3D Shapes - Worksheet

Skill

Group A - Sketching 3D shapes
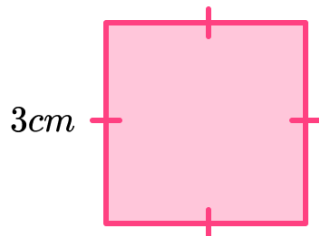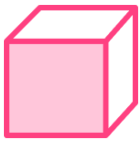
Sketch the following 3D shapes

1) Cube

2) Cuboid

3) Triangular Prism

4) Square Based Pyramid

5) Cylinder

6) Cone

7) Sphere

8) Triangular based pyramid

9) L-Shaped Prism

10) Hemisphere
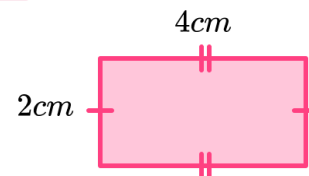
11) Tetrahedron
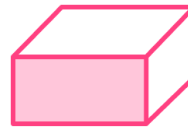
12) Octahedron

Group B - Area of faces of 3D shapes

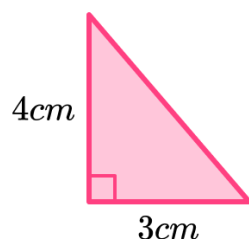Calculate the area of the highlighted face on the 3D shape

1)
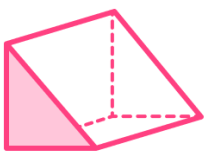

$3cm$

2)

$4cm$

$2cm$

3)

$4cm$

$3cm$

4)

$5cm$

$2cm$

3D Shapes - Worksheet

5)

$3cm$

$4cm$

$2cm$

6)

$2cm$

$6cm$

$4cm$

7)

$3cm$

$4cm$

$6cm$

$2cm$

8)

$4cm$

9)

$3cm$

10)

$2cm$

$6cm$

11)

$4cm$

$5cm$

$1cm$

$6cm$

12)

$8cm$

$1cm$

$1cm$

$5cm$

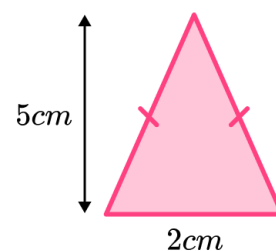**thirdspacelearning.com**   Helping schools close the maths attainment gap through targeted one to one teaching and flexible resources
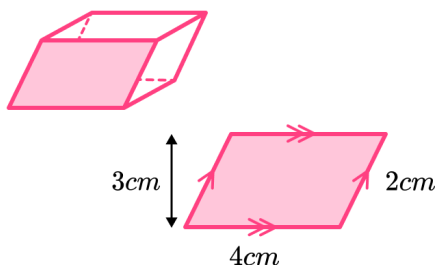
2

3D Shapes - Worksheet

Group C - Volume and surface area of 3D shapes

Given the dimensions of the front face in **Group B**, use the rest of the information to calculate the volume, surface area or depth of the 3D shape:

1)

$3cm$
$3cm$
$3cm$

Calculate the volume of the cube.

2)

$2cm$
$4cm$

Volume = $24cm^3$
Calculate the depth of the cuboid.

3)

$4cm$
$3cm$
$5cm$

Calculate the volume of the triangular prism.

4)

$5cm$
$2cm$

Volume = $60cm^3$
Calculate the depth of the triangular prism.

5)

$3cm$
$4cm$
$2cm$
$3cm$

Calculate the surface area of the parallelogram prism.

6)

$2cm$
$6cm$
$4cm$
$6.5cm$

Calculate the volume of the trapezoidal prism.

