

3D Shapes - Faces, Edges, Vertices and Nets

Solutions

For AQA GCSE Mathematics (8300) • 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 (1 mark)

Which statement about a square-based pyramid is correct?

Tick one box.

The base is a square: that is 1 face.

There are 4 triangles going up to the top: 4 more faces.

So it has $1 + 4 = 5$ faces.

Check the others: it has 5 vertices (4 round the base and 1 at the top), not 4.

It has 8 edges (4 round the base and 4 sloping), not 5.

The base is a square, so not all of its faces are triangles.

Answer: It has 5 faces.

Tip: Remember to count the base. Students often forget it and say a square-based pyramid has only 4 faces.

2 (1 mark)

Circle the solid that has one flat face and one curved surface.

Options: cylinder, cone, sphere, cube

Cylinder: 2 flat faces (the circles at each end) and 1 curved surface.

Cone: 1 flat face (the circular base) and 1 curved surface.

Sphere: 1 curved surface and no flat faces.

Cube: 6 flat faces and no curved surface.

Answer: cone

Tip: A cylinder has **two** flat circular faces, one at each end, so it does not fit.

3 (1 mark)

Circle the solid that does **not** have a uniform cross section.

Options: cube, cylinder, triangular prism, square-based pyramid

A uniform cross section means every slice straight across the solid is the same shape and size.

Every slice across a cube is the same square.

Every slice across a cylinder is the same circle.

Every slice across a triangular prism is the same triangle.

Slices across a pyramid get smaller towards the top, so its cross section is not uniform.

Answer: square-based pyramid

Tip: Prisms (including cubes and cuboids) and cylinders have a uniform cross section. Pyramids, cones and spheres do not.

4 (2 marks)

(a) How many edges does a cube have?

Circle your answer.

Options: 6, 8, 12, 24

There are 4 edges round the top face.

There are 4 edges round the bottom face.

There are 4 upright edges joining them.

$$4 + 4 + 4 = 12$$

Answer: 12

Tip: 6 is the number of faces and 8 is the number of vertices. Edges are the lines where two faces meet.

- (b) The base of a pyramid is a hexagon.
How many of the faces of the pyramid are triangles?
Circle your answer.

Options: 5, 6, 7, 12

A hexagon has 6 sides.

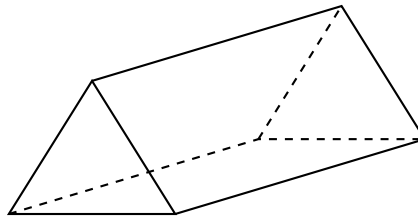
Each side of the base has a triangle going up to the top.

So there are 6 triangular faces (plus the hexagon base, 7 faces in total).

Answer: 6

5 (2 marks)

Here is a solid prism.



Not drawn accurately

- (a) How many faces does the prism have?

There are 2 triangle faces (the ends).

There are 3 rectangle faces.

$$2 + 3 = 5$$

Answer: 5

(b) How many vertices does the prism have?

Each triangular end has 3 corners.

$$3 + 3 = 6$$

Answer: 6

6 (3 marks)

Complete the table.

	Faces	Edges	Vertices
Pentagonal prism	7		
Triangular-based pyramid		6	
Square-based pyramid			5

Pentagonal prism: 2 pentagon ends + 5 rectangles = 7 faces.

Edges: 5 round each end and 5 joining the ends, so $5 + 5 + 5 = 15$ edges.

Vertices: 5 at each end, so 10 vertices.

Triangular-based pyramid: 1 triangle base + 3 triangles round the sides = 4 faces.

Vertices: 3 round the base and 1 at the top, so 4 vertices.

Square-based pyramid: 1 square + 4 triangles = 5 faces.

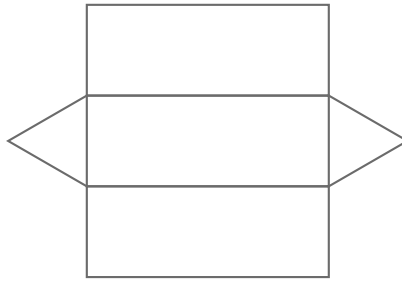
Edges: 4 round the base + 4 sloping = 8 edges.

Answer: Pentagonal prism: 15 edges, 10 vertices. Triangular-based pyramid: 4 faces, 4 vertices. Square-based pyramid: 5 faces, 8 edges.

Marks: 3 marks for all six missing numbers correct. 2 marks for four or five correct. 1 mark for two or three correct.

7 (1 mark)

Here is the net of a 3D shape.



Write down the name of the 3D shape.

The net has 2 triangles and 3 rectangles.

The triangles fold up to make the two ends.

The rectangles make the sides that join the ends.

Answer: Triangular prism

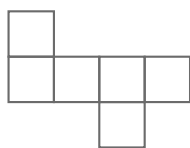
8 (1 mark)

Here are four nets.

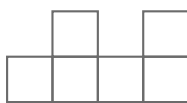
Each net is made from six squares.

Which net will **not** fold to make a cube?

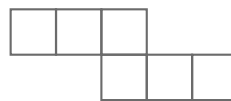
Circle the correct letter.



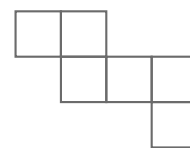
A



B



C



D

Imagine folding each net, keeping one square as the base.

A: a row of four squares makes the four sides, with one square folding up to make the top and one folding down to make the bottom. This works.

B: a row of four squares makes the four sides, but **both** of the squares above the row fold over to make the top.

