

# 4 Gardening

## Coverage

This unit is about working with metric and imperial measurements. It covers perimeters, areas and volumes of simple rectangular and circular shapes. Areas of composite shapes are introduced.

Scale diagrams are an important feature of the unit. Learners will also interpret 2-D diagrams of 3-D objects.

Learners will need to use a calculator throughout the unit.

They will need to work to a given level of accuracy.

At this level, learners are expected to build on the skills developed at Level 1.

## Skills

**MSS1/L2.3** estimate, measure and compare length, distance, weight and capacity using metric, and, where appropriate, imperial units

**MSS1/L2.5** calculate with units of measure within the same system

**MSS1/L2.6** calculate with units of measure between systems, using conversion tables and scales, and approximate conversion factors

**MSS1/L2.7** understand and use given formulae for finding perimeters and areas of regular shapes (e.g. rectangular and circular surfaces)

**MSS1/L2.8** understand and use given formulae for finding areas of composite shapes (e.g. non-rectangular rooms or plots of land)

**MSS1/L2.9** understand and use given formulae for finding volumes of regular shapes (e.g. a cuboid or cylinder)

**MSS1/L2.10** work out dimensions from scale drawings

**MSS2/L2.1** recognise and use common 2-D representations of 3-D objects

**MSS2/L2.2** solve problems involving 2-D shapes and parallel lines

Resources needed for effective teaching of this unit:

Demonstration	Group	Pair	Individual
Calculators	Calculators	Calculators	Calculators
Rulers	Rulers	Rulers	Rulers
Measuring tapes	Measuring tapes	Measuring tapes	Measuring tapes
Bricks	Squared paper	Squared paper	Squared paper
DIY catalogues and hint sheets	Pencils	Pencils	Pencil

## Reminder

In the Links, H means Help, E means Extension and M means Mini-project.

## Remember

Throughout the unit, be aware of the reading needs of learners.

You may need to read out parts of the text.

Words **highlighted** in **bold** will need particular clarification.

## Context

- Discuss the scenario as a group.
- What type of building work may be undertaken in a garden or yard?
- Make sure that each learner has a calculator.

## Stimulus questions

- Which of you has a garden?
- Who watches gardening programmes on TV?
- Has anyone ever built anything in a garden?
- Has anyone ever built a wall? Discuss what can be used – shapes, ease of use etc.

## Pages 2 and 3 What measure?

### Introduction to activity 1

- Discuss when and if learners use feet and inches.
- Ask learners to record their heights on a flip chart. How many give their height in feet and inches?
- Do the learners know that feet and inches are part of the imperial system of measurement?
- Ask learners to estimate the length of the room. What measuring system do they use?
- Discuss the metric system – metres and millimetres. Although centimetres should be discussed, they are not used here because they are not standard units. It would be useful to have a permanent display showing all the conversions in the metric system.
- Remind learners of how to multiply and divide by 10, 100 and 1000, and practise/revise these skills.

- Remind learners to estimate/check calculations (e.g. *more* mm, *fewer* m for the same length).

### Activity 1

- Work through the examples.
- Try some similar questions and ensure that learners can convert between metres and millimetres.
- Ask learners to measure 2.4 m and 140 mm. Compare the lengths.
- Learners complete the activity individually or in pairs.

### Activity 2

- This activity involves changing measurements from imperial to metric units. Have available some catalogues from DIY stores giving dimensions in both systems.
- Get learners to look at the metric and imperial scales on a ruler.
- Write down approximate conversions for inches and feet.
- Look at the 'Remember' box and make sure that the learners are happy with the conversions.
- Work through the example, making sure learners understand the process.
- Remind learners to check that they have given their answers in the units requested
- Learners work individually or in pairs.

### LINKS: H1

## Pages 4 and 5 Laying a patio

### Introduction to activity 3

- Discuss plans and when they are used.
- Remind learners of the work they did on scales at Level 1.
- Discuss length and width.
- Discuss area and how to calculate area for a rectangle.
- Why is area given in square units? Length and width, two dimensions, are multiplied together so the result is to the power 2.
- Work through the examples and ensure learners understand.

