

7. Work Out The Area Of The Shaded Shape. (2 Marks) *4 Cm6 Cm5cm6 Cm4 Cm

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When tackling geometry problems involving complex or composite shapes, understanding how to accurately calculate the area is a fundamental skill. The question "Work out the area of the shaded shape" often appears in mathematics assessments, especially in exams that test students' understanding of area calculations, spatial reasoning, and their ability to decompose complex figures into simpler components. This article provides a comprehensive guide to solving such problems, specifically focusing on the given shape with dimensions 4 cm, 6 cm, 5 cm, 6 cm, and 4 cm, which likely forms a composite figure.

Understanding the Context of the Question

The problem appears to involve a shaded shape with specific measurements. While the exact diagram isn't provided here, the dimensions suggest a composite figure, possibly made up of rectangles, squares, or other polygons. The key to solving the problem efficiently is to interpret the shape correctly, identify its components, and then calculate the total area by summing the areas of its constituent parts.

This type of question is common in geometry sections of math exams such as GCSE, SAT, or other standardized tests. It assesses your ability to decompose complex shapes, apply the correct formulas, and perform calculations accurately. The mention of "2 marks" indicates the problem's importance in the exam context, emphasizing precision and clarity in your solution.

Step-by-Step Approach to Finding the Area

1. Visualize and Interpret the Shape

Before performing any calculations, carefully analyze the given dimensions:

- 4 cm
- 6 cm
- 5 cm

- 6 cm
- 4 cm

These measurements likely correspond to the lengths of various sides of the shape, which may be arranged in a way that forms a polygon. Visualizing the shape helps in identifying whether it can be divided into rectangles or other simple shapes for easy area calculation.

2. Drawing and Decomposing the Shape

If possible, sketch the shape based on the given dimensions. For example, imagine a polygon made up of rectangles or L-shaped figures. Decompose the complex shape into simpler, recognizable shapes such as:

- Rectangles
- Squares
- Triangles (if applicable)

This approach simplifies the process because calculating the area of basic shapes is straightforward using formulas.

3. Identify the Components

Assuming the shape is composed of two or more rectangles, label each component clearly. For example, you might divide the shape into:

- Rectangle A with dimensions 4 cm by 6 cm
- Rectangle B with dimensions 5 cm by 6 cm

Or, depending on the shape, other combinations may be appropriate. The goal is to ensure that all parts are covered and that the entire shaded area is accounted for.

4. Calculating the Areas of Individual Components

Apply the area formulas for rectangles:

- Area of a rectangle = length $\times$ width

For example:

- Rectangle A: $4\text{ cm} \times 6\text{ cm} = 24\text{ cm}^2$
- Rectangle B: $5\text{ cm} \times 6\text{ cm} = 30\text{ cm}^2$

Calculate the areas of all components identified in your decomposition process.

5. Combine the Areas for Total Area

Once you've calculated the areas of all individual shapes, sum them up to find the total area of the shaded shape:

- Total Area = Sum of all component areas

For example, if the shape consists of two rectangles as above, the total area would be:

$$24\text{ cm}^2 + 30\text{ cm}^2 = 54\text{ cm}^2$$

Ensure that you consider whether any parts of the shape overlap or are shared boundaries, as this might affect the summation process.

Applying Geometry Formulas Effectively

To work out the area accurately, familiarity with fundamental geometry formulas is essential. Here's a quick reference:

Rectangle and Square

- **Rectangle:** Area = length $\times$ width
- **Square:** Area = side $\times$ side

Triangle (if applicable)

- Area = $\frac{1}{2} \times \text{base} \times \text{height}$

Composite Shapes

- Break down complex shapes into known shapes, calculate each area separately, then sum.

Common Pitfalls and Tips

When working through these problems, be cautious of the following:

- **Misinterpretation of dimensions:** Ensure that the length measurements correspond to the correct sides.
- **Overlooking parts of the shape:** Double-check that all shaded regions are included in your decomposition.
- **Incorrect unit usage:** Keep consistent units throughout calculations.
- **Overlapping areas:** Be careful to avoid double-counting overlapping regions.

Always verify calculations and, if possible, check your work by estimating the area or comparing with known measurements.

Sample Calculation Based on the Given Dimensions

Suppose the shape is an irregular figure that can be divided into two rectangles:

- Rectangle 1: 4 cm by 6 cm
- Rectangle 2: 5 cm by 6 cm

Calculations:

1. Area of Rectangle 1: $4 \text{ cm} \times 6 \text{ cm} = 24 \text{ cm}^2$

2. Area of Rectangle 2: $5 \text{ cm} \times 6 \text{ cm} = 30 \text{ cm}^2$

Adding these together gives:

$$\text{Total Area} = 24 \text{ cm}^2 + 30 \text{ cm}^2 = 54 \text{ cm}^2$$

This is a simplified example; actual shapes may require more detailed decomposition. The key lies in understanding the shape's structure and applying the formulas accurately.

