

EDEXCEL FUNCTIONAL SKILLS PILOT

TEACHER'S NOTES

Maths Level 1

Chapter 5

Working with shape and space

- SECTION H**
- 1 Calculating perimeter
 - 2 Calculating area
 - 3 Calculating volume
 - 4 Angles
 - 5 Line symmetry
 - 6 Tessellation
 - 7 Remember what you have learned

Maths Level 1

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Chapter 5: Working with space and shape

Use these free pilot resources to help build your learners' skill base

We are delighted to continue to make available our free pilot learner resources and teacher notes, to help teach the skills learners need to pass Edexcel FS Mathematics, Level 1.

But use the accredited exam material and other resources to prepare them for the real assessment

We developed these materials for the pilot assessment and standards and have now matched them to the final specification in the table below. They'll be a useful interim measure to get you started but the assessment guidance should no longer be used and you should make sure you use the accredited assessments to prepare your learners for the actual assessment.

New resources available for further support

We're also making available new learner and teacher resources that are completely matched to the final specification and assessment – and also providing access to banks of the actual live papers as these become available. We recommend that you switch to using these as they become available.

Coverage of accredited specification and standards

The table below shows the match of the accredited specification to the unit of pilot resources. This table supersedes the pilot table within the teacher notes.

Coverage and Range	Exemplification	Learner Unit
Work out areas and perimeters in practical situations	<ul style="list-style-type: none"> Find area and perimeter of rectangles and squares Find areas and perimeters of compound shapes made from rectangles by counting squares 	H1 Calculating perimeter H2 Calculating area
Construct geometric diagrams, models and shapes	<ul style="list-style-type: none"> Measure angles in 2D shapes Measure lengths Draw 2D shapes using a ruler and protractor 	H4 Angles G5 Length, weight and capacity Draw 2D shapes using a ruler and protractor is covered in our new publishing (see below)
		H7 Remember what you have learned

Where to find the final specification, assessment and resource material

Visit our website www.edexcel.com/fs then:

- **for the specification and assessments:** under **Subjects**, click on **Mathematics (Levels 1–2)**
- **for information about resources:** under **Support**, click on **Published resources**.

5

Shape and space

(pages 86–95 in the learner materials)

Performance	Coverage and Range	Unit Objectives
Learners can:	Learners can:	
<ul style="list-style-type: none"> ■ Understand practical problems in familiar and unfamiliar contexts and situations, some of which are non-routine ■ Identify and obtain necessary information to tackle the problem ■ Select mathematics in an organised way to find solutions to practical problems for different purposes ■ Apply mathematics in an organised way to find solutions to practical problems for different purposes ■ Use appropriate checking procedures at each stage ■ Interpret and communicate solutions to practical problems, drawing simple conclusions and giving explanations 	<ul style="list-style-type: none"> ■ Work out areas, perimeters and volumes ■ Draw shapes measuring and drawing angles and identifying line symmetry and tessellation 	<p>H1 Calculating perimeter</p> <p>H2 Calculating area</p> <p>H3 Calculating volume</p> <p>H4 Angles</p> <p>H5 Line symmetry</p> <p>H6 Tessellation</p> <hr/> <p>H7 Remember what you have learned</p>

Approaches to teaching

This section covers the skills necessary for learners to be able to work efficiently with perimeter, area, volume, angles, line symmetry and tessellation. The unit focuses on the delivery of working with shape and space and the questions set allow the learner to practise the full range of skills being taught. The table identifies the coverage and range from the functional skills standards: mathematics level 1 which are covered in this section.

H1 Calculating perimeter

The main idea is that learners can find the perimeter of any simple shape by adding together the sides that make up its boundary. Advise learners that they can work out the perimeter of a rectangle if they are given the length and width, which are the lengths of two adjacent sides. Stress the importance of checking that all lengths are in the same units and converting any lengths, as necessary, before doing further calculations.

Activities

Give learners a set of cards: each card should have the name of a shape, and a perimeter value on each, e.g. "rectangle, perimeter = 56 cm". Ask learners to discuss possible values for the dimensions of the shape, e.g. length = 15 cm, width = 13 cm in the example above.

