EDEXCEL FUNCTIONAL SKILLS PILOT

Maths Level 1

Chapter 5

Working with shape and space

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EDEXCEL FUNCTIONAL SKILLS: INTERIM SUPPORT MATERIAL

Maths Level 1

Carol Roberts

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	• 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	• 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**.

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H Working with perimeter, area and volume

You should already know how to:

✔ read, measure and compare metric units of length.

By the end of this section you will know how to:

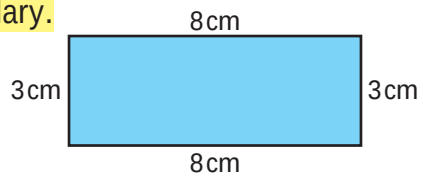
- work out the perimeters of simple shapes
- work out the areas of rectangles
- work out volumes of simple solids, such as cuboids
- identify acute, right and obtuse angles
- identify lines of symmetry on a shape
- identify shapes which tessellate.

1 Calculating perimeter

Learn the skill

The **perimeter** of a shape is the distance all the way around its boundary.

Example: What is the perimeter of the shape?



Add all the side lengths: 8 + 3 + 8 + 3 = 22 cm Answer: 22 cm

Remember

Perimeter is a length, measured in units such as kilometres (km), metres (m) or centimetres (cm).

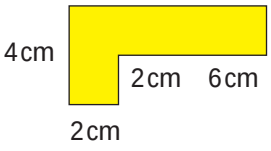
Try the skill

1. Work out the perimeters of the following shapes.

a

b

c



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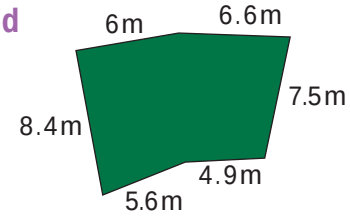
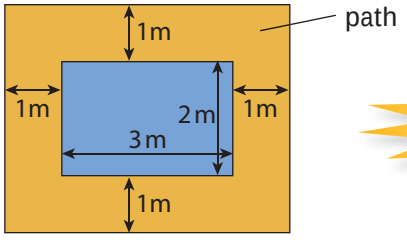


2. A woman wants to build a fence around the edge of the path that surrounds her garden pond. What length of fencing does she need to buy?



Challenge question!

2 Calculating area

Learn the skill

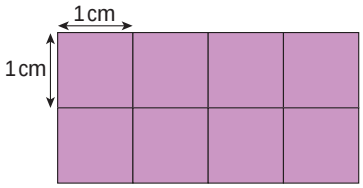
Area is a measure of the amount of surface a shape has.

The rectangle is made up of eight unit squares.

Each unit square measures 1 cm by 1 cm and its area is 1 cm^2 or 1 centimetre squared.

The area of the rectangle is 8 cm^2.

There are 4 columns and 2 rows: $4 \times 2 = 8\,cm^2$



The **area** of a rectangle = **length** × **width**.

Example 1: A rectangular garden is 9.8 metres wide and 20 metres long. What is the area of the garden?

First, identify the length (20 m) and the width (9.8 m).

To find the area, multiply the length by the width:

$9.8 \times 20\,m^2 = 9.8 \times 2 \times 10\,m^2 = 19.6 \times 10\,m^2 = 196\,m^2$

Answer: 196 m^2

Example 2: A gardener wants to reseed a client's lawn. The lawn is a rectangle 18.75 metres long and 8.59 metres wide. What calculation can he do to roughly work out the area of the lawn?

First, round the length and width to the nearest whole numbers. For a rough estimate, 20 m and 10 m will be 'good enough'.

18.75 rounds up to 20, and 8.59 rounds up to 10.

Area is calculated by multiplying length and width.

Answer: 20 × 10

Remember

Centimetre squared is sometimes written as square centimetres.
cm^2 is the abbreviated form.

Tip

Length is the longer horizontal dimension.
Width is the shorter horizontal dimension.
Height is the vertical dimension.

