

3D Shapes - Faces, Edges, Vertices and Nets

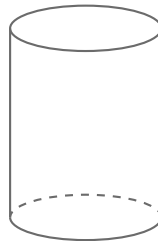
Solutions

For Pearson Edexcel GCSE Mathematics (1MA1) • Foundation tier

Each question is shown in grey, followed by the working, one step per line. The final answer is in a box. *Marks* shows how the marks are usually given in the exam, and **Tip** points out a common mistake.

1 (2 marks)

- (a) Write down the mathematical name of this solid shape.

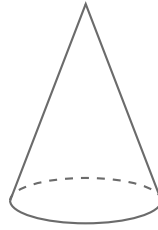


It has two flat circular ends joined by one curved surface.

Answer: Cylinder

Tip: Give the name of the **3-D** solid. “Circle” is a 2-D shape, so it scores no marks.

- (b) Write down the mathematical name of this solid shape.



It has one flat circular base and a curved surface that goes up to a point.

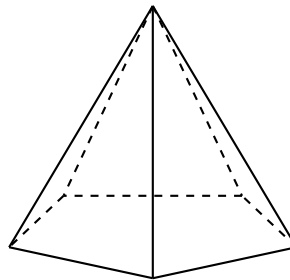
Answer: Cone

Tip: Just write “cone”. Names like “triangle cone” or “cylinder pyramid” are not accepted.

2 (2 marks)

The diagram shows a pyramid.

The base of the pyramid is a pentagon.



*Diagram **NOT** accurately drawn*

- (a) Write down the number of vertices of the pyramid.

The base is a pentagon, so it has 5 corners.

There is 1 more vertex at the top of the pyramid.

$$5 + 1 = 6$$

Answer: 6

- (b) Write down the number of edges of the pyramid.

There are 5 edges round the pentagon base.

There are 5 sloping edges going up to the top.

$$5 + 5 = 10$$

Answer: 10

Tip: Count the edges you cannot see as well (the dashed lines). Edges are the lines where two faces meet.

3 (2 marks)

- (a) A solid shape has one curved surface.

It has no flat faces and no edges.

Write down the mathematical name of this solid shape.

The only solid with just one curved surface and no flat faces is a sphere (a ball shape).

Answer: Sphere

Tip: “Circle” is a 2-D shape, so it scores no marks. The 3-D solid is a sphere.

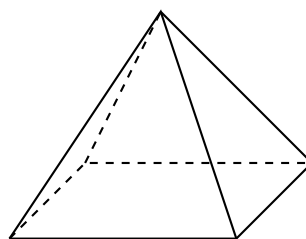
- (b) In the space below, draw a sketch of a square-based pyramid.

Draw a square base (it looks like a parallelogram when you draw it in 3-D).

Mark a point above the middle of the base.

Join each corner of the base to that point.

For example:



Answer: A sketch of a square-based pyramid

Tip: All four sloping edges must meet at **one** point at the top. If the top is a line, you have drawn a prism.

4 (4 marks)

Here is a triangular prism.

The two ends of the prism are equilateral triangles.

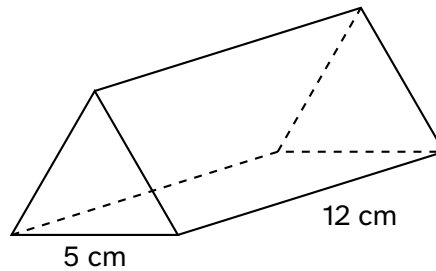


Diagram **NOT** accurately drawn

- (a) Write down the number of vertices of the prism.

Each triangular end has 3 corners.

$$3 + 3 = 6$$

Answer: 6

- (b) How many of the faces of the prism are rectangles?

The two ends are triangles.

Each side of the triangle is joined to the other end by a rectangle.

So there are 3 rectangular faces.

Answer: 3

- (c) Work out the total length of all the edges of the prism.

Each triangular end has 3 edges of length 5 cm, so the two ends have 6 edges of 5 cm.

$$6 \times 5 = 30 \text{ cm}$$

There are 3 long edges of 12 cm joining the two ends.

$$3 \times 12 = 36 \text{ cm}$$

Total: $30 + 36 = 66$ cm

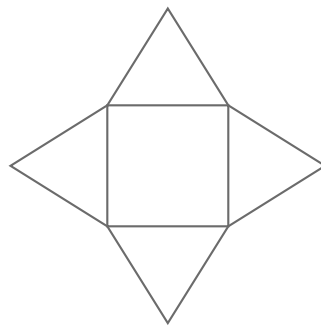
Answer: 66 cm

Tip: The edges are not all the same length. Count the short edges on the ends and the long edges separately.

Marks: 1 mark for 6×5 or 3×12 . 1 mark for 66.

5 (1 mark)

Here is a net.



Write down the name of the 3-D shape this net makes.

The net has 1 square and 4 triangles.

The square is the base.

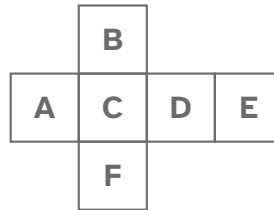
The 4 triangles fold up to meet at a point.