Misconceptions

Learners sometimes make mistakes when trying to work out the perimeter of a rectangle by adding the length and width but forgetting to multiply this by 2. Another common error occurs when learners do not 'think through' problems that require them to add on additional lengths or to use the information given to work out unknown sides. For example, in question 2 on page 86 of the Skills Book, learners actually need to add an extra 8 metres to the perimeter of the pond to account for the metre-wide path surrounding the pond. Some learners will probably only add on 4 m. In questions such as this, advise learners to draw a diagram of the whole situation – the pond with the surrounding path – marking all the distances involved.

H2 Calculating area

The main idea is to enable learners to work out or estimate the area of a rectangular space, in square millimetres, centimetres or metres. Encourage learners to check that the length and width are in the same units before they multiply. Remind learners that area has two dimensions and make the connection between this and the 2 in mm^2 , cm^2 and m^2 . When demonstrating how to estimate area, review the rules for rounding numbers.

Activities

Make a sets of cards: put e.g. 'area = 40 cm^2 ' on each card. Ask learners in pairs or small groups to discuss possible lengths and widths that will give the area value on the card. An extension exercise to this is to give learners cards with both an area and a perimeter value on, e.g. 'area = 40 cm^2 , perimeter = 26 cm '. Ask them to find the one possible value for the length and width that will give these values for perimeter and area, e.g. length = 8 cm , width = 5 cm . (This activity is beyond Level 1 but many learners will enjoy the challenge and come up with ingenious ways to solve the problem).

Misconceptions

Learners can confuse perimeter with area and may add the lengths instead of multiplying them. For example, for practice question 1 on page 94 of the Skills Book, you can see that 290 m^2 has been given as a possible answer; this is aimed at learners making this error.

Learners may also be confused when multiplying with decimals. For example, in practice question 9 on page 95, learners may have difficulty multiplying 2.5 by 1.5. Advise learners that multiplying an amount by 1.5 is the same as finding one and a half times that amount.

H3 Calculating volume

The main idea is to enable learners to work out or estimate the area of a rectangular space, in square millimetres, centimetres or metres. Encourage learners to check that the length and width are in the same units before they multiply. Remind learners that area has two dimensions and make the connection between this and the 2 in mm^2 , cm^2 and m^2 .

Activities

Prepare cards showing the words 'length', 'area' and 'volume', and various statements and images of objects such as 'space in refrigerator', 'the units are squared', 'the units are cubed', 'the length of a washing line', 'the amount of space on a wall', 'this has one dimension'. Ask learners, in pairs or groups, to sort the cards into categories.

Misconceptions

The most common error learners at Level 1 make with problems involving volume is to combine adding with multiplying, instead of simply multiplying three numbers. Practice question 10 on page 95 is aimed at learners who make this particular error. Other

questions about volume focus on errors in units or dimensions – see practice test question 8. Reiterate and emphasise the important point that all volume questions involve cubed units.

H4 Angles, H5 lines of symmetry and H6 tessellations

The main ideas here are to enable learners to become familiar with common angles, line symmetry and tessellation. Explain the difference between acute, right and obtuse angles and demonstrate how to identify these in regular and irregular polygons. Demonstrate line symmetry in common shapes on paper by cutting them out and folding them along lines of symmetry. Demonstrate tessellation by slotting identical shapes together.

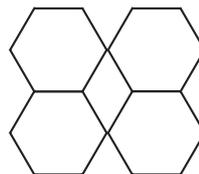
Activities

Use a piece of string and a pin to demonstrate a quarter turn, half turn and full turn, how each quarter turn describes 90° , how two quarter turns describe 180° and four quarter turns describe 360° . Ask learners to cut out common shapes e.g. hexagons, pentagons, parallelograms, and to discuss in pairs which will tessellate and which will leave other shapes in between when they try to tessellate them (such as triangles).

Misconceptions

Learners often make mistakes when reading scales. Learners often miss lines of symmetry, e.g. for a square they easily spot the vertical and horizontal lines but may miss the diagonal. Conversely, they insert lines of symmetry which do not exist in shapes such as parallelograms, not realising that the one half is not in fact the reflection of the other.

Learners may also miss the possibility of tessellating with shapes such as regular hexagons by attempt to connect them horizontally in rows, thereby creating gaps: ie.



