SPRINGBOARD 6 LESSON 17
MEASURES 3

TOTAL TIME

30 MINUTES

Objective:

- Find perimeters of simple shapes and their areas by counting squares, and begin to use the formula in words for the area of a rectangle

Vocabulary:

- area
- length
- breadth
- perimeter
- square centimetres (cm^2)

By the end of the lesson children should be able to:

- find the perimeter and area of a rectangle;
- find the area of other shapes and compare the areas of these shapes.

Resources:

- OHT 17.1
- Resource Sheet 17.1
- whiteboards and pens

ORAL AND MENTAL STARTER

10 MINUTES

Show the children OHT 17.1. Explain that the grid is in centimetres.

Q: What is the name of shape A?

Q: How do we find the perimeter and area of this rectangle?

Establish that the perimeter is the distance around the shape in cm and that the area is the space inside the shape measured in centimetre squares, square centimetres or cm^2.

Ask the children to find the perimeter and area of rectangles A, B and C and to write their answers on their whiteboards.

Collect and discuss their answers for the perimeters. Record the answers on the board.

Perimeter of A is 6 + 4 + 6 + 4 = 20 cm.
Perimeter of B is 2 + 12 + 2 + 12 = 28 cm.
Perimeter of C is 3 + 8 + 3 + 8 = 22 cm.

Establish that another way to find the perimeter of a rectangle is to add together the length and breadth, and then multiply this answer by 2. Record this on the board next to the above.

$2 \times (6 + 4) = 20$ cm
$2 \times (2 + 12) = 28$ cm
$2 \times (3 + 8) = 22$ cm

Collect and discuss the children's answers for the areas.

Establish that:

area of A is $6 \times 4 = 4 \times 6 = 24$ cm^2;
area of B is $12 \times 2 = 2 \times 12 = 24$ cm^2;
area of C is $3 \times 8 = 8 \times 3 = 24$ cm^2.

Point out that the areas of rectangles A, B and C are the same but that their perimeters are all different.

Q: What is shape D?

Q: What are its area and perimeter?

Take responses. Point out that this square has the same perimeter as rectangle A: $2 \times (5 + 5) = 20$ cm, but it has a larger area. Write: 'Area of D is $5 \times 5 = 25$ cm^2'.

Q: What is shape E?

Q: How do we find its area?

Establish that the area of this triangle is half the area of a 4 cm by 4 cm square. Write: 'Area of E is $\frac{1}{2}$ of 16 cm^2 = 8 cm^2'.

MAIN TEACHING ACTIVITY

Emphasise that to find the area of a rectangle we need to know the length and breadth of the rectangle.
Write on the board: 'Area of rectangle = length $\times$ breadth'.
Give out Resource Sheet 17.1.
Explain that the grid is in cm and ask the children to find the area of the rectangle.
Encourage them to calculate the area by multiplying the length by the breadth, $2 \times 5 = 10$ cm^2, and emphasise that the units are centimetre squares.

Q: How can we work out the areas of the triangles?

Encourage the children to draw rectangles around the triangles and use the fact that the area of the triangle is half the area of the rectangle.

Ask children to find the areas of the other shapes.
Encourage the children to draw in rectangles and find the areas of any rectangles and triangles that they can then combine to find the area of the original shape. Collect answers. Discuss the methods the children used and correct any errors and misunderstandings.

PLENARY

5 MINUTES

Ask the children to draw a rectangle on the resource sheet. Say that this rectangle is to have an area of 36 cm². Ask the children to work out the perimeter of their rectangle.
Record the children's responses in a table on the board.

Area of rectangle = 36 cm²		
Length	Breadth	Perimeter
4 cm	9 cm	26 cm

Q: Which rectangle has the smallest perimeter?

Identify the square, 6 cm by 6 cm. Establish that this has a perimeter
2 × (6 + 6) = 24 cm. Remind the children that a square is a special rectangle and this is the shape that has the smallest perimeter of any rectangle with a given area.

Remember:

■ Perimeter is the distance around the shape and is measured in units of length such as cm.

■ Area is the space inside the shape and is measured in square units such as square centimetres, written as cm².

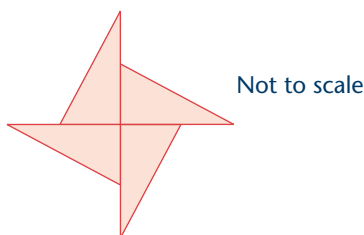■ To find the area of shapes it is helpful to find the areas of rectangles or triangles to add and subtract.

LESSON 17 RELATED TEST QUESTION 1999 TEST B (CALCULATOR PAPER)

20 Lindy has 4 triangles, all the same size.

13cm 12cm 5cm
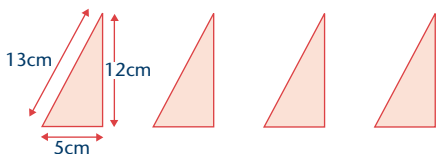
She uses them to make a star.

Not to scale

Calculate the **perimeter** of the star.

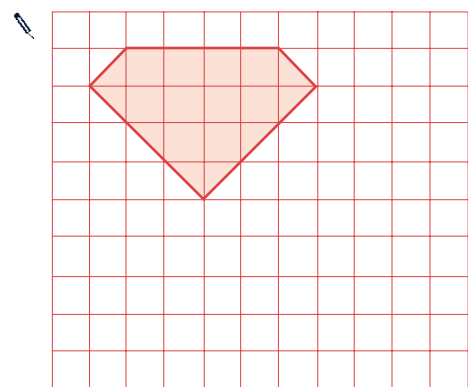Show your method. You may get a mark.

cm

2 marks

LESSON 17 RELATED TEST QUESTION 2000 TEST B (CALCULATOR PAPER)

11 On the grid, draw a **rectangle** which has the **same area** as this shaded pentagon.

Use a ruler.

1 mark

GUIDANCE FROM MARK SCHEME

Question	Requirement	Additional Guidance
20	80	*If the answer is incorrect, award* **ONE** *mark for evidence of an appropriate method, e.g. (13 + 12 – 5) × 4 Calculation need not be performed for the award of the mark.*

Question	Requirement	Additional Guidance
11	*Any rectangle with an area of 14 squares, e.g.*	*Rectangle need not be shaded or coincident with the grid lines. Accept extensions to the grid to allow, for example, a 14 × 1 rectangle. Accept slight inaccuracies in drawing provided the intention is clear.*
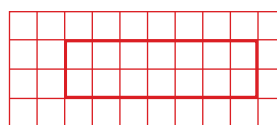
ANALYSIS OF CHILDREN'S ANSWERS

■ Question 11 was accessible to most children. Children working at levels 3 and 4 who answered the question incorrectly, either counted the half squares as whole squares or ignored the half squares. Consequently their rectangles were too large or too small.

■ Although many children attempted Question 20, few children working at levels 3 and 4 answered it correctly. The most common error was to estimate that half the 12 cm side was in contact with the other triangle, and to give the answer as 76 cm. Very few children gained the method mark alone, and too few children annotated the diagram with numbers to help them find the perimeter.

IMPLICATIONS FOR PLANNING

■ There should be planned teaching activities where children create compound shapes using familiar geometric shapes, with the opportunity to explore and discuss the properties of these compound shapes.

■ Children should be taught how to annotate and label diagrams when finding areas and perimeters. Activities that are likely to lead to children making incorrect assumptions about shapes are good assessment activities for a plenary.