Remember

Area is measured in **two dimensions**, so it is always measured in **square units**, such as cm^2 or m^2.

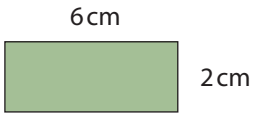
Tip

To multiply a number by 20, multiply first by 2 and then multiply the result by 10.

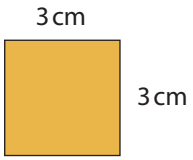
Try the skill

1. Find the area of each of these rectangles.

a



b



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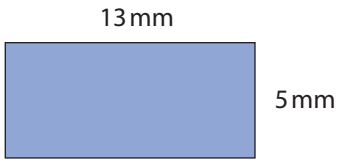

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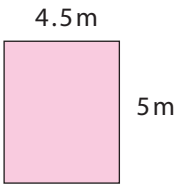


2. A window is 50 centimetres high and 2 metres long. What is its area?

3. A corridor is a rectangular shape of length 8 metres and width 1.5 metres. Find its area.

4. A carpet layer is ordering new carpet for a living room. The floor of the room is 5.92 metres long and 3.74 metres wide. Which two numbers should he multiply together to work out an approximate area of the floor?

5. The front of a house is being repainted. The front is rectangular in shape and is 12.18 m wide and 14.8 m high. What is the approximate area that will be repainted?

6. **Challenge question!**

Jonathon is designing a rectangular path for his garden using paving stones.
The paving stones are square in shape and are 50 cm wide.
If the path is to be 8 m long and 1 m wide, how many paving stones will Jonathon need to buy?

Tip

First change units so that both measurements are either in centimetres or metres – you decide which is easier for you!

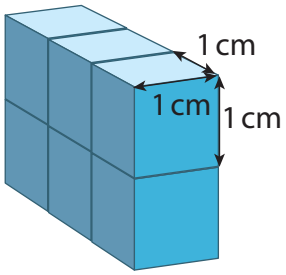
3 Calculating volume

Learn the skill

Volume is the amount of space taken up by a three-dimensional (3-D) shape.

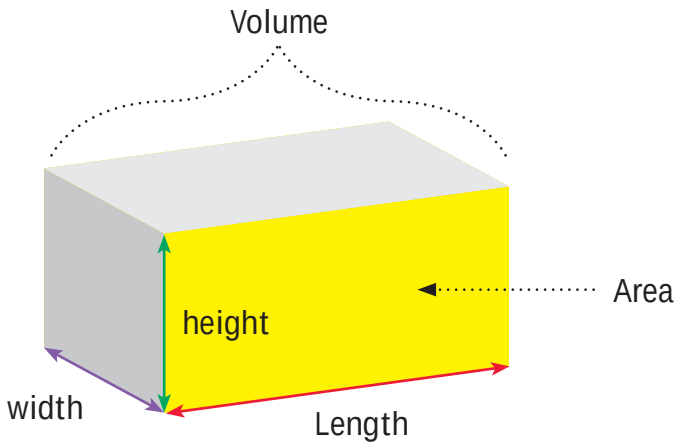
In this cuboid there are 6 (= 3 × 2) cubes.

Each cube measures 1 cm by 1 cm by 1 cm so its volume is 1 cm^3, or 1 centimetre cubed.

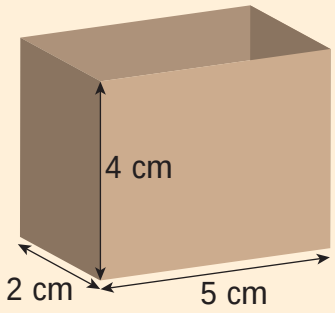


The volume of the cuboid is 6 cm^3: 3 cm × 2 cm × 1 cm = 6 cm^3.

The **volume** of a cuboid = **length** × **width** × **height**.



Example 2: A box has length 5 cm, width 2 cm and height 4 cm. What is its volume?



