 26 \text{ cm}$

- Square

- Formula: $P = 4 \times \text{side}$
- Example: For a square with side = 6 cm:
- $P = 4 \times 6 = 24 \text{ cm}$

- Triangle

- Formula: Sum of all three sides
- Example: Sides are 3 cm, 4 cm, and 5 cm
- $(P = 3 + 4 + 5 = 12 \text{ cm})$

- Regular Polygon (e.g., Hexagon)

- Formula: $(P = \text{number of sides} \times \text{length of one side})$
- Example: Regular hexagon with side length 4 cm:
- $(P = 6 \times 4 = 24 \text{ cm})$

Tips for Calculating Perimeter

- Always ensure units are consistent.
- For irregular shapes, sum all side lengths.
- When only the area or some dimensions are given, use the relevant formulas to find missing lengths.

Circumference of Circles: Formulas and Calculations

The circumference is specific to circles and is calculated differently from perimeters of polygons.

Formula for Circumference

- $(C = 2 \pi r)$
- Alternatively, using diameter:
- $(C = \pi d)$

Where:

- (r) = radius of the circle
- (d) = diameter (twice the radius)
- $(\pi) \approx 3.1416$

Examples

- If the radius $(r = 7\text{ cm})$:
- $(C = 2 \times 3.1416 \times 7 \approx 43.98\text{ cm})$
- If the diameter $(d = 14\text{ cm})$:
- $(C = 3.1416 \times 14 \approx 43.98\text{ cm})$

Tips for Calculating Circumference

- Always identify the radius or diameter first.
- Use (π) approximations appropriately; for high precision, use more decimal places.
- Remember that circumference and perimeter are analogous but specific to circles and polygons, respectively.

Area: Concepts, Formulas, and Examples

Area calculations depend heavily on shape specifics.

Area of Common Shapes

- Rectangle
 - Formula: $(A = \text{length} \times \text{width})$
 - Example: length = 10 cm, width = 4 cm:
 - $(A = 10 \times 4 = 40\text{ cm}^2)$
- Square
 - Formula: $(A = \text{side}^2)$
 - Example: side = 5 cm:
 - $(A = 5^2 = 25\text{ cm}^2)$
- Triangle
 - Formula: $(A = \frac{1}{2} \times \text{base} \times \text{height})$
 - Example: base = 6 cm, height = 8 cm:

- $A = \frac{1}{2} \times 6 \times 8 = 24, \text{cm}^2$
- Circle
 - Formula: $A = \pi r^2$
 - Example: radius = 3 cm:
 - $A = 3.1416 \times 3^2 \approx 28.27, \text{cm}^2$
- Trapezium (Trapezoid)
 - Formula: $A = \frac{1}{2} \times (a + b) \times \text{height}$
 - Where a and b are the lengths of the two parallel sides.
 - Example: $a = 5, \text{cm}$, $b = 7, \text{cm}$, height = 4 cm:
 - $A = \frac{1}{2} \times (5 + 7) \times 4 = \frac{1}{2} \times 12 \times 4 = 24, \text{cm}^2$

Tips for Calculating Area

- Break complex shapes into simpler ones when necessary.
- Use the correct formula for each shape.
- Ensure units are consistent; convert if necessary before calculation.
- When using approximation for π , be aware of potential small errors.

Key Differences Between Perimeter, Circumference, and Area

Aspect	Perimeter	Circumference	Area
Shape	Polygons (most)	Circles	2D shapes
Measurement	Length around shape	Length around circle	Surface space enclosed
Units	Linear units (cm, in, ft)	Linear units	Square units (cm², in²)
Dependence	Sides of polygons	Radius or diameter of circle	Shape dimensions (length, width, radius, etc.)

Practical Applications and Real-World Contexts

Understanding these concepts extends beyond academics into real-world applications:

- Architecture: Estimating fencing (perimeter) and flooring (area).
- Engineering: Calculating material needed for construction or manufacturing.
- Design and Art: Determining the amount of material for shapes.
- Navigation: Estimating the length of a circular route (circumference).

Common Mistakes to Avoid

- Confusing perimeter and area; remember perimeter is length, area is surface.
- Forgetting units; always specify units in answers.
- Using the wrong formula for the shape.
- Ignoring the need to convert units before calculations.
- Rounding π prematurely; use the most precise value needed for accuracy.