7)

$3cm$
$4cm$
$2cm$
$8cm$
$6cm$
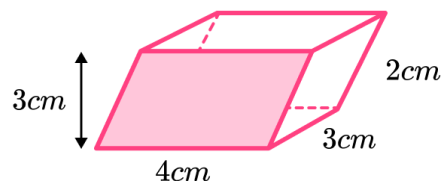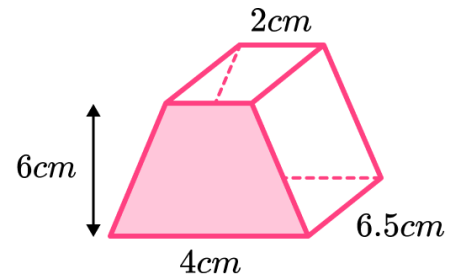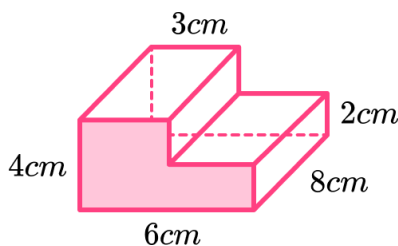
Calculate the surface area of the L-shaped prism.

8)

$4cm$
$10cm$

Calculate the volume of the cylinder, correct to 3sf.
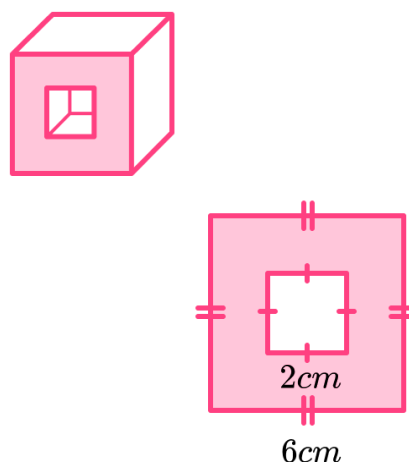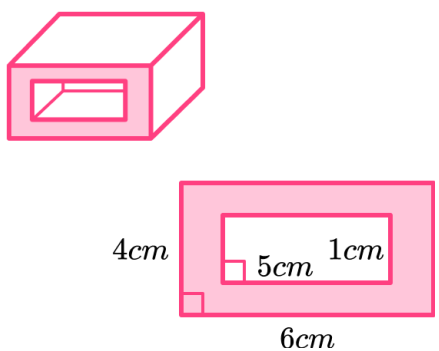
9)

$6cm$
$3cm$

Calculate the volume of the cone, correct to 3sf.

3D Shapes - Worksheet

10)

$2cm$

$6cm$

Volume = $192cm^3$
Calculate the depth of the 3D polyhedron.

11)

$4cm$

$5cm$

$1cm$

$6cm$

Volume = $123.5cm^3$
Calculate the depth of the 3D polyhedron.

12)

$8cm$

$1cm$

$5cm$

$1cm$

Volume = $156cm^3$
Calculate the depth of the 3D polyhedron.

Group D - Vertices, Edges and Faces

State the number of vertices, edges and faces of each 3D shape.

1) Cube

Vertices:

Edges:

Faces:

2) Cuboid

Vertices:

Edges:

Faces:

3) Triangular Prism

Vertices:

Edges:

Faces:

4) Square Based Pyramid

Vertices:

Edges:

Faces:

5) Triangular based pyramid

Vertices:

Edges:

Faces:

6) Tetrahedron

Vertices:

Edges:

Faces:

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3D Shapes - Worksheet

7) Cylinder

Vertices:

Edges:

Faces:

8) Sphere

Vertices:

Edges:

Faces:

9) Cone

Vertices:

Edges:

Faces:

10) L-Shaped Prism

Vertices:

Edges:

Faces:

11) Hemisphere

Vertices:

Edges:

Faces:

12) Octahedron

Vertices:

Edges:

Faces:

3D Shapes - Worksheet

Applied

1) Below is a list of 3D shapes.

| Dodecahedron | Tetrahedron | Sphere | Cube | Triangular Prism |

    (a) Which 3D shape has the greatest number of vertices?

    (b) Which 3D shape has the least number of faces?

2)   **(a)** Determine whether the sum of the number of vertices, edges and faces of a 3D shape is always / sometimes / never equal to 26.

    (b) Let E represent the number of edges and F represent the number of faces. Is F-E always / sometimes / never equal to 1?

3)   **(a)** A cube has a side length of $6.4cm$.
Calculate the surface area of the cube.
State the units.

    (b) Calculate the volume of the same cube.
State the units.

4)   **(a)** A cuboid with a volume of $42cm^3$.
Each side length is an integer and the area of the cross section is equal to $7cm^2$. Determine the three dimensions of the cuboid.