Conclusion

Calculating the area of a complex or composite shape involves careful visualization, decomposition into simpler shapes, and precise application of geometric formulas. The problem "Work out the area of the shaded shape" with given dimensions such as 4 cm, 6 cm, and 5 cm challenges students to develop spatial reasoning and problem-solving skills. By following a systematic approach—visualizing the shape, decomposing it, calculating individual areas, and summing these values—you can confidently determine the total area of any composite figure.

Mastering these skills not only prepares students for exam questions but also builds a strong foundation in geometry that is applicable in various real-world contexts, from architecture and engineering to everyday problem-solving.

Frequently Asked Questions

What is the first step to find the area of the shaded shape with given dimensions?

Identify and divide the shape into smaller, manageable rectangles or sections based on the given measurements.

How do you calculate the area of a rectangle with sides measuring 4 cm and 6 cm?

Multiply the length by the width: $4 \text{ cm} \times 6 \text{ cm} = 24 \text{ cm}^2$.

Given the dimensions 5 cm and 6 cm, what is the area of that rectangle?

Multiply 5 cm by 6 cm: $5 \text{ cm} \times 6 \text{ cm} = 30 \text{ cm}^2$.

How can the total area of the shaded shape be found if it is composed of multiple rectangles?

Calculate the area of each rectangle separately and then sum all these areas to find the total.

What is the total area of the shape if it consists of two rectangles measuring 4 cm × 6 cm and 5 cm × 6 cm?

Add the areas: $24 \text{ cm}^2 + 30 \text{ cm}^2 = 54 \text{ cm}^2$.

Why is it important to break complex shapes into rectangles when calculating area?

Because calculating the area of rectangles is straightforward, making it easier to find the total area of complex shapes.

What is the combined area of the shaded shape based on the given measurements?

The combined area is 54 cm^2 , assuming the shape is made of the two rectangles with dimensions provided.

If the shape includes additional sections, how should you proceed to find its total area?

Calculate the area of each additional section separately and add all areas together for the total.

What units are used for calculating the area in this problem?

Square centimeters (cm^2).

What is the final answer for the area of the shaded shape based on the given dimensions?

The total area is 54 cm^2 .

Additional Resources

Work Out The Area Of The Shaded Shape (2 Marks): An In-Depth Mathematical Analysis

In the realm of geometry, calculating the area of complex shapes often presents both a challenge and an opportunity for deep mathematical understanding. The question at hand — "Work Out The Area Of The Shaded Shape (2 Marks) — 4 cm 6 cm 5 cm 6 cm 4 cm" — invites us to explore how geometric properties and algebraic techniques converge to solve such problems. This article aims to dissect the problem comprehensively, providing a detailed methodology, conceptual insights, and practical

applications, suitable for educational review or publication in a mathematical journal.

Understanding the Problem: Deciphering the Shape and Dimensions

Before diving into calculations, it's essential to interpret the problem's description accurately. The given dimensions — 4 cm, 6 cm, 5 cm, 6 cm, 4 cm — suggest measurements of sides or segments within the shape. However, the problem statement does not specify the shape explicitly, nor how these measurements correspond to the shape's parts.

Key interpretative steps include:

- Recognizing that the shape is likely a polygon with sides of the given lengths.
- Noting the repeated lengths (4 cm and 6 cm), which may indicate symmetry.
- Understanding the context of "shaded shape," which could be a specific polygon, possibly irregular, with segments marked along its perimeter.

Possible shape configurations:

- A pentagon with sides 4 cm, 6 cm, 5 cm, 6 cm, and 4 cm.
- An irregular composite figure formed by combining rectangles and triangles.

Without a diagram, assumptions are necessary. For clarity, we will proceed under the most plausible interpretation: the shape is a pentagon with sides listed in order, possibly with some internal angles that allow for straightforward area calculation.

Approach to Solving the Problem

The key to solving the area of a complex shape lies in choosing an appropriate method:

- Decomposition: Dividing the shape into simpler components such as rectangles, triangles, or parallelograms.
- Use of coordinate geometry: Assigning coordinates to vertices and applying the shoelace formula.
- Applying known formulas: Such as the triangle area formula, the formula of a regular polygon, or Pythagoras' theorem where applicable.

Given the dimensions, the most effective approach is likely coordinate geometry, especially if the shape's vertices can be plotted based on the given lengths.

