

Chapter 8 Area and perimeter

Specification

FS coverage and range Work out areas and perimeters in practical situations

FS exemplification Find area and perimeter of rectangles and squares
Find areas and perimeters of compound shapes made from rectangles by counting squares

GCSE

GCSE specification **GM x** Calculate perimeters and areas of shapes made from triangles and rectangles **and other shapes**

Edexcel GCSE course **Specification A:**
Foundation 14.1–14.4, 20.5
Higher Chapter 10, 23.8
Specification B:
Foundation Unit 2: 18.1–18.3, 19.4
Higher Unit 2: Chapter 14

Resources

General resources Leaves (real or cut out of card)
Centimetre squared paper
Tracing paper
Rulers
Ordnance Survey maps with different scales

Resource sheets 8.1, 8.2

ActiveTeach resources Video
ResultsPlus Knowledge Check
ResultsPlus Problem Solving
Question Audio
Animations

Lesson 1

Objectives

- Sketch a diagram from written information
- Calculate area and perimeter to solve a problem
- Think about the appropriateness and accuracy of results

Starter

- Draw a number of rectangles and squares on the board. Ask students to work out their area and perimeter. Remind students of different formulae that can be used to work out the perimeter and area of a rectangle.

Main teaching and learning

- Give each student a leaf. This could be a real leaf or one cut out from card. Ask them to estimate the area of the leaf. Provide centimetre squared paper. Discuss strategies used by students to find the area. Ask: *Why is your answer an estimate rather than an exact answer? Is it an underestimate or an overestimate?*
- Extend this idea to finding the area of a lake, forest or town on an Ordnance Survey map. First ensure that students realise what each square on the map represents.
- Ask students how they would find the area of a rectangle accurately. Link this to *Take a look*: Football pitch (p81). They could work out the maximum and minimum size of a pitch for two age groups. Ask: *Why do you think older players have bigger pitches?*
- Draw a compound shape on the board and ask students how they could find its area. Give students Resource sheet 8.1 and ask them to find the areas of the shapes given.
- Ask students to find the perimeters of the shapes on Resource sheet 8.1.

Issues and misconceptions

- Students may struggle to understand the difference between area and perimeter and so not know which concept to use in a given situation. Emphasise that perimeter is a measure of length, so is measured in metres, kilometres and so on, while area is a measure of the space inside a two-dimensional shape, so is measured in m^2 , cm^2 and so on.

Support

- Ensure students know to draw around the leaf and then count squares to find its area.
- Provide tracing paper so they can trace the areas on the map along with the squares to make it easier to count them.

Extension

- Ask students to estimate areas using maps with differing scales. Students will first need to work out the area 'in real life' of one square on the map.

Plenary

- Pose the following questions:
 - *Cara wants to make a rectangular sand pit in her garden. She has 16 m of wood to make the sides. What dimensions could the sand pit be?*
 - *Cara wants the sand pit to have as large an area as possible. What dimensions should she choose?*

Formative assessment

- Divide students into pairs. Tell each student to draw three rectangles on plain paper. Their partner should then estimate the area of each rectangle. They should then swap papers, work out the real area of each rectangle and see how close the estimates were.

Homework

- Ask students to complete *Have a go* Q1–3.

Lesson 2

Objectives

- Calculate building costs for areas
- Think about different solutions to a problem
- Communicate solutions clearly and methodically

Starter

- Draw a compound shape (using rectangles and triangles only) on the board, giving enough measurements so that area can be calculated. Ask students to work out the area and then discuss different strategies used.

Main teaching and learning

- Ask students to read *Take a look: Driveway* (p83). Tell them that the owner of the house wants to buy enough fertiliser to cover the lawn. Each box contains enough fertiliser to cover 13 m². Ask: *How many boxes will he need to buy?* Students should work in pairs to come up with a solution to this problem.
- Discuss solutions and strategies used. If anyone gives the (incorrect) answer of five boxes, ask: *How did you get this answer?* (It was probably obtained from rounding to the nearest whole number rather than considering the total number of boxes. In this example the amount needs to be rounded up as five boxes would not provide enough fertiliser.)
- Relate this to the question posed in *Take a look: Driveway*. Ask students to work out their own answer before looking at the solution given in the *Student Book*.
- Ask students to complete *Have a go* Q4–7.

Issues and misconceptions

- Students may not realise that they do not need to use all the information they are given in order to work out the solution to the problem.

Support

- It may be necessary to continue reminding students that, in these questions, they need to find the area and not the perimeter.
- For Q4 and Q5, students could draw the rectangles on centimetre squared paper using a scale of 1 cm:1 m. This will enable them to count squares to find the area rather than having to use the formula.

Extension

- Ask students to return to Q6. Ask them to work out the effect on the cost if the rolls of insulation are laid lengthwise along the loft rather than crosswise.

Plenary

- Examine how different students have set out their solutions to the *Take a look* and *Have a go* questions. Discuss what makes an answer easy to follow. Stress the importance of showing each stage in the working and making the final answer clear. Where necessary, written explanations should be given.

Formative assessment

- Ask students to mark each other's answers to Q4 and Q5 and compare them with their own. They should check that all units are given in the answers where appropriate, and are correct.

Homework

- Ask students to complete Q8.

Lesson 3

Objectives

- Know how to calculate perimeter to solve a problem
- Model situations using diagrams
- Use diagrams to illustrate the solution to a problem
- Use information presented in tables and lists

Starter

- Draw several rectangles on the board, giving the length and the perimeter of each. Ask: *How could we find the width of the rectangles?* Discuss possible strategies. Extend the exercise so students are given the length and area of several rectangles.

Main teaching and learning

- Give students the shapes from Resource sheet 8.2. These represent gardens and include rectangles as well as other quadrilaterals. Also give them the information about the cost of fence panels from *Take a look: Building a fence* (p85). Explain that panels can be cut but then only one piece can be used. Ask students to find the cheapest way to put a fence around the perimeter of the garden.
- Discuss students' results and the strategies used. Ask:
 - *Could you have put fencing around your perimeter in a cheaper way?*
 - *Why should you use an 8 foot panel rather than two 4 foot panels for a long stretch?*
- Relate this to *Take a look: Building a fence*. The possible results here are given in a table. Ask: *Why is a table a good way to consider all possible solutions?*
- Ask students to complete *Have a go* Q9 and Q10.

Issues and misconceptions

- Students may not understand that the perimeter is the distance around the edge of the garden.

Support

- Ensure that students who need support start the main activity using a rectangle. Restrict these students to quadrilaterals with sides that are a multiple of 4 or 6.

Extension

- Change the rules slightly so that, if a panel is cut, both pieces can be used. Ask: *Does this enable a cheaper solution to be found?*

Plenary

- Ask students to share their solutions to Q10. How many students arrived at the correct solution? Discuss these students' strategies and ask them to show the class how they set out their solutions.

Formative assessment

- Students should swap books and mark each other's solutions to Q9. They should check that, as well as having the correct answer, it is possible to see how the solution was obtained.

Homework

- Ask students to complete Q11 and/or Q12.