    (b) A sphere has a surface area of $1256.64cm^3$.
Calculate the radius of the sphere correct to the nearest integer.

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3D Shapes - Exam Questions

1) **(a)** Cube A has a cross sectional area of $64cm^2$. Calculate the volume of Cube A.

…………………cm^3
(2)

(b) Cube B has a volume of $216cm^3$. Calculate the surface area of Cube B. State the units in your answer.

………………
(2)
(4 marks)

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2) **(a)** Below is a sketch of the cross section of a swimming pool.
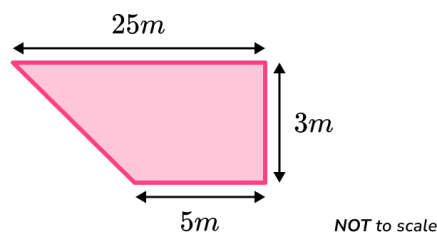
25m

3m

5m   *NOT to scale*

If the pool is $10m$ wide, what volume of water will fill the swimming pool? Write your answer in cubic metres.

…………………m^3
(3)

(b) If $1\ Litre = 0.001m^3$, how many litres of water are in the swimming pool?

………………litres
(2)
(5 marks)

3D Shapes - Exam Questions

3) **(a)** Draw the front view of the following 3D shape:
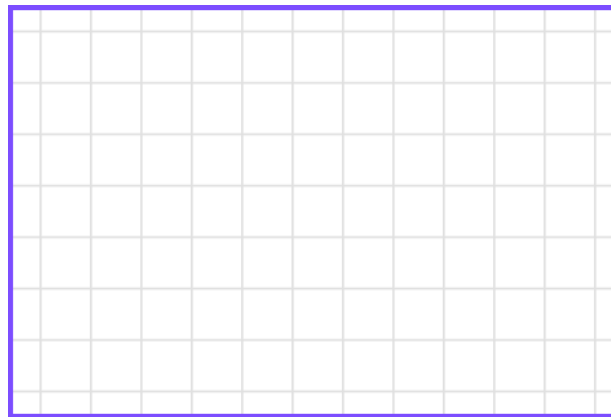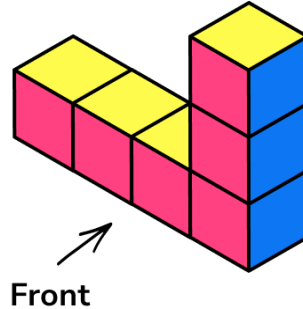
Front

(2)

(b) Draw this 3D shape from the front, side and plan view:

2cm

6cm

6cm

2cm

2cm

6cm

2cm

6cm

Front View   **Plan View**   **Side View**

(3)

(5 marks)

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3D Shapes - Exam Questions

4) **(a)** A cylinder has a volume of $V = \pi r^2 h$.

Calculate the radius of a cylinder with a volume of $360\pi \ cm^3$
and a height of $10 cm$.
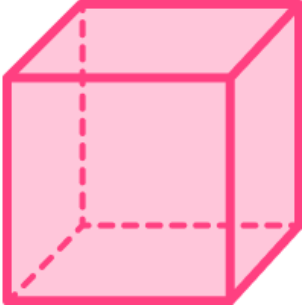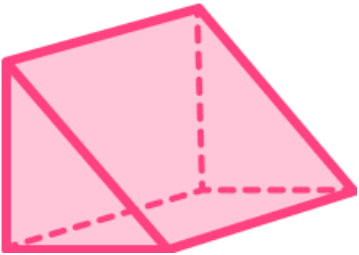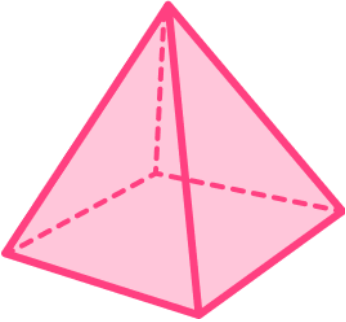
…………………cm

(3)

