



Circles, sectors, areas, prisms and solids

Grades 4–9 About 85 minutes Calculator allowed

94 marks

Name _____

Class _____

Date _____

A Before you start

Grades 4–5

You will need these in every question below.

A1 Work out the area of a triangle with base 9 cm and perpendicular height 7 cm. [1 mark]

Answer

A2 Change 3.5 m^2 into cm^2 . [1 mark]

Answer

A3 Work out the circumference of a circle with diameter 8 cm. Give your answer correct to 1 decimal place. [2 marks]

Answer

A4 Work out the volume of a cuboid that measures 6 cm by 4 cm by 2.5 cm. [1 mark]

Answer

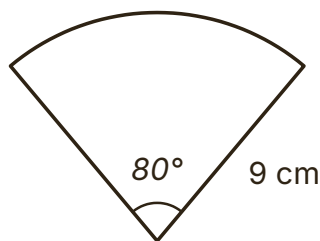
A5 Work out the area of a circle with radius 5 cm. Give your answer in terms of π . [1 mark]

Answer

Your teacher works through each example with you. Then try the one beside it on your own.

EXAMPLE 1

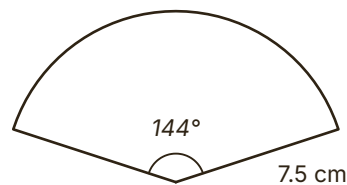
A sector has radius 9 cm and angle 80° . Work out its area. Give your answer correct to 3 significant figures.



Not drawn accurately

Hint A sector is a fraction of the whole circle. Here the fraction is $\frac{80}{360}$.

- B1** The diagram shows a sector of a circle. Work out the length of its arc. Give your answer correct to 3 significant figures. [2 marks]

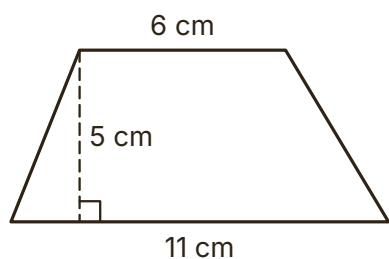


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Answer

EXAMPLE 2

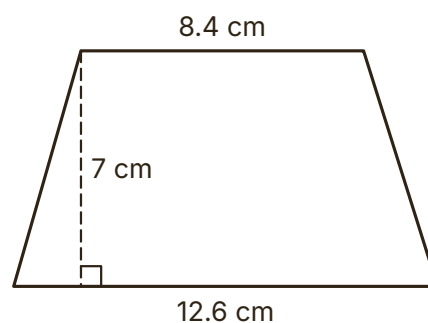
A trapezium has parallel sides of 6 cm and 11 cm. The perpendicular distance between them is 5 cm. Work out its area.



Not drawn accurately

Hint Add the parallel sides, halve, and multiply by the height.

- B2** Work out the area of the trapezium. [2 marks]

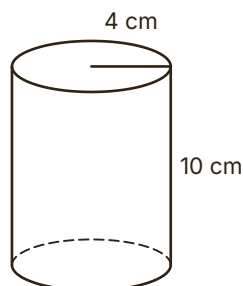


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Answer

EXAMPLE 3

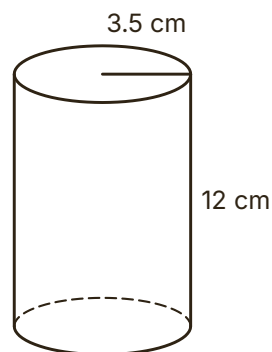
A cylinder has radius 4 cm and height 10 cm. Work out its volume. Give your answer correct to 3 significant figures.



Not drawn accurately

Hint A cylinder is a prism. Its cross-section is a circle, so the volume is $\pi r^2 h$.

- B3** The diagram shows a closed cylinder. Work out its total surface area. Give your answer correct to 3 significant figures. [3 marks]

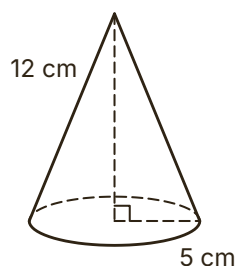


Not drawn accurately

Answer

EXAMPLE 4

A cone has base radius 5 cm and perpendicular height 12 cm. Work out its volume. Give your answer correct to 3 significant figures.



Not drawn accurately

Hint A cone holds one third of the cylinder with the same base and height.