Apply the skills

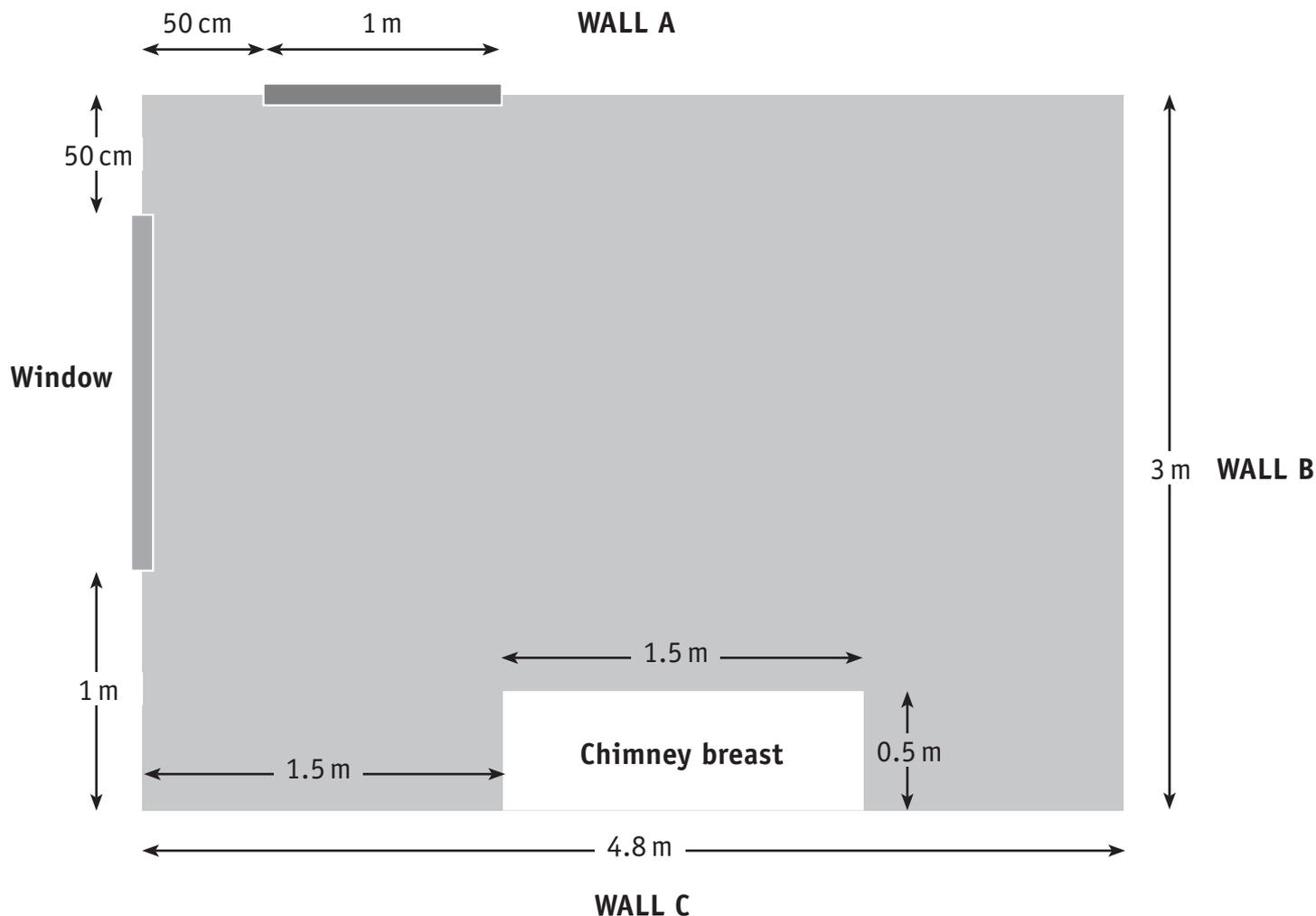
The learners need to develop their Process Skills, which are:

Representing	Analysing	Interpreting
Making sense of situations and representing them	Processing and using the mathematics	Interpreting and communicating the results of the analysis

At Level 1 the learners may receive some guidance on how to first approach a problem but then must decide on the methods used and identify the information they need for themselves. A suitable activity to practise their skills in shape and space would be to investigate furnishing and/or decorating a room. The task below involves planning a make-over for a lounge and incorporates measures of perimeter, area and volume as well as problem-solving in two and three dimensions.

Lounge make-over

The diagram shows the aerial view of a lounge which is to be decorated, carpeted and furnished (not drawn to scale).