Using the Answer Key Effectively

- Cross-check each step to ensure formulas are applied correctly.
- Practice with various shapes to become familiar with different formulas.
- Use diagrams to visualize shapes and dimensions.
- Verify units before final answers.
- Solve additional problems to reinforce understanding.

Conclusion

Mastering the concepts of perimeter, circumference, and area is fundamental in geometry and other mathematical applications. An answer key that thoroughly explains each aspect, provides formulas, examples, and tips empowers students and educators to approach problems confidently and accurately. Developing a strong grasp of these concepts not only boosts academic performance but also enhances problem-solving skills applicable in everyday life. Remember, practice and attention to detail are key to becoming proficient in calculating perimeter, circumference, and area across various shapes.

End of Review

QuestionAnswer What is the formula for calculating the perimeter of a rectangle? The perimeter

of a rectangle is calculated by adding the lengths of all four sides, or using the formula: $P = 2 \times (\text{length} + \text{width})$. How do you find the circumference of a circle? The circumference of a circle is found using the formula: $C = 2 \times \pi \times \text{radius}$, or $C = \pi \times \text{diameter}$. What is the area of a triangle with a base of 8 cm and a height of 5 cm? The area of the triangle is $(1/2) \times \text{base} \times \text{height} = 0.5 \times 8 \times 5 = 20 \text{ cm}^2$. How is the area of a square calculated? The area of a square is found by squaring the length of one side: $\text{Area} = \text{side} \times \text{side}$, or side^2 . What is the difference between perimeter and area? Perimeter is the total length around a shape, while area is the measure of the surface inside the shape. Perimeter is in units of length, and area is in square units.

Related keywords: perimeter formulas, circumference calculation, area formulas, geometry practice answers, math homework solutions, perimeter and area worksheets, circle circumference problems, rectangle area solutions, shape measurement key, math answer key

word problems area of rectangle square parallelogram

Word problems area of rectangle square parallelogram

Understanding the area of various geometric shapes is fundamental in mathematics, especially when solving real-world problems. Among these shapes, rectangles, squares, and parallelograms are common, and their area calculations form the basis for many word problems encountered in academic and practical settings. Mastering how to approach, interpret, and solve word problems involving these shapes' areas enhances problem-solving skills and mathematical reasoning. This comprehensive guide aims to explore the area concepts for rectangles, squares, and parallelograms through detailed explanations, strategies for solving word problems, and practical examples.

Understanding Basic Concepts of Area

What is Area?

Area refers to the amount of surface covered by a two-dimensional shape. It is measured in square units such as square centimeters (cm^2), square meters (m^2), or square inches (in^2). Calculating the area allows us to determine how much space a shape occupies.

Importance of Area in Real Life

Understanding area calculations helps in various fields such as:

- Architecture and construction (flooring, wall painting)
- Agriculture (farming land measurement)
- Interior design (carpet or tile coverage)
- Art and design (canvas or paper sizes)

Area of Basic Shapes: Rectangles, Squares, and Parallelograms

Rectangle

- Formula: $\text{Area} = \text{length} \times \text{width}$
- Properties: Opposite sides are equal, and angles are right angles.
- Notation: If length = L and width = W , then $\text{Area} = L \times W$.

Square

- Formula: $\text{Area} = \text{side} \times \text{side} = \text{side}^2$
- Properties: All sides are equal, and angles are right angles.
- Note: The square is a special case of a rectangle.

Parallelogram

- Formula: $\text{Area} = \text{base} \times \text{height}$
- Properties: Opposite sides are equal and parallel; angles are not necessarily right angles.
- Note: The height is the perpendicular distance between the bases.

Approach to Solving Word Problems on Area

Solving word problems involving areas requires a systematic approach:

- Read the problem carefully to understand what is given and what is asked.
- Identify the shape involved and recall the relevant formula.
- Extract numerical data and assign variables if needed.
- Determine the missing dimensions (length, width, height, base, etc.).
- Apply the area formula correctly.
- Perform calculations step-by-step.
- Check your answer in the context of the problem.

Strategies for Solving Word Problems

Step-by-Step Problem-Solving Techniques

- Visualize the problem: Draw diagrams or sketches to understand the shape and dimensions.
- Label all given data: Mark known measurements and unknowns clearly.
- Translate words into mathematical expressions: Convert phrases into equations using the formulas.
- Use units consistently: Convert all measurements to the same unit before calculations.
- Estimate before exact calculation: For complex problems, rough estimates can guide your approach.
- Verify the answer: Ensure the solution makes sense logically and contextually.