(b) Calculate the volume to surface area ratio for the cylinder.
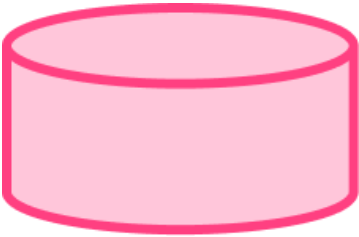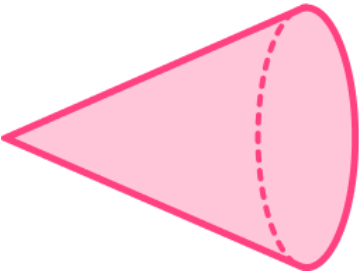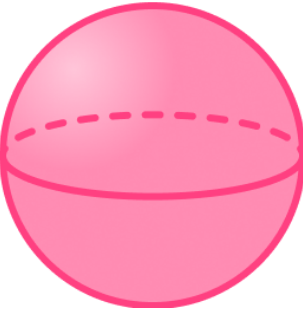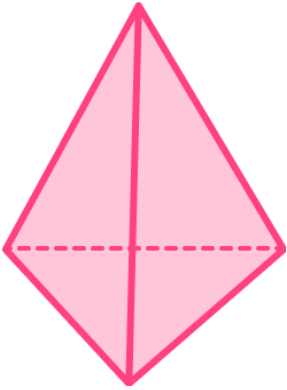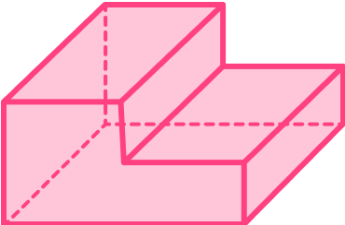
Write the ratio in its simplest form.

…………………

(5)
(8 marks)
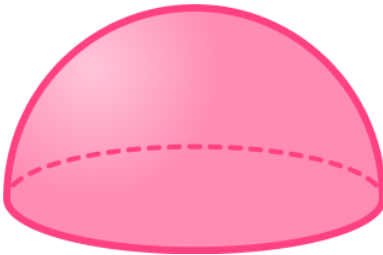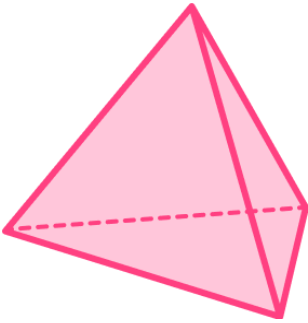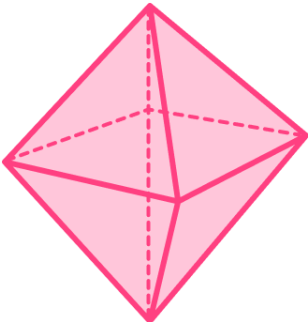
3D Shapes - Answers

	Question	Answer
	Skill Questions	
Group A	Sketch the following 3D shapes **1)** Cube	**1)**
	2) Cuboid	**2)**
	3) Triangular Prism	**3)**
	4) Square Based Pyramid	**4)**

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10
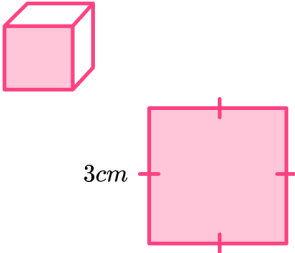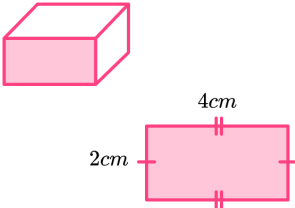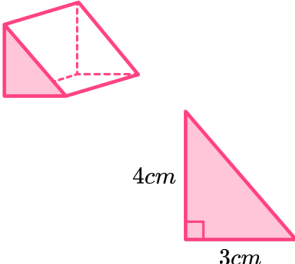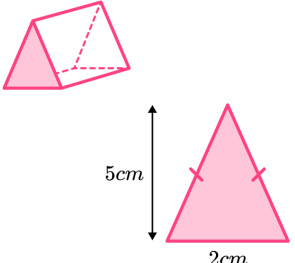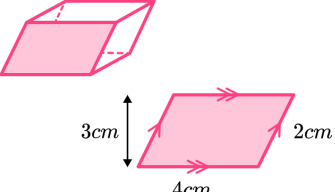
3D Shapes - Answers