Potential tasks:

Carpeting:

- Find the required area of carpet
- Work out the wastage due to chimney breast area

Wall papering:

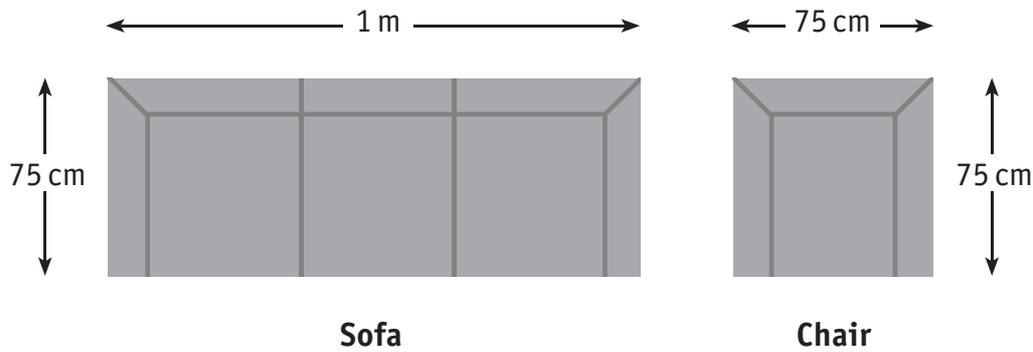
- Wallpaper comes in rolls 53 cm wide. Work out the number of strips required for wall B.
- Work out the number of strips required for the complete room. (Plan as if you are going to paper over the door, windows and fireplace!)
- Each roll of paper is 10 m long. The walls are 2.3 m up to the picture rail. How many full-height strips can you make from one roll of paper?
- One 'rule of thumb' is to say that the paper 'saved' by not papering over the door and windows will give you the spare you need for corners etc. Use this to estimate how many rolls of paper you need for the room.

Painting:

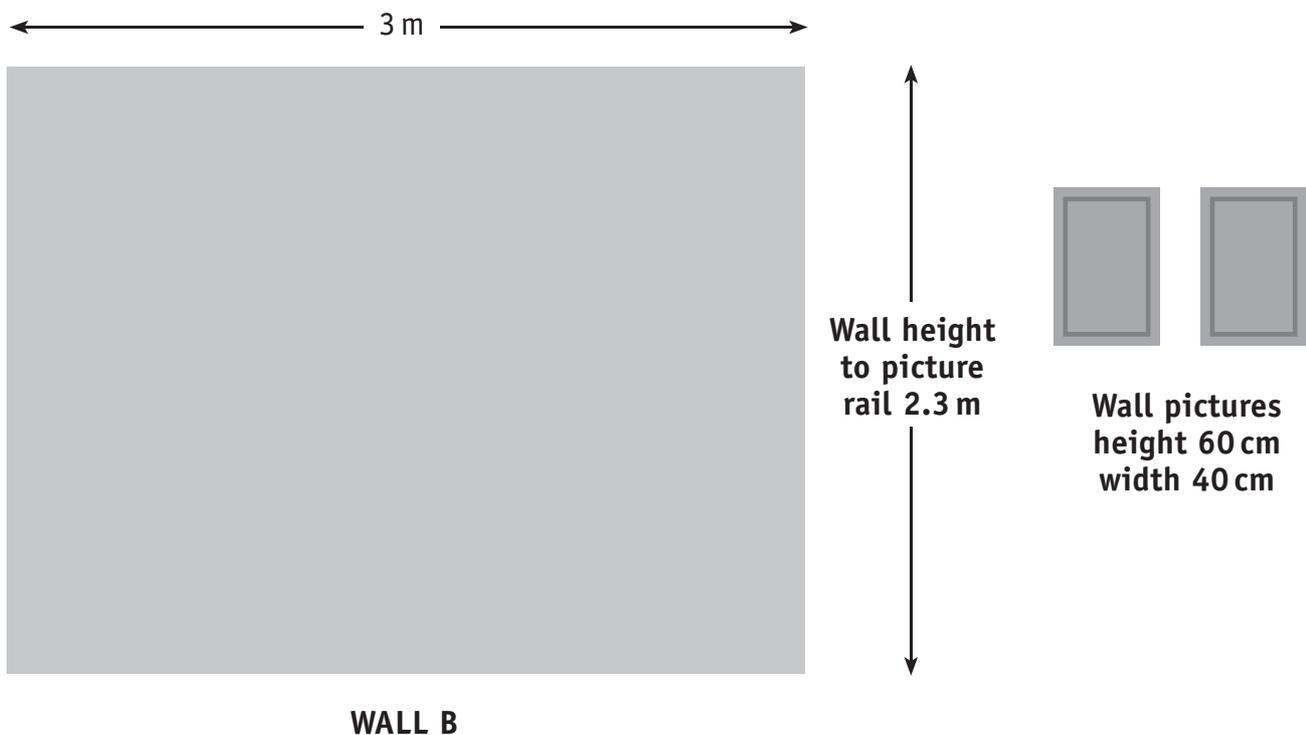
- The height above the picture rail is 50 cm. Work out the total surface area requiring painting (i.e. adding together area of ceiling and the wall rectangles above picture rail.)