- B4** A sphere has radius 4.5 cm. Work out its volume. Give your answer correct to 3 significant figures. [2 marks]

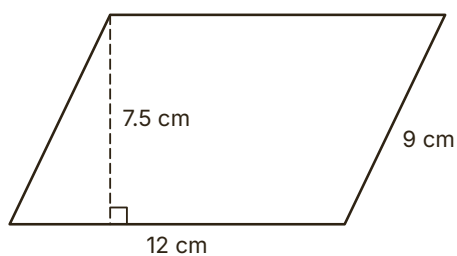
Answer

Each question asks for something different. Show your working.

- C1** A circle has an area of 50 cm^2 . Work out its radius. Give your answer correct to 3 significant figures. [2 marks]

Answer

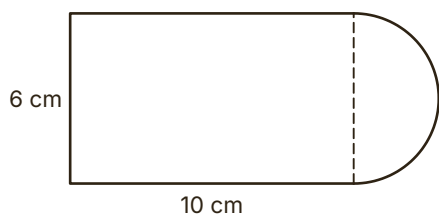
- C2** Work out the area of the parallelogram. [2 marks]



Not drawn accurately

Answer

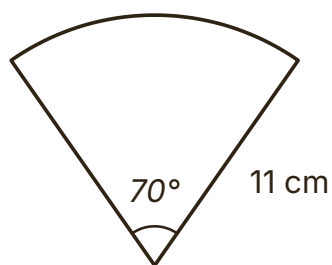
- C3** The shape is a rectangle with a semicircle on one end. Work out its perimeter. Give your answer correct to 3 significant figures. [3 marks]



Not drawn accurately

Answer

C4 The diagram shows a sector of a circle.



Not drawn accurately

(a) Work out the arc length. Give your answer correct to 3 significant figures. [2 marks]

Answer

(b) Work out the perimeter of the sector. [1 mark]

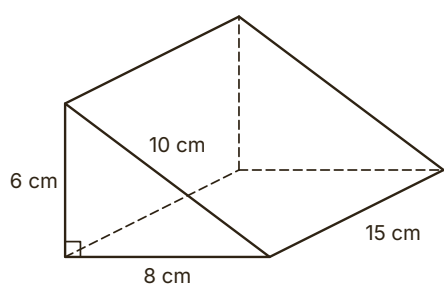
Answer

(c) Work out the area of the sector. Give your answer correct to 3 significant figures. [2 marks]

Answer

Total for C4: 5 marks

C5 The diagram shows a triangular prism.



Not drawn accurately

(a) Work out the volume of the prism. [2 marks]

Answer

(b) Work out the total surface area of the prism.

[3 marks]

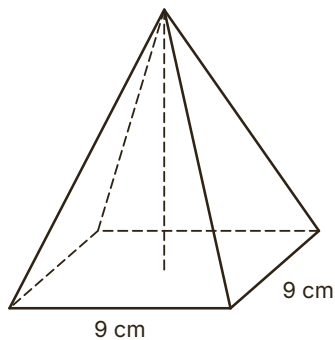
Answer

Total for C5: 5 marks

- C6** A cylindrical jug has radius 5 cm. It holds exactly 1 litre of water when full. Work out the height of the jug. Give your answer correct to 3 significant figures. [3 marks]

Answer

- C7** The diagram shows a pyramid with a square base. The perpendicular height of the pyramid is 14 cm. Work out its volume. [2 marks]



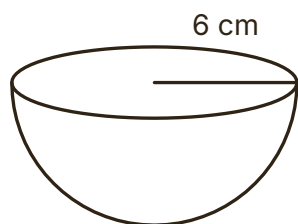
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Answer

- C8** A cone has base radius 5 cm and slant height 13 cm. Work out the area of its curved surface. Give your answer correct to 3 significant figures. [2 marks]

Answer

- C9** The diagram shows a solid hemisphere. Work out its total surface area, including the flat face. Give your answer correct to 3 significant figures. [3 marks]



Not drawn accurately

Answer

D Exam-style questions

Grades 6–9

Answer every question in the space given. Show your working: most of the marks are for method.

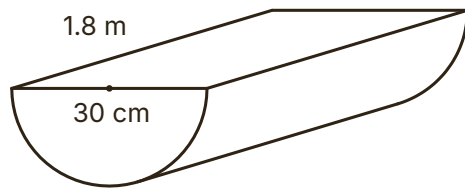
- D1** A trapezium has parallel sides of 7 cm and 11 cm. Its area is 72 cm^2 . Work out the perpendicular distance between the parallel sides. [3 marks]

Answer

- D2** Mia says, "A sphere of radius 3 cm holds more than a cylinder of radius 3 cm and height 4 cm." [3 marks]

Show that Mia is wrong.