Group A contd	5) Cylinder	5)
	6) Cone	6)
	7) Sphere	7)
	8) Triangular Based Pyramid	8)
	9) L-Shaped Prism	9)
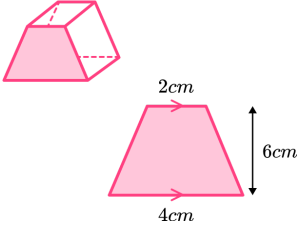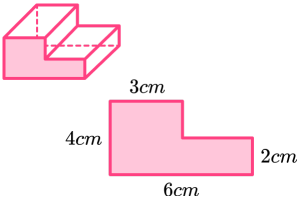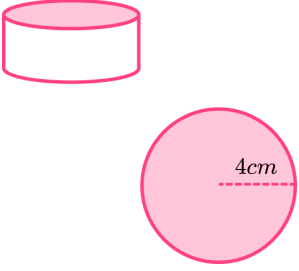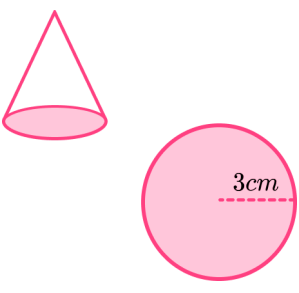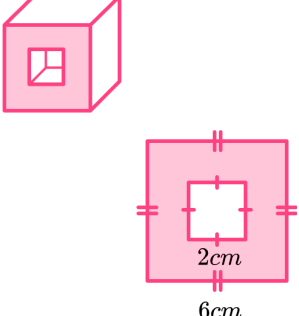
3D Shapes - Answers

Group A contd	**10)** Hemisphere	**10)**
	11) Tetrahedron	**11)**
	12) Octahedron	**12)**
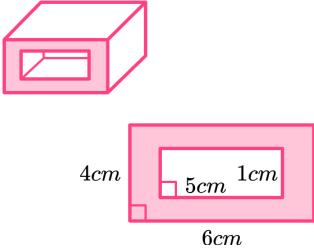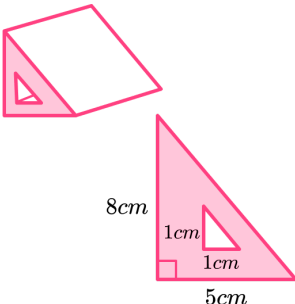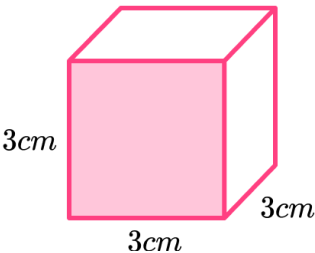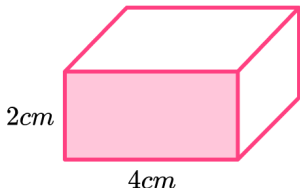
3D Shapes - Answers

Group B	Calculate the area of the highlighted face on the 3D shape	
	1) 3cm	**1)** $A = 3^2 = 9cm^2$
	2) 4cm 2cm	**2)** $A = 4 \times 2 = 8cm^2$
	3) 4cm 3cm	**3)** $A = \frac{4 \times 3}{2} = 6cm^2$
	4) 5cm 2cm	**4)** $A = \frac{5 \times 2}{2} = 5cm^2$
	5) 3cm 2cm 4cm	**5)** $A = 4 \times 3 = 12cm^2$

3D Shapes - Answers

Group B	6)	

6)

6) $A = \frac{(4+2)}{2} \times 6$

$A = 3 \times 6 = 18cm^2$

7)

7) $A = 4 \times 3 + 3 \times 2$

$A = 12 + 6 = 18cm^2$

8)

8) $A = \pi \times 4^2$

$A = 16\pi$

$A = 50.27cm^2 \, (2dp)$

9)

9) $A = \pi \times 3^2$

$A = 9\pi$

$A = 28.27cm^2 \, (2dp)$

10)

