

SS2 • Understanding perimeter and area

Mathematical goals

To help learners to:

- understand the difference between perimeter and area.

To give learners practice in:

- calculating the area of rectangular shapes;
- calculating the perimeters of rectangular shapes.

Starting points

Learners may have had some previous experience of calculating perimeter and area.

Materials required

Possibly:

- a large block of chocolate.

For each learner you will need:

- several sheets of centimetre squared paper;
- pencil and ruler;
- mini-whiteboard.

Time needed

At least 30 minutes.

Suggested approach **Beginning the session**

Show the group a large bar of chocolate (real if possible; otherwise use a diagram) that has many squares, e.g. 36. Assume that all the squares are 1 cm by 1 cm. Ask learners to explain what is meant by the area and the perimeter of the bar, rather than simply state the rule for calculating them. Discuss the difference between area (i.e. in this case, the area is the number of squares expressed in cm^2) and perimeter (i.e. the distance all the way around the outside).

Working in pairs (1)

Ask learners to work in pairs and give each pair some sheets of squared paper, a pencil and a ruler. Explain that they have to rearrange the squares to make different rectangles but they must keep the same number of squares. Their task is to find the arrangement that makes the rectangle with the longest perimeter and the arrangement that makes the shortest perimeter. They should draw the rectangles on their squared paper to help their discussion.

Whole group discussion (1)

Share answers and identify which arrangement has the longest perimeter and which has the shortest. Explain that they can now divide the squares into smaller areas, i.e. the length and width of the rectangle, measured in centimetres, no longer have to be integers. Ask for suggestions and check, as a group, to see if the perimeter can be made bigger or smaller.

If an interactive whiteboard is available, the length of the rectangle can be put onto a spreadsheet and the width and perimeter calculated using the spreadsheet. This allows an exploration of a wider range of decimal numbers for the length (in particular, very small ones) which show the width getting bigger and the perimeter getting very big.

| | A | B | C |
|---|--------|----------|----------------|
| 1 | Length | Width | Perimeter |
| 2 | | $=36/A2$ | $=2 * (A2+B2)$ |

Copy the formulae downwards into the B and C columns, e.g.

| | A | B | C |
|---|--------|-------|-----------|
| 1 | Length | Width | Perimeter |
| 2 | 4.5 | 8 | 25 |

Working in pairs (2)

Change the specification to a fixed perimeter of, say, 40 cm and a variable area. Challenge learners to find the maximum and minimum areas.

Ask learners, using squared paper, to find possible rectangles with perimeter 40 cm, giving their lengths and widths.

Learners tend to find it much more difficult to fix the perimeter and change the area. They often draw rectangles that have an area of 40 cm².

Whole group discussion (2)

Share all the findings. If possible, use a spreadsheet to explore further with non-integers for the length and width.

| | A | B | C |
|---|--------|--------|--------|
| 1 | Length | Width | Area |
| 2 | | =20-A2 | =A2*B2 |

Copy the formulae downwards into the B and C columns, e.g.

| | A | B | C |
|---|--------|-------|-------|
| 1 | Length | Width | Area |
| 2 | 4.5 | 15.5 | 69.75 |

Reviewing and extending the learning

- Use mini-whiteboards and ask learners to draw rectangles (with dimensions) that have:
 - an area of 50 cm^2 ;
 - or
 - a perimeter of 12 cm ;
 - plus other examples of your own.
- Encourage learners to use compound rectangular shapes. Fix the perimeter and allow learners to explore which shapes give the largest area and which give the smallest.
- Repeat for a fixed area.

What learners might do next

Investigate areas and perimeters of other shapes.