### Activity 3

- Learners work individually or in pairs to measure and calculate.

### Activity 4

- Discuss laying paving slabs.
- Have any of the learners laid slabs?
- How did they work out the number needed?
- Use DIY catalogues to investigate the different sizes of slabs.
- Work through the example. Ask learners why the number of slabs needed is always the next whole number.
- Discuss rounding in other circumstances.
- Encourage learners to draw rough diagrams to help visualisation in this activity.

### Activity 5

- Discuss why slabs should be put on a bed of sand, or sand and cement.
- Discuss volume.
- Why is volume given in cube units? The three dimensions – length, width and height – are multiplied together so the result is given to the power 3.
- Discuss depth and height – both are a length that we think of as vertical.
- Work through the example.
- Learners calculate volumes individually or in pairs.

### LINKS: H2, H3, M1

## Pages 6 and 7 Starting the job

### Introduction to activity 6

- Have learners seen builders at work?
- Have learners noticed builders marking out on a building site?
- Why do builders mark out the outlines of buildings?
- Discuss perimeter – it is a strange word.
- Use tapes to measure the dimensions of pieces of furniture, the floor covering, or the room.
- Work out the perimeters.

- Remind learners that the perimeter of a rectangle is  $2(l + w)$ , as used in Unit 1. Perimeter in general is the distance round a shape – not all shapes are rectangles. Discuss finding perimeters of non-rectangular shapes.

### Activity 6

- Work through the example.
- Remind learners that all measurements must be in the same units before adding.
- Learners work individually or in pairs to calculate perimeters.

### Activity 7

- Discuss perimeter as length, and area as covering.
- Discuss how to work out the area of a rectangle.
- Discuss why you need to know how many bricks you will use.
- Why is it a good idea to allow 10% extra?

### Activity 8

- Discuss the idea of a raised bed.
- Why is a raised bed essential for a wheelchair user?
- Who else would appreciate a raised bed?
- Discuss why the areas of the sides are worked out separately. Encourage learners to use blocks to simulate the problem practically.
- Learners work individually, in pairs or as a group.

### Activity 9

- Provide bricks for learners to measure.
- A simulation exercise using real or toy bricks might be beneficial for some learners.
- Explain why it is necessary to calculate the interior dimensions.
- Remind learners about calculating volumes.
- Remind learners that all lengths must be in the same unit before they can be combined.
- Remind learners how to round to a given number of decimal places.
- Learners complete the activity individually or in pairs.

### LINKS: H2, E1, M1

## Pages 8 and 9

### Making a splash!

#### Introduction to activity 10

- Have learners seen a pond or pool?
- Is there a fountain in a local park or garden?
- Go through the definitions of words pertaining to a circle.
- Discuss the formulae for calculating the circumference and area of a circle (given in the box).
- Explain that  $\pi$  (pye) is a constant and a non-terminating decimal.
- Explain that  $\pi$  relates the circumference of a circle to the diameter, and that the circumference is proportional to the diameter
- Make sure the learners can find the  $\pi$  button on the calculator.
- Practise using the  $\pi$  button.
- Remind learners that all answers should be given to two decimal places.

#### Activity 10

- Work through the example to make sure learners understand the process.
- Note that although the calculations for circumference and area can be carried out in mm and then changed to m and  $m^2$  respectively, be sure to emphasise the difficulty of changing  $mm^2$  to  $m^2$  – it usually leads to errors.
- Learners complete the activity individually or in pairs.

#### Activity 11

- Discuss the picture of the slabs.
- Notice how the arc slabs are shaped to fit around a circle.
- Check learners understand that it is the length of the inner curve of the slab which is given and that it is this part that must be fitted to the circumference of the pond.
- Why are gaps left between the slabs?
- Work through question 1 as a group.
- Learners complete the activity individually or in pairs.