10) $A = 6^2 - 2^2$

$A = 36 - 4 = 32cm^2$

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3D Shapes - Answers

Group B	**11)** 4cm, 5cm, 1cm, 6cm **12)** 8cm, 1cm, 1cm, 5cm	**11)** $A = 6 \times 4 - 5 \times 1$ $A = 24 - 5 = 19cm^2$ **12)** $A = \frac{8 \times 5}{2} - \frac{1 \times 1}{2}$ $A = 20 - \frac{1}{2} = 19.5cm^2$
Group C	Given the dimensions of the front face in **Group B**, use the rest of the information to calculate the volume, surface area or depth of the 3D shape. **1)** 3cm, 3cm, 3cm Calculate the volume of the cube. **2)** 2cm, 4cm Volume = $24cm^3$ Calculate the depth of the cuboid.	**1)** $9 \times 3 = 27cm^3$ **2)** $24 \div 8 = 3cm$

3D Shapes - Answers

| Group C contd | 3)
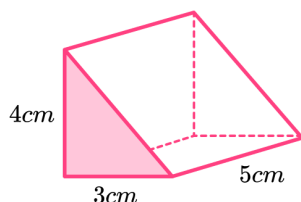
Calculate the volume of the triangular prism.

4)
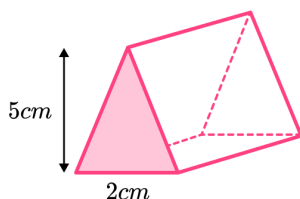
Volume = $60cm^3$
Calculate the depth of the triangular prism.

5)
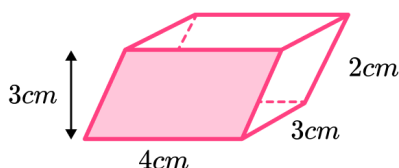
Calculate the surface area of the parallelogram prism.

6)
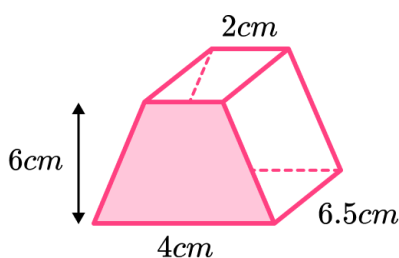
Calculate the volume of the trapezoidal prism.

7)
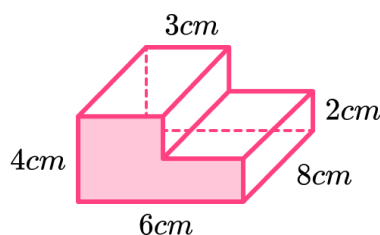
Calculate the surface area of the L-shaped prism. | **3)** $6 \times 5 = 30cm^3$

4) $60 \div 5 = 12cm$

5) $12 \times 2 = 24cm^2$
$(4 \times 3) + (2 \times 3) +$
$(2 \times 3) + (4 \times 3) = 36cm^2$

$24 + 36 = 60cm^2$

6) $18 \times 6.5 = 117cm^3$

7) $18 \times 2 = 36cm^2$
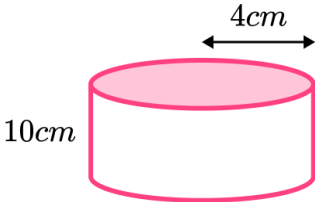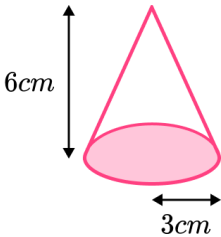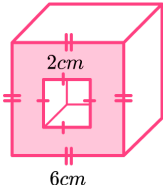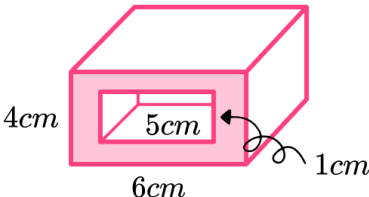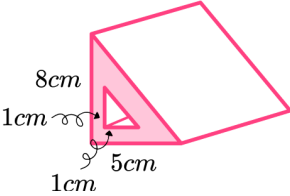
$(6 \times 8) + (4 \times 8) + (3 \times 8) +$
$(2 \times 8) + (3 \times 8) + (2 \times 8)$
$= 160cm^2$