So two faces overlap and there is no bottom. B does not make a cube.

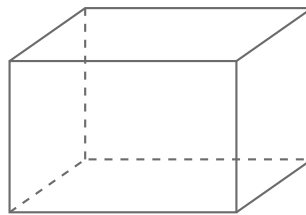
C and D both fold up with one square on each face of the cube.

Answer: B

Tip: When a net has a row of four squares, there must be exactly one square on each side of the row (one above and one below).

9 (1 mark)

Here is a cuboid.



Sam says,

‘A cuboid has 8 edges.’

Is Sam correct? Tick a box.

Give a reason for your answer.

Count the edges of the cuboid.

4 edges on the top.

4 edges on the bottom.

4 upright edges.

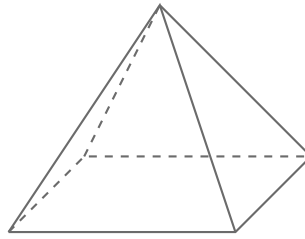
$4 + 4 + 4 = 12$ edges.

Sam has given the number of vertices (8), not edges.

Answer: No, a cuboid has 12 edges (it has 8 vertices).

10 (2 marks)

Here is a square-based pyramid.



The base is a square with sides of length 4 cm.

Each triangular face has a base of 4 cm and a perpendicular height of 3 cm.

The square base of the net is drawn on the centimetre grid.

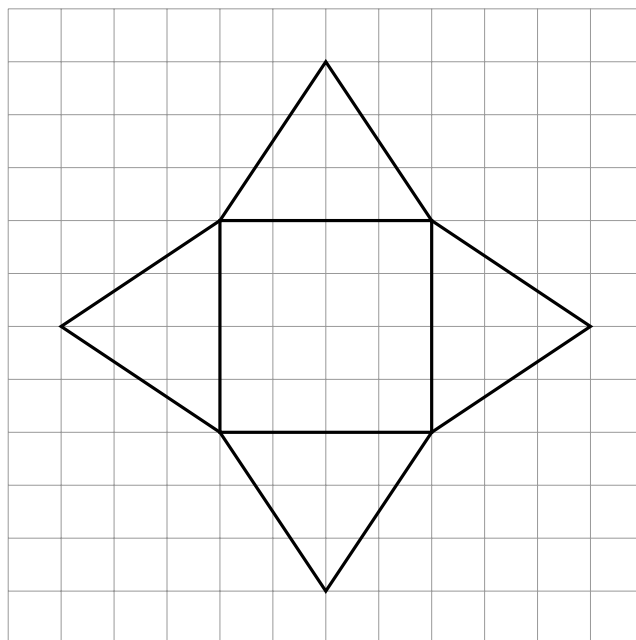
Draw the four triangles to complete a net of the pyramid on the centimetre grid.

A square-based pyramid has 5 faces: the square base and 4 triangles.

Each triangle sits on one side of the square.

Each triangle has a base of 4 cm (a side of the square) and its top point is 3 cm out from the middle of that side.

One correct net is shown below.



Answer: Four triangles, each with base 4 cm (a side of the square) and height 3 cm

Tip: Put the top point of each triangle 3 cm from the **middle** of its side, not above a corner, or the faces will not meet at one point.

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

11 (4 marks)

A cuboid has a square base.

The area of the base is 36 cm^2 .

The edges of the cuboid have a total length of 84 cm.

Work out the height of the cuboid.

The base is a square with area 36 cm^2 , so each side of the base is $\sqrt{36} = 6 \text{ cm}$.

A cuboid has 12 edges: 4 round the base, 4 round the top and 4 upright edges.

The base and the top are both 6 cm squares, so they use $8 \times 6 = 48 \text{ cm}$

The 4 upright edges add up to $84 - 48 = 36 \text{ cm}$

Height of the cuboid: $36 \div 4 = 9$ cm

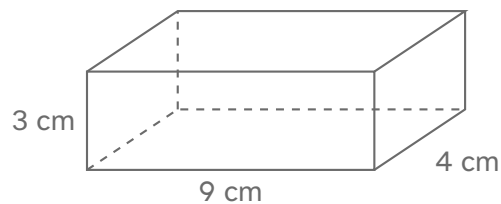
Answer: 9 cm

Tip: Don't forget the edges round the top. A common mistake is to count only the 4 base edges and get $(84 - 24) \div 4 = 15$.

Marks: 1 mark for a side of the base of 6. 1 mark for $8 \times 6 = 48$. 1 mark for $84 - 48 = 36$. 1 mark for 9.

12 (3 marks)

Here is a cuboid.



Not drawn accurately

A cube has the same total surface area as this cuboid.
Work out the length of one edge of the cube.
You must show your working.

A cuboid has three pairs of matching faces.

$$9 \times 4 = 36 \text{ cm}^2$$

$$9 \times 3 = 27 \text{ cm}^2$$

$$4 \times 3 = 12 \text{ cm}^2$$

$$\text{Total surface area: } 2 \times (36 + 27 + 12) = 2 \times 75 = 150 \text{ cm}^2$$

$$\text{A cube has 6 identical square faces, so one face has area } 150 \div 6 = 25 \text{ cm}^2$$

Edge of the cube: $\sqrt{25} = 5$ cm

Answer: 5 cm

Tip: Don't stop at 25: that is the area of one face of the cube. The edge length is the square root, 5 cm.

Marks: 1 mark for the area of one face of the cuboid, e.g. 9×4 . 1 mark for 150. 1 mark for 5.