Common Pitfalls to Avoid

- Confusing perimeter with area.
- Using incorrect formulas for the shape.
- Forgetting to convert units.
- Misreading the problem's data.
- Ignoring the need for perpendicular height in parallelogram problems.

Sample Word Problems and Solutions

Problem 1: Area of a Rectangle

Question: A rectangle has a length of 12 meters and a width of 5 meters. Find its area.

Solution:

- Step 1: Identify given data: Length = 12 m, Width = 5 m.
- Step 2: Recall formula: Area = length $\times$ width.
- Step 3: Calculate: Area = $12 \times 5 = 60 \text{ m}^2$.
- Answer: The rectangle's area is 60 square meters.

Problem 2: Area of a Square

Question: A square garden has a side length of 8 meters. What is the area?

Solution:

- Step 1: Given: Side = 8 m.
- Step 2: Formula: Area = side².
- Step 3: Calculation: $8^2 = 64 \text{ m}^2$.
- Answer: The garden covers 64 square meters.

Problem 3: Area of a Parallelogram

Question: A parallelogram has a base of 15 meters and a height of 6 meters. Find its area.

Solution:

- Step 1: Given: Base = 15 m, Height = 6 m.
- Step 2: Formula: Area = base × height.
- Step 3: Calculation: $15 \times 6 = 90 \text{ m}^2$.
- Answer: The parallelogram's area is 90 square meters.

Problem 4: Word Problem Combining Shapes

Question: A rectangular park measures 200 meters in length and 150 meters in width. A square playground of side length 30 meters is within the park. Find the area of the remaining part of the park after excluding the playground.

Solution:

- Step 1: Calculate park area: $200 \times 150 = 30,000 \text{ m}^2$.
- Step 2: Calculate playground area: $30^2 = 900 \text{ m}^2$.
- Step 3: Subtract playground area from park area: $30,000 - 900 = 29,100 \text{ m}^2$.
- Answer: The remaining area of the park is 29,100 square meters.

Advanced Word Problems and Applications

Problem 5: Multiple Shapes in a Real-World Context

A farmer has a rectangular field measuring 500 meters by 300 meters. Within it, there is a parallelogram-shaped pond with a base of 100 meters and a height of 40 meters. Find the area of the field that is not occupied by the pond.

Solution:

- Step 1: Calculate total field area: $500 \times 300 = 150,000 \text{ m}^2$.
- Step 2: Calculate pond area: $100 \times 40 = 4,000 \text{ m}^2$.
- Step 3: Subtract pond area from total field: $150,000 - 4,000 = 146,000 \text{ m}^2$.
- Answer: The area of the field excluding the pond is 146,000 square meters.

Problem 6: Applying Area in Construction

A construction company needs to lay tiles on a square kitchen floor of side length 9 meters. If each tile covers 0.25 m^2 , how many tiles are needed to cover the entire floor?

Solution:

- Step 1: Calculate floor area: $9^2 = 81 \text{ m}^2$.
- Step 2: Determine number of tiles: $81 \div 0.25 = 324$ tiles.
- Answer: 324 tiles are required to cover the floor.

Additional Tips for Mastering Word Problems on Area

- Practice regularly: The more problems you solve, the better you understand different scenarios.
- Use diagrams: Visual representation helps in understanding complex problems.
- Understand the context: Real-world problems often contain clues that guide your calculations.
- Check units and conversions: Mistakes often occur due to incorrect units.
- Review formulas: Be sure about the formulas for different shapes and their conditions.

Conclusion

Mastering the area of rectangles, squares, and parallelograms through word problems enhances your mathematical skills and prepares you for tackling real-life situations involving space and measurements. Remember to approach each problem methodically, visualize the shapes involved, and apply the correct formulas. With consistent practice and attention to detail, solving word problems related to the area of these shapes becomes intuitive and rewarding. By understanding these fundamental concepts, you develop a strong foundation for more advanced geometry and problem-solving tasks.

Word Problems in Area of Rectangle, Square, and Parallelogram: A Comprehensive Guide

Understanding how to solve word problems related to the area of rectangles, squares, and parallelograms is a fundamental skill in geometry that combines conceptual understanding with practical problem-solving. These problems are often encountered in academic assessments and real-life scenarios, making mastery in this area essential for students and enthusiasts alike. This comprehensive guide delves into the various aspects of word problems involving the areas of these quadrilaterals, offering detailed explanations, strategies, and examples to enhance your problem-solving toolkit.