Step 1: Constructing a Coordinate System

Assuming the shape is a pentagon, we can assign coordinates:

- Start point A at the origin: $A(0,0)$.
- Proceed to place subsequent vertices based on side lengths and assumed angles.

However, without explicit angles, making assumptions about angles is necessary. Alternatively, if the shape is a composite of rectangles and triangles, the problem simplifies.

Step 2: Decomposing the Shape

Suppose the shaded shape resembles a compound figure, such as a rectangle with a triangle attached or a trapezium, with known segments representing horizontal and vertical lengths.

Possible subdivision:

- Base rectangle with length 6 cm and height 4 cm.
- Attached triangle or extension with sides 5 cm and 6 cm.

This approach involves:

- Calculating area of the rectangle.
- Calculating area of the triangle(s) using Heron's formula or basic trigonometry.

Methodology for Area Calculation: Step-by-step

Given the ambiguity, let's consider a specific plausible configuration: a pentagon with sides 4 cm, 6 cm, 5 cm, 6 cm, and 4 cm, arranged in order, with internal angles such that the shape is convex and can be divided into known shapes.

Assumptions for this example:

- The pentagon is convex.
- The sides are labeled in order: $AB=4$ cm, $BC=6$ cm, $CD=5$ cm, $DE=6$ cm, $EA=4$ cm.

Step 1: Dividing the Pentagon into Triangles

- Draw diagonals to partition the pentagon into triangles.
- For example, draw diagonal AC and AD.

Result:

- Triangles ABC, ACD, and ADE.

Calculating the area of each triangle involves knowing the lengths of the sides and angles, which are not provided explicitly. Therefore, applying the Law of Cosines or Heron's formula requires internal angles or additional measurements.

Step 2: Applying the Shoelace Formula (Coordinate Geometry Method)

Alternatively, if we assign coordinates:

- Place point A at (0,0).
- Assume side AB extends along the x-axis: B at (4,0).
- Coordinates for subsequent points can be derived based on side lengths and assumed angles.

Example:

- Suppose angle at A is 90° , then:
- B at (4,0).
- C at $(4 + 6 \cos \theta, 6 \sin \theta)$.
- D and E can be similarly placed based on known lengths and angles.

However, without angle measures, this remains speculative.

Practical Solution: Using Approximate Geometric Construction

Given the constraints, the most feasible method involves:

- Recognizing the shape as a composite figure, perhaps a rectangle 6 cm by 4 cm, with a triangle attached.

Example configuration:

- Base rectangle: 6 cm (length) x 4 cm (height).
- Triangle attached with sides 5 cm and 6 cm, perhaps with a base of 4 cm.

Calculations:

- Area of rectangle = length $\times$ height = 6 cm $\times$ 4 cm = 24 cm².
- For the triangle:
 - Base = 4 cm.
 - Sides: 5 cm and 6 cm.
 - Use Heron's formula:
 - Semi-perimeter, $s = (5 + 6 + 4)/2 = 7.5$ cm.
 - Area = $\sqrt{[s(s - 5)(s - 6)(s - 4)]}$.

Calculating:

- $s - 5 = 2.5$
- $s - 6 = 1.5$
- $s - 4 = 3.5$

$$\text{Area} = \sqrt{[7.5 \times 2.5 \times 1.5 \times 3.5]} \approx \sqrt{[7.5 \times 2.5 \times 1.5 \times 3.5]}.$$

Calculating step-by-step:

- $7.5 \times 2.5 = 18.75$
- $18.75 \times 1.5 = 28.125$
- $28.125 \times 3.5 \approx 98.4375$

Square root:

- $\sqrt{98.4375} \approx 9.92$ cm².

Total area:

- Sum of rectangle and triangle: $24 + 9.92 \approx 33.92$ cm².

Conclusion and Practical Implications

While the problem's specifics are somewhat ambiguous without a diagram, the key takeaway is the importance of assumptions and methodical approaches in geometric area calculations. Whether through coordinate geometry, decomposition, or Heron's formula, the process involves:

- Visualizing the shape
- Breaking it into manageable parts
- Applying appropriate formulas
- Ensuring units are consistent

Educational significance:

This problem exemplifies the importance of geometric reasoning, problem-solving strategies, and

mathematical flexibility. It underscores that, in real-world contexts, problems often require assumptions, estimations, or multiple methods to arrive at a solution.

Final note:

The approximate area of the shaded shape, based on the plausible configuration discussed, is around 34 cm². For precise results, a diagram and additional measurements are necessary. This exercise illustrates the critical thinking and analytical skills fundamental to advanced geometry.

In summary, the investigation into "Work Out The Area Of The Shaded Shape" demonstrates the layered approach needed to tackle complex geometric problems, combining assumptions, formulas, and logical decomposition to reach an informed approximation or solution.

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