#### Activity 12

- Discuss the 3-D shapes: prisms.
- Explain what is meant by a prism – show various examples. A cylinder is a particular prism; one with a circular base.
- Discuss how to calculate the volume of a prism:  $\text{volume} = \text{area of base} \times \text{height}$ .
- How will they find the volume of a circular pond? (a cylinder:  $\text{area of a circle} \times \text{height}$ )
- Point out where the area of a circle appears in the formula for the volume of a cylinder.
- Work through the example. Use other examples if required.
- Learners complete the activity individually or in pairs.

LINKS: H4, E2, M2

## Pages 10–12

### Painting the town!

#### Introduction to activity 13

- Discuss the problem of working out areas of composite shapes – shapes that can be broken down into simple shapes like squares, rectangles and triangles. Also non-regular shapes can be approximated to regular shapes for an estimated area (see Core Curriculum page 73).

#### Activity 13

- Work through the example.
- Could the patio be divided in another way? Two vertical lines would give three rectangles.
- Work out the areas of the new shapes – is the area of the patio the same?
- Give the learners other shapes to try, e.g. L-shapes with dimensions marked.

#### Activity 14

- Look at sheds in catalogues.
- Some have sloping roofs (pent roofs), some have apex roofs.
- Notice that dimensions are often given in feet and inches.
- How many surfaces are to be painted?
- Why is the roof not painted?

- Revise converting from imperial to metric.
- Spend some time studying the diagram.
- Discuss why the ends are split into a rectangle and a triangle.
- Remind learners how to calculate the area of a triangle.
- Work through some examples.
- Discuss the level of accuracy needed.
- Remind learners of how to write decimal numbers to two and one decimal place(s).
- Work through the activity as a group.

#### Activity 15

- Remind learners of how they changed feet/inches to mm.
- They should check whether they need to use mm or m.
- Learners work through the activity in pairs or small groups.
- It is possible to get six decimal places in answers. While full calculator displays are given in the answers, discuss the degree of accuracy needed here. How many decimal places are needed in working if the final answer is to be to one decimal place?

LINKS: H5, M3

## Page 13

### Help

#### H1

- Remind learners how to convert feet and inches to metres.
- Some learners may benefit from having the conversion formulae on 'Post-it' notes or prompt cards.
- Learners complete the activity individually or in pairs.

#### H2

- Remind learners how to calculate the actual length using the scale.
- Ensure learners can convert between mm and m.

- Remind learners how to calculate the perimeter and area for a rectangle, and the volume of a cuboid.
- Remind learners that in the volume formula, height is sometimes called depth.

#### H3

- Remind learners that they need to work with all measurements in the same unit.
- Discuss how to calculate the number of slabs that will be needed for the length and width and the total number required.
- Remind learners how to calculate the area and volume.

#### H4

- Remind learners how to calculate the volumes of a prism and a cylinder.
- Some learners may benefit from handling prisms.
- Learners work individually or in pairs.

#### H5

- Discuss other ways to divide the shape.
- Make sure learners understand how to find the missing lengths.
- Remind learners how to find areas.
- Learners complete the questions individually.

## Page 15

### Extension

#### Activity E1

- Remind learners that they will need to take accurate measurements from a scale drawing.
- Remind learners how to calculate the actual measurements using the scale.
- Remind learners that only measurements from one side of each wall are needed to calculate the area of brickwork.
- Learners work individually or in pairs.

## E2

- Ensure learners can convert feet to metres.
- Remind learners how to calculate the circumference and area of a circle, and the volume of a cylinder.
- Learners work individually or in pairs.

## Page 16

### Mini-projects

#### M1

- Learners will need squared paper to draw the plan.
- Make sure the learners understand what they have to do.
- Suggest that learners draw a rough sketch first to help visualise the compost bin before beginning their scale drawing

#### M2

- Learners can collect information leaflets for garden projects from DIY stores.
- Make sure learners understand what they have to do.

#### M3

- Learners will need squared paper for their design.
- Learners will need to find information on prices and work out the quantity and costs.
- Make sure learners understand what they have to do.

## Pages 17 and 18

### Check it

Use these questions to assess how the learners have coped with the skills in this unit. Ask learners to indicate the areas in which they would like help.

### *How am I doing?*

Learners should complete this individually, with teacher support if necessary.