Introduction to Area in Quadrilaterals

Before diving into specific word problems, it's crucial to understand what area signifies in the context of rectangles, squares, and parallelograms.

What is Area?

- Definition: Area refers to the amount of surface covered by a two-dimensional shape. It is measured in square units (e.g., square meters, square centimeters).
- Significance: Knowing the area helps in tasks such as flooring, painting, land measurement, and design.

General Formulas

- Rectangle: $\text{Area} = \text{length} \times \text{breadth}$
- Square: $\text{Area} = \text{side}^2$
- Parallelogram: $\text{Area} = \text{base} \times \text{height}$

Note: For parallelograms, the height is perpendicular to the base, which is a key aspect in solving problems.

Understanding Word Problems: Key Concepts and Strategies

Word problems require translating real-world language into mathematical expressions. Here's a structured approach:

Step-by-Step Problem-Solving Strategy

- Read Carefully: Understand what is being asked. Identify the given data and what you need to find.

- Identify the Shape: Recognize whether the problem involves a rectangle, square, or parallelogram.
- Highlight Known Values: Mark the given dimensions, areas, or other relevant information.
- Determine Unknowns: Decide which dimensions or measurements need to be calculated.
- Choose the Correct Formula: Select the appropriate area formula based on the shape.
- Set Up Equations: Translate the problem into mathematical equations.
- Solve the Equations: Perform calculations step-by-step.
- Check Units and Reasonableness: Make sure the units are consistent and the answer makes sense in context.
- Answer in Context: Write the final answer with appropriate units and interpret it if necessary.

Word Problems Involving Rectangles

Rectangles are the most straightforward among these shapes, and their word problems often involve calculating area based on given dimensions or vice versa.

Common Types of Rectangular Area Problems

- Finding the area given length and breadth
- Finding missing dimensions when the area and one dimension are known
- Determining the length or breadth when the area and other dimension are known

Sample Problems and Solutions

Problem 1: A rectangle has a length of 12 meters and a breadth of 5 meters. Find its area.

Solution:

- Use the formula: $\text{Area} = \text{length} \times \text{breadth}$
- $\text{Area} = 12 \times 5 = 60$ square meters

Problem 2: The area of a rectangle is 84 square meters, and its length is 12 meters. Find its breadth.

Solution:

- Rearrange the formula: $\text{breadth} = \frac{\text{Area}}{\text{length}}$
- $\text{breadth} = \frac{84}{12} = 7$ meters

Real-Life Application

- Calculating the area of a garden with given dimensions.
- Determining the amount of material needed for a rectangular tablecloth.

Word Problems Involving Squares

Squares are special rectangles with all sides equal. Their word problems often involve the side length or the area, with the relationship $(\text{Area} = \text{side}^2)$.

Common Types of Square Area Problems

- Finding area when side length is known
- Finding side length when area is given
- Application in tiling, fencing, and design

Sample Problems and Solutions

Problem 3: The side of a square playground is 20 meters. Find its area.

Solution:

- Use $(\text{Area} = \text{side}^2)$
- $(\text{Area} = 20^2 = 400)$ square meters

Problem 4: A square piece of land has an area of 256 square meters. Find the length of one side.

Solution:

- $(\text{side} = \sqrt{\text{area}})$
- $(\text{side} = \sqrt{256} = 16)$ meters

Practical Applications

- Calculating the amount of paint needed to cover a square wall.
- Determining the size of tiles required for a square floor.

Word Problems Involving Parallelograms

Parallelograms have a more complex area formula involving base and height. Their word problems often include scenarios where height is not directly given, requiring the use of auxiliary data or geometric reasoning.

Common Types of Parallelogram Area Problems

- Calculating area when base and height are known
- Finding missing height or base when the area and other dimensions are given
- Using diagonal and side lengths to find area

Key Concepts for Parallelogram Problems

- The height is perpendicular to the base, not necessarily the side length.
- Sometimes, the problem involves the use of other properties, such as diagonals or angles.

Sample Problems and Solutions

Problem 5: A parallelogram has a base of 15 meters and a height of 8 meters. Find its area.