First, identify the length (5 cm), the width (2 cm), and the height (4 cm).

volume = length × width × height

5 × 2 × 4 = 40cm^3

Answer: 40 cm^3

Remember

Centimetre cubed is sometimes written as cubic centimetres. cm^3 is the abbreviated form.

Remember

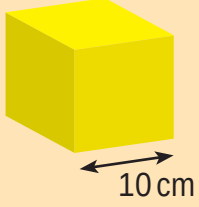
Volume is measured in **three dimensions**, so it is always measured in **cubic units**: cubic millimetres (mm^3), cubic centimetres (cm^3) or cubic metres (m^3).

Remember

A cuboid is the mathematical name for a box. A cube is a special type of cuboid: its sides are all the same length.

Tip

Volume is the amount of space a solid takes up, whereas **capacity** is the maximum amount a container can hold.



This cube has a volume of 1000 cm3 and can hold a capacity of 1 litre.

Try the skill

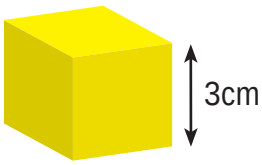
1. What metric unit would you use to measure:

a the volume of a cardboard box _____

b the volume of a swimming pool _____

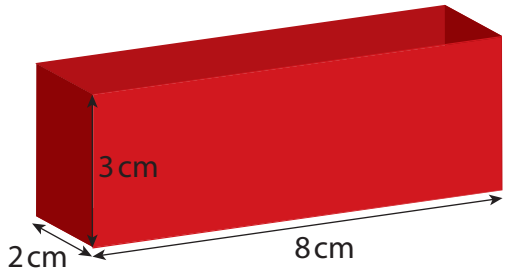
c the amount of water in a swimming pool? _____

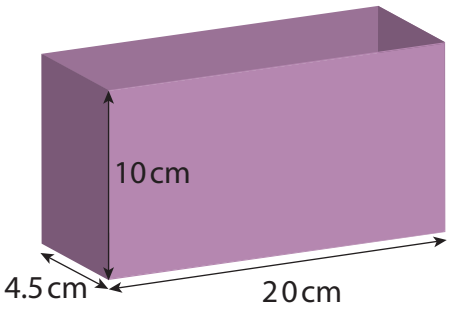
2. What is the volume of this cube?



_____

3. Find the volume of these cuboids.





a _____ **b** _____

4. An ice cube has length, width and height of 3 cm. What is its volume?

_____

5. The dimensions of a room are:
length 8 metres, width 5.5 metres, height 3 metres.
What is the volume of the room?

_____

6. A brick is 20 cm long, 10 cm wide and 8 cm high. What is its volume?

_____

7. A fish tank is 30 cm long, 20 cm wide and 40 cm high.
How much water can it hold when it is full to the top?

_____

8. A tall city building is 160 m high, 20 m from side to side and 15 m from front to back. What is the volume of the building?

_____

4 Angles

Learn the skill

Where two lines meet, an **angle** is formed.

Angles are measured in **degrees.**

The angle on the floor between two walls in the corner of a rectangular room is called a **right angle**.

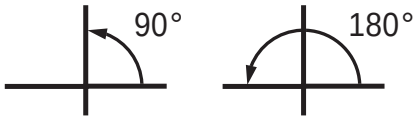
A right angle is the same as 90° and is also a **¼ turn**.

Two right angles make a **½ turn**.

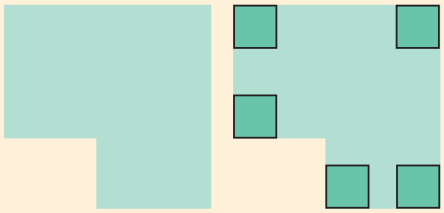
Two right angles equals **180°**.

Remember

The symbol for degrees is °

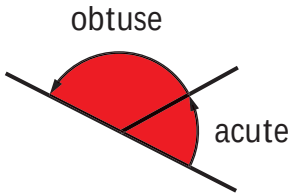


Example 1: This is the floor plan for a new office. Mark in all the right angles between office walls.
Note where the corners are.