$36 + 160 = 196cm^2$ |

3D Shapes - Answers

Group C contd	8) Calculate the volume of the cylinder, correct to 3sf.	**8)** $50.27 \times 10 = 503cm^3$ (3sf)
	9) Calculate the volume of the cone, correct to 3sf.	**9)** $28.27 \times 6 \div 3 = 56.5cm^3$ (3sf)
	10) Volume = $192cm^3$ Calculate the depth of the 3D polyhedron.	**10)** $192 \div 32 = 6cm$
	11) Volume = $123.5cm^3$ Calculate the depth of the 3D polyhedron.	**11)** $123.5 \div 19 = 6.5cm$
	12) Volume = $156cm^3$ Calculate the depth of the 3D polyhedron.	**12)** $156 \div 19.5 = 8cm$

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3D Shapes - Answers

Group D	State the number of vertices, edges and faces of each 3D shape.	
	1) Cube Vertices: Edges: Faces:	**1) Cube** Vertices: 8 Edges: 12 Faces: 6
	2) Cuboid Vertices: Edges: Faces:	**2) Cuboid** Vertices: 8 Edges: 12 Faces: 6
	3) Triangular Prism Vertices: Edges: Faces:	**3) Triangular Prism** Vertices: 6 Edges: 9 Faces: 5
	4) Square Based Pyramid Vertices: Edges: Faces:	**4) Square Based Pyramid** Vertices: 5 Edges: 8 Faces: 5
	5) Triangular based pyramid Vertices: Edges: Faces:	**5) Triangular based pyramid** Vertices: 4 Edges: 6 Faces: 4
	6) Tetrahedron Vertices: Edges: Faces:	**6) Tetrahedron** Vertices: 4 Edges: 6 Faces: 4
	7) Cylinder Vertices: Edges: Faces:	**7) Cylinder** Vertices: 0 Edges: 2 Faces: 3

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THIRD SPACE
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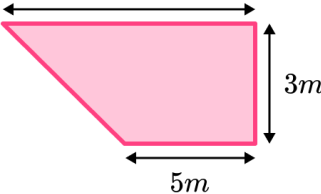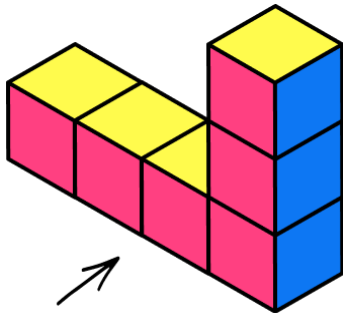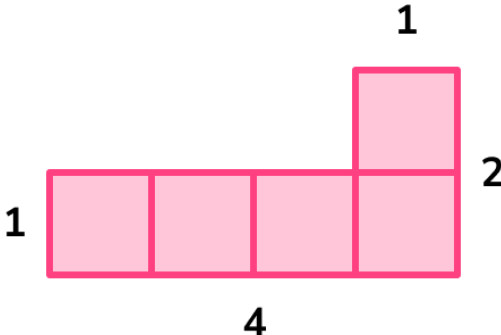
3D Shapes - Answers

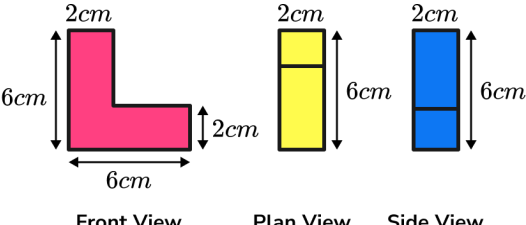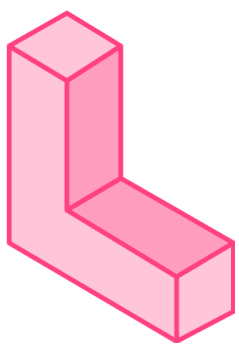| Group D contd		
	8) Sphere Vertices: Edges: Faces:	**8) Sphere** Vertices: 0 Edges: 0 Faces: 1
	9) Cone Vertices: Edges: Faces:	**9) Cone** Vertices: 1 Edges: 1 Faces: 2
	10) L-Shaped Prism Vertices: Edges: Faces:	**10) L-Shaped Prism** Vertices: 12 Edges: 18 Faces: 8
	11) Hemisphere Vertices: Edges: Faces:	**11) Hemisphere** Vertices: 0 Edges: 1 Faces: 2
	12) Octahedron Vertices: Edges: Faces:	**12) Octahedron** Vertices: 6 Edges: 12 Faces: 8