Solution:

- $\text{Area} = \text{base} \times \text{height}$
- $\text{Area} = 15 \times 8 = 120$ square meters

Problem 6: The area of a parallelogram is 180 square meters, and the base length is 12 meters. Find the height.

Solution:

- $\text{height} = \frac{\text{Area}}{\text{base}}$
- $\text{height} = \frac{180}{12} = 15$ meters

Problem 7: In a parallelogram, if the side length is 10 meters and the height is 6 meters, what is the area? (Assume the side length is the base.)

Solution:

$$\text{Area} = \text{base} \times \text{height} = 10 \times 6 = 60 \text{ square meters}$$

Complex Application Problems

- Using diagonals to find the area when height is unknown.
- Estimating land area from irregular measurements involving parallelogram-shaped plots.

Advanced Word Problems and Real-World Applications

Real-life scenarios often involve combining multiple shapes and dimensions, requiring critical thinking and multi-step calculations.

Examples of Complex Word Problems

Example 1: A rectangular garden measures 50 meters in length and 30 meters in width. A path of uniform width surrounds the garden, increasing its total area to 2,500 square meters. Find the width of the path.

Solution Approach:

- Let w be the width of the path.
- Total dimensions including the path: $(50 + 2w)$ and $(30 + 2w)$.
- Set up the equation: $(50 + 2w)(30 + 2w) = 2500$.
- Expand and solve the quadratic:

[

$$(50 + 2w)(30 + 2w) = 2500$$

]

[

$$1500 + 100w + 60w + 4w^2 = 2500$$

]

\[

$$4w^2 + 160w + 1500 = 2500$$

\]

\[

$$4w^2 + 160w - 1000 = 0$$

\]

- Divide through by 4:

\[

$$w^2 + 40w - 250 = 0$$

\]

- Use quadratic formula:

\[

$$w = \frac{-40 \pm \sqrt{40^2 - 4 \times 1 \times (-250)}}{2}$$

\]

\[

$$w = \frac{-40 \pm \sqrt{1600 + 1000}}{2} = \frac{-40 \pm \sqrt{2600}}{2}$$

\]

- Approximate:

\[

$$\sqrt{2600} \approx 50.99$$

]

- Possible solutions:

[

$$w = \frac{-40 + 50.99}{2} \approx \frac{10.99}{2} \approx 5.495$$

]

[

$$w = \frac{-40 - 50.99}{2} \approx \frac{-90.99}{2}$$

QuestionAnswer How do you find the area of a rectangle with length 8 meters and width 5 meters? Multiply the length by the width: $8 \times 5 = 40$ square meters. A square has a perimeter of 36 meters. What is its area? First, find the side length: $36 \div 4 = 9$ meters. Then, $\text{area} = 9 \times 9 = 81$ square meters. If the base of a parallelogram is 10 cm and the height is 7 cm, what is its area? $\text{Area} = \text{base} \times \text{height} = 10 \times 7 = 70$ square centimeters. A rectangle's length is twice its width. If the area is 48 square meters, what are the dimensions? Let width = w , then length = $2w$. $\text{Area} = w \times 2w = 2w^2 = 48$. So, $w^2 = 24$, $w \approx 4.9$ meters. Length ≈ 9.8 meters. How do you determine the area of a parallelogram given the diagonals and the angle between them? Use the formula: $\text{Area} = \frac{1}{2} \times d_1 \times d_2 \times \sin(\text{angle between diagonals})$. What is the area of a square with a diagonal length of $10\sqrt{2}$ cm? Diagonal = $s\sqrt{2}$, so $s = \text{diagonal} / \sqrt{2} = 10\sqrt{2} / \sqrt{2} = 10$ cm. $\text{Area} = s^2 = 10 \times 10 = 100$ square centimeters. A rectangle has a length of 15 meters and an area of 150 square meters. What is its width? $\text{Width} = \text{area} \div \text{length} = 150 \div 15 = 10$ meters. How do you find the area of a rhombus if you know the lengths of its diagonals? $\text{Area} = \frac{1}{2} \times d_1 \times d_2$, where d_1 and d_2 are the diagonals. In a parallelogram, if the base is 12 cm and the height is 9 cm, what is its area? $\text{Area} = \text{base} \times \text{height} = 12 \times 9 = 108$ square centimeters.

Related keywords: area calculation, perimeter, geometry, shape problems, algebra, rectangles, squares, parallelograms, formulas, math exercises

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