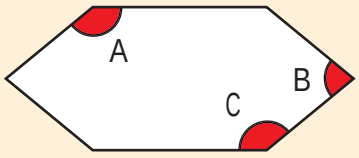


Angles which are **less than 90°** are called **acute angles**.

Angles which are **more than 90° but less than 180°** are called **obtuse angles**.



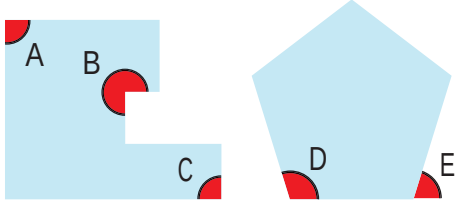
Example 2: This is hexagon or a 6-sided shape.
a. Which angles are acute?
b. Which angles are obtuse?



a. **B** is acute.
b. **A** and **C** are obtuse.

Try the skill

1. Which angles are right angles in the shape below?



2. **a** Is angle D acute or obtuse? _____

b Is angle E acute or obtuse? _____

3. State whether the following angles are acute, right or obtuse angles.

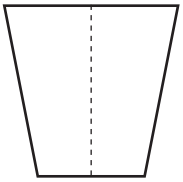
45° _____ 90° _____ 120° _____

179° _____ 10° _____ 89° _____

5 Line symmetry

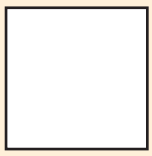
Learn the skill

A shape has line symmetry if it can be folded in half so that the two halves exactly match one another. The fold line that is made is called the **line of symmetry**.

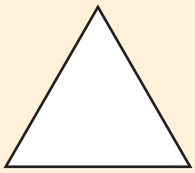


Examples: how many lines of symmetry do these shapes have? Draw them in.

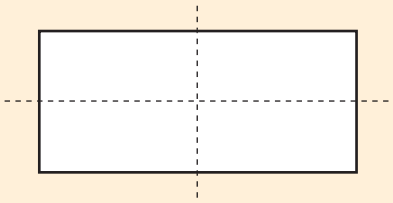
rectangle



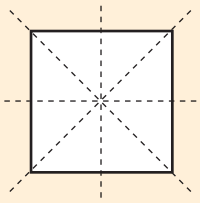
square



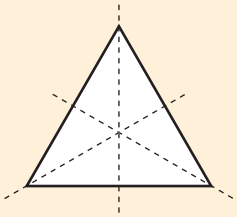
equilateral triangle



2 lines of symmetry



4 lines of symmetry

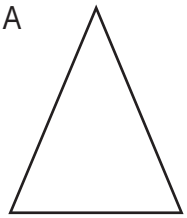


3 lines of symmetry

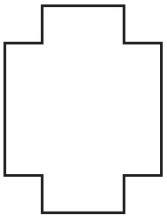
Try the skill

1. Identify the number of lines of symmetry for each shape and draw them in.

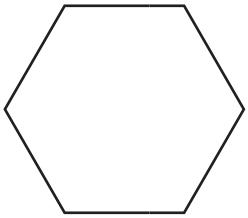
A



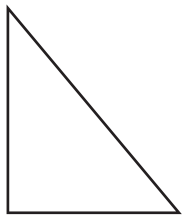
B



C



D

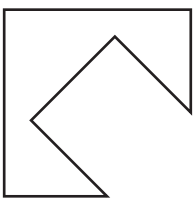


2. Many species in nature have line symmetry. Draw in the line of symmetry for these species.

A

B

3. The diagram shows the aerial view of a corner cabinet for a kitchen.
Draw in any lines of symmetry.



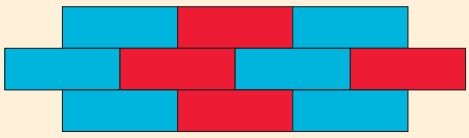
6 Tessellation

Learn the skill

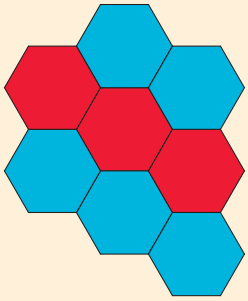
If identical shapes can slot together without leaving any gaps the shapes are **tessellate**.