Furnishing:

- Here are details of the sizes of sofa and chairs:



- Why can't the sofa be positioned anywhere along wall C? Where do you think they should be positioned in the room?
- Work out the available floor space left after the sofa and two chairs have been placed in the room.
- Where would you position two identical pictures on wall B so that the design is symmetrical:



Answers: Section A

H Working with perimeter, area and volume

1 Calculating perimeter – page 86

- 20 cm
 - 12 cm
 - 24 m
 - 39 m
- 18 m

2 Calculating area – page 87

- 12 cm²
 - 9 cm²
 - 65 mm²
 - 22.5 m²
- 10 000 cm² or 1 m²
- 12 m²
- 6 × 4
- 12 × 15 m² = 180 m²
- 16 × 2 stones = 32 stones

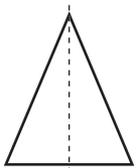
3 Calculating volume – page 89

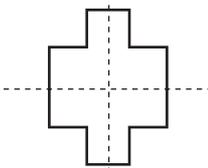
- mm³ or cm³ or m³
 - m³
 - litres
- 8 cm³
- 2 × 3 × 8 cm³ = 48 cm³
 - 4.5 × 10 × 20 cm³ = 900 cm³
- 27 cm³
- 132 m³
- 1600 cm³
- 24 000 cm³
- 48 000 m³

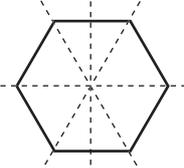
4 Angles – page 91

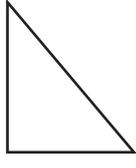
- A and C
- obtuse
 - acute
- 45° is acute, 90° is a right angle, 120° is obtuse, 179° is obtuse, 10° is acute, 89° is acute

5 Line symmetry – page 92

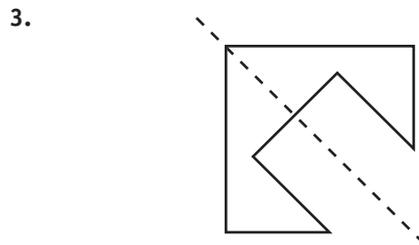
- 

1 line
 - 

2 lines
 - 

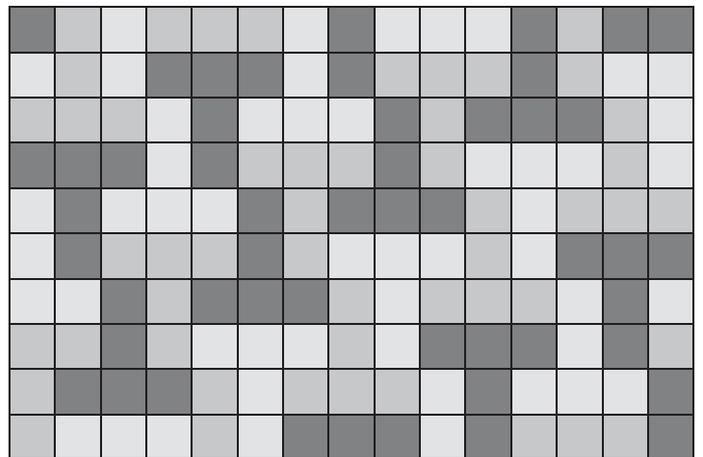
4 lines
 - 

0 lines



6 Tessellation – page 93

- a, b and d
-



7 Remember what you have learned – page 94

- B
- A
- B
- D
- B
- A
- D
- D
- C
- D