- D3** A water trough is a prism. Its cross-section is a semicircle of radius 30 cm. The trough is 1.8 m long.



Not drawn accurately

- (a) Work out the volume of the trough in litres. Give your answer correct to 3 significant figures. [4 marks]

Answer

- (b) Water flows into the empty trough at 12 litres per minute. How long does it take to fill the trough? Give your answer to the nearest minute. [2 marks]

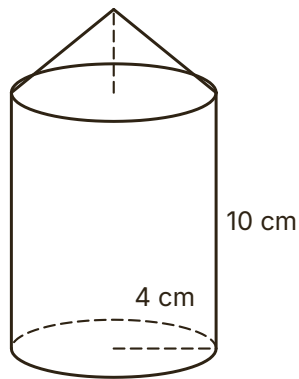
Answer

Total for D3: 6 marks

- D4** A sector of a circle has radius 12 cm. Its area is $56\pi \text{ cm}^2$. Work out the angle of the sector. [3 marks]

Answer

- D5** The solid is made from a cylinder with a cone on top. They have the same radius. The cone is 3 cm tall. Work out the volume of the solid. Give your answer correct to 3 significant figures. [4 marks]



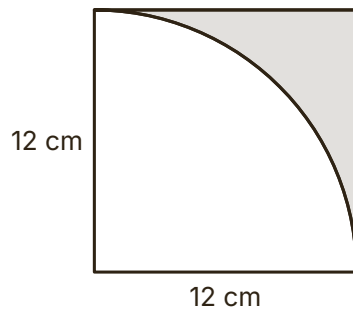
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Answer

- D6** A solid metal sphere of radius 9 cm is melted down. All the metal is made into a cylinder of radius 6 cm. Work out the height of the cylinder. [3 marks]

Answer

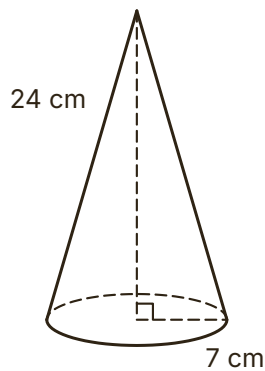
- D7** The diagram shows a square of side 12 cm. A quarter circle of radius 12 cm is drawn with its centre at one corner. Work out the area of the shaded region. Give your answer correct to 3 significant figures. [3 marks]



Not drawn accurately

Answer

- D8** The diagram shows a solid cone. Work out its total surface area. Give your answer correct to 3 significant figures. [4 marks]



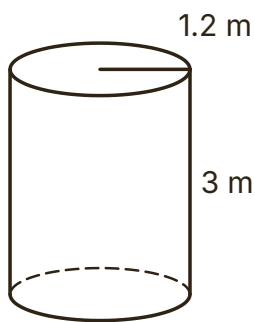
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Answer

- D9** A circular pond has radius 4.5 m. A path 1.5 m wide is laid all the way round the edge of the pond. Paving the path costs £18 per m^2 . Work out the cost of paving the path. Give your answer to the nearest pound. [4 marks]

Answer £

- D10** A closed cylindrical tank is to be painted on the outside, including both ends. One tin of paint covers 8 m^2 . Work out the number of tins needed. [4 marks]



Not drawn accurately

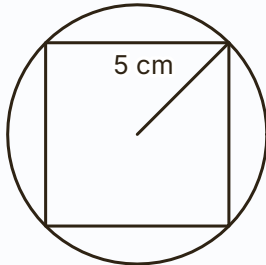
Answer

E Extension

Grade 9 and beyond

No route is given. Spend five minutes on a problem before you look at a hint. The hints are on the last page of the worksheet, and you can use one at a time.

- E1** A square is drawn inside a circle of radius 5 cm. All four corners of the square are on the circle. Work out the area inside the circle but outside the square. Give your answer correct to 3 significant figures. [3 marks]



Not drawn accurately

Answer

- E2** A sector of radius 10 cm and angle 288° is cut from paper. The two straight edges are joined to make a cone with no base. Work out the volume of the cone. Give your answer correct to 3 significant figures. [4 marks]