Answer: Square-based pyramid

6 (1 mark)

Here is the net of a cube.

The faces are labelled A to F.



The net is folded to make a cube.

Which face will be opposite face **A**?

Look at the row of four faces: A, C, D, E.

When this row folds round, faces with one face between them end up opposite each other.

A and D have one face (C) between them.

So A is opposite D.

(Also, C is opposite E, and B is opposite F.)

Answer: D

7 (2 marks)

On the centimetre grid, draw a net of a cube with edges of length 2 cm.

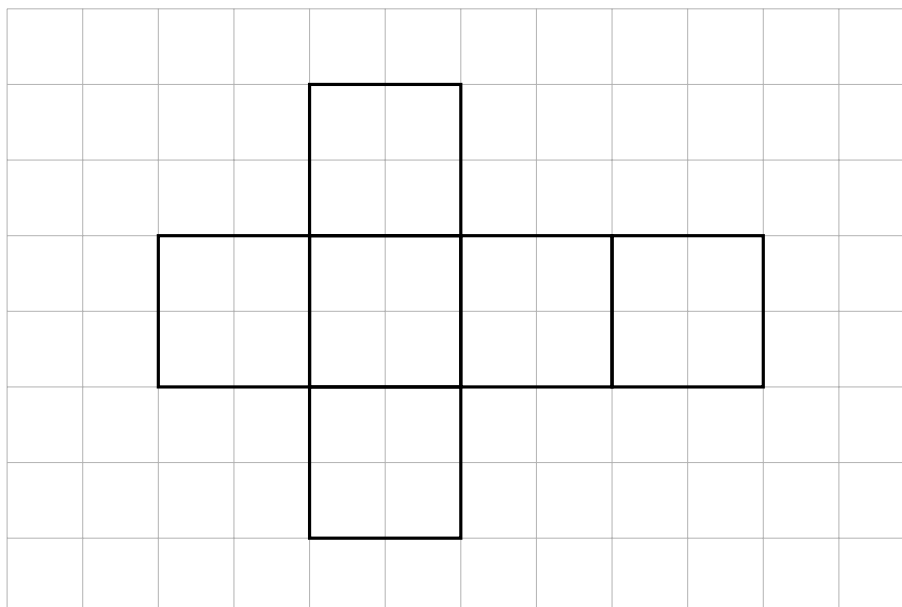


A cube has 6 faces, and they are all squares.

Each face must be 2 cm by 2 cm (2 squares across and 2 squares up on the grid).

Arrange the 6 squares so they fold into a cube.

For example, a cross shape: a row of 4 squares, with one more square above and one below the second square.



Answer: Any correct net of 6 squares, each 2 cm by 2 cm

Marks: 2 marks for a correct net. 1 mark for 6 squares of side 2 cm that do not fold into a cube.

8 (2 marks)

A cuboid measures 5 cm by 3 cm by 2 cm.

Work out the total length of all the edges of the cuboid.

A cuboid has 12 edges.

There are 4 edges of each length: 5 cm, 3 cm and 2 cm.

$$4 \times 5 = 20$$

$$4 \times 3 = 12$$

$$4 \times 2 = 8$$

$$\text{Total: } 20 + 12 + 8 = 40 \text{ cm}$$

Answer: 40 cm

Tip: Don't just add $5 + 3 + 2 = 10$. That only counts 3 of the 12 edges.

Marks: 1 mark for a correct method, e.g. $4 \times (5 + 3 + 2)$. 1 mark for 40.

9 (2 marks)

A hexagonal prism has two ends that are hexagons.

Write down the number of faces, edges and vertices of a hexagonal prism.

A hexagon has 6 sides.

Faces: 2 hexagon ends + 6 rectangles = 8

Edges: 6 on each end + 6 joining the ends = $6 + 6 + 6 = 18$

Vertices: 6 on each end = $6 + 6 = 12$

Answer: 8 faces, 18 edges, 12 vertices

Marks: 2 marks for all three correct. 1 mark for two correct.

10 (2 marks)

A prism has 21 edges.

Work out the number of faces of the prism.

Let the ends of the prism have n sides.

There are n edges on each end and n edges joining the ends.

So the prism has $n + n + n = 3n$ edges.

$3n = 21$, so $n = 21 \div 3 = 7$

Each end has 7 sides.

Faces: 2 ends + 7 rectangles = 9

Answer: 9

Tip: Try it on a prism you know. A triangular prism has 3 sides on each end and 9 edges, which is 3×3 .

Marks: 1 mark for $21 \div 3$ or for finding that each end has 7 sides. 1 mark for 9.

11 (3 marks)

Rosie has 1 m of wire.

She uses the wire to make the edges of a model of a cube.

Each edge of the cube is 7 cm long.

How much wire does Rosie have left?

A cube has 12 edges.

Wire used: $12 \times 7 = 84$ cm

Change 1 m into cm: $1 \text{ m} = 100 \text{ cm}$

Wire left: $100 - 84 = 16$ cm

Answer: 16 cm

Tip: Change both amounts into the same units before you subtract: 1 m is 100 cm.

Marks: 1 mark for using 12 edges. 1 mark for $100 - 84$ (with both amounts in cm). 1 mark for 16.