3D Shapes - Answers

	Question	Answer
	Applied Questions	
1)	Below is a list of 3D shapes. **Dodecahedron Tetrahedron Sphere** **Cube Triangular Prism** **a)** Which 3D shape has the greatest number of vertices? **b)** Which 3D shape has the least number of faces?	**a)** Dodecahedron **b)** Sphere
2)	**a)** Determine whether the sum of the number of vertices, edges and faces of a 3D shape is always / sometimes / never equal to 26. **b)** Let E represent the number of edges and F represent the number of faces. Is F-E always / sometimes / never equal to 1?	**a)** Cube $= 8 + 12 + 6 = 26$ Counter example: Cylinder $= 0 + 3 + 2 = 5$ Sometimes **b)** Cone $= F - E = 2 - 1 = 1$ Counter example: Cube $= 6 - 12 = -6$ Sometimes
3)	**a)** A cube has a side length of $6.4cm$. Calculate the surface area of the cube. State the units. **b)** Calculate the volume of the same cube. State the units.	**a)** $SA = 6.4^2 \times 6$ $= 245.76cm^2$ **b)** $V = 6.4^3 = 262.144cm^3$
4)	**a)** A cuboid with a volume of $42cm^3$. Each side length is an integer and the area of the cross section is equal to $7cm^2$. Determine the three dimensions of the cuboid. **b)** A sphere has a surface area of $1256.64cm^3$. Calculate the radius of the sphere correct to the nearest integer.	**a)** $7 = 1 \times 7$ (only) $42 \div 7 = 6$ $1 \times 7 \times 6$ **b)** $SA = 4\pi r^2 = 1256.64$ $\pi r^2 = 314.16$ $r^2 = 100.000...$ $r = 10cm$ (0dp)

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3D Shapes - Mark Scheme

		Question	Answer	
		Exam Questions		
1)	**(a)**	Cube A has a cross sectional area of $64cm^2$. Calculate the volume of Cube A.	**(a)** $\sqrt{64} = 8cm$ $8^3 = 512cm^3$	**(1)** **(1)**
	(b)	Cube B has a volume of $216cm^3$. Calculate the surface area of Cube B. State the units in your answer.	**(b)** $\sqrt[3]{216} = 6cm$ $6^2 \times 6 = 216$ cm^2	**(1)** **(1)** **(1)**
2)	**(a)**	Below is a sketch of the cross section of a swimming pool. 25m 3m 5m *NOT* to scale If the pool is $10m$ wide, what volume of water will fill the swimming pool? Write your answer in cubic metres.	**(a)** $V = (\frac{25+5}{2} \times 3) \times 10$ $= 15 \times 3 \times 10$ $= 450m^3$	**(1)** **(1)** **(1)**
	(b)	If $1\,Litre = 0.001m^3$, how many litres of water are in the swimming pool?	**(b)** $1000L = 1m^3$ $450m^3 = 450,000L$	**(1)** **(1)**
3)	**(a)**	Draw the front view of the following 3D shape: **Front**	**(a)** For 'L-shape' For correct dimensions	**(1)** **(1)**

3D Shapes - Mark Scheme

(b)	Draw the 3D shape from the following front, side and plan view: $2cm$ — $6cm$ — $2cm$ — $6cm$ **Front View** **Plan View** **Side View**	**(b)** For height of 6 For base of 6 For fully correct diagram	**(1)** **(1)** **(1)**
4) (a)	A cylinder has a volume of $V = \pi r^2 h$. Calculate the radius of a cylinder with a volume of $360\pi \; cm^3$ and a height of 10cm.	**(a)** $\pi r^2 \times 10 = 360\pi$ $r^2 = 36$ $r = 6cm$	**(1)** **(1)** **(1)**
(b)	Calculate the volume to surface area ratio for the cylinder. Write the ratio in its simplest form.	**(b)** $SA = 2\pi r^2 + 2\pi rh$ $= 72\pi + 120\pi$ $= 192\pi$ $360\pi : 192\pi$ $15 : 8$	**(1)** **(1)** **(1)** **(1)** **(1)**

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