When you tile a wall, you are tessellating with the tiles – you certainly do not want to leave any gaps in between tiles!

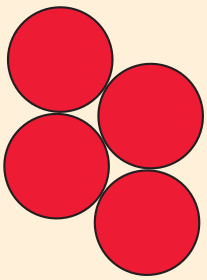
Examples:



rectangles tessellate



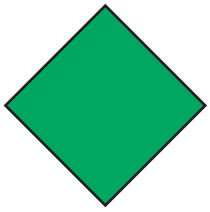
hexagons tessellate

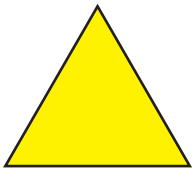


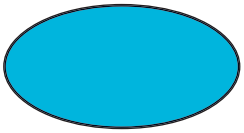
circles do not tessellate because there are gaps in between

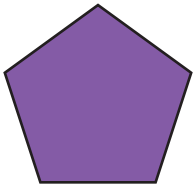
Try the skill

1. Identify which shapes tessellate.

A 

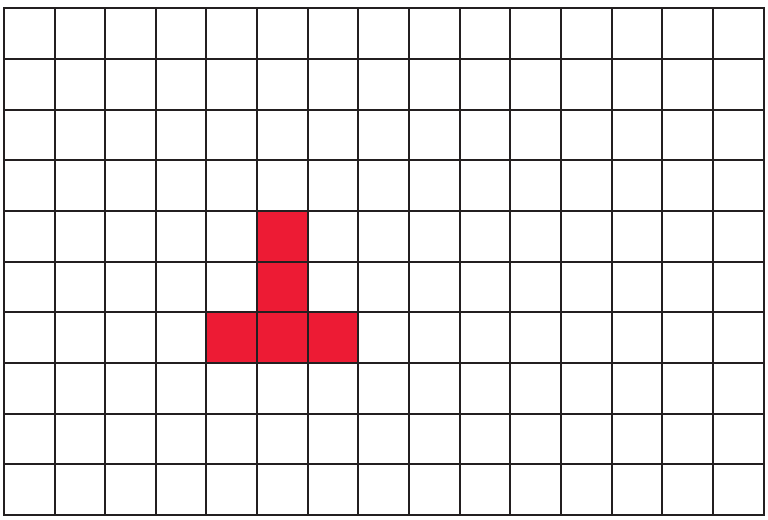
B 

C 

D 

Challenge question!

2. Copy the T-shape below at least 10 times onto squared paper. Cut out the shapes and see if you can tessellate them.



7 Remember what you have learned

First complete this ...

- The _____ of a shape is the distance all the way around its boundary.
- _____ is the amount of space taken up by a shape.
- The area of a rectangle = _____ × _____.
- _____ is the amount of space taken up by a three-dimensional (3-D) solid.
- The volume of a cuboid = _____ × _____ × _____.

Tip

If a question gives dimensions in different units, convert them so that all the units are the same before you work out perimeter, area or volume.

Try the skill

1. A rugby pitch measures 200 metres long and 90 metres wide.

What is the area of the pitch?

- **A** ☐ 290 m^2
- **B** ☐ 18 000 m^2
- **C** ☐ 380 m^2
- **D** ☐ 1800 m^2

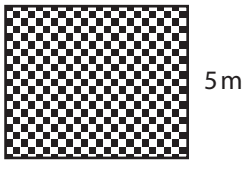
2. A woman wants to gravel over her garden. She estimates the garden to be 8.4 metres long by 7.5 metres wide.

What is the approximate area of her garden?

- **A** ☐ 64 m^2
- **B** ☐ 56 m^2
- **C** ☐ 58 m^2
- **D** ☐ 70 m^2

3. In a house, the kitchen floor is 6 metres long by 5 metres wide. The floor area is calculated to be 30 units.

What is the unit for the floor area?

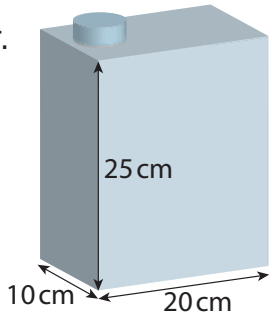


- **A** ☐ m
- **B** ☐ m^2
- **C** ☐ m^3
- **D** ☐ cm^2

4. This diagram shows a water container.
What is the volume the container?

Tip

A litre is the same as 1000 cm^3

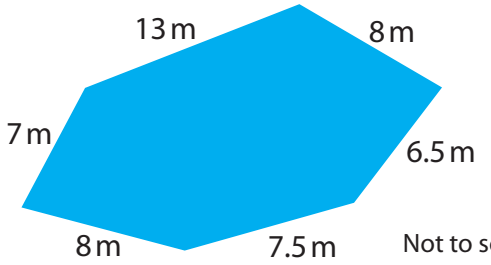


- **A** ☐ 55 cm^3
- **B** ☐ 500 cm^3
- **C** ☐ 755 cm^3
- **D** ☐ 5000 cm^3

5. A second water container has a capacity of 5000 cm^3.
What is 5000 cm^3 in litres?

- **A** ☐ 0.5 l
- **B** ☐ 5 l
- **C** ☐ 50 l
- **D** ☐ 500 l

6. How long would a fence need to be in order to enclose this boating lake?



- **A** ☐ 50 m
- **B** ☐ 60 m
- **C** ☐ 80 m
- **D** ☐ 100 m

7. A man wants to put new carpet on the floor in his office. The floor is 6.92 metres long and 4.84 metres wide.

Which of the following calculations should he use to find a quick estimate of the area of the floor?

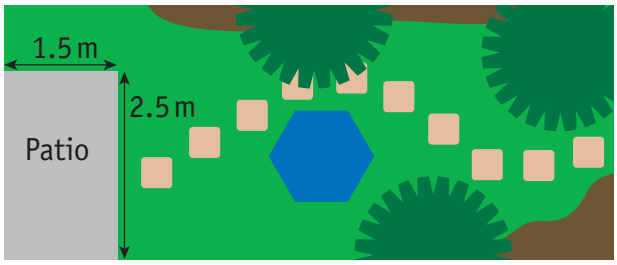
- **A** ☐ 6 × 4
- **B** ☐ 6 × 5
- **C** ☐ 7 × 4
- **D** ☐ 7 × 5

8. The diagram shows a cardboard box used to package perfume. The box is a cube of side length 10 cm.

What is its volume?

- **A** ☐ 1000 cm^2
- **B** ☐ 100 cm^3
- **C** ☐ 100 cm^2
- **D** ☐ 1 000 cm^3

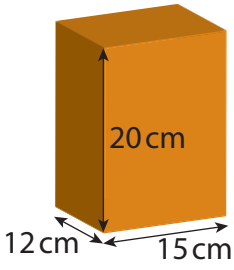
9. A rectangular area in a garden is to be paved for a patio.



What is the area to be paved for the patio?

- **A** ☐ 1.25 m^2
- **B** ☐ 3.50 m^2
- **C** ☐ 3.75 m^2
- **D** ☐ 4.00 m^2

10. How do you work out the correct volume of this box?



- **A** ☐ Add 12, 15 and 20 together.
- **B** ☐ Add 12, 15 and 20 together, then multiply by 2.
- **C** ☐ Add 20 to 15, then multiply by 12.
- **D** ☐ Multiply 20 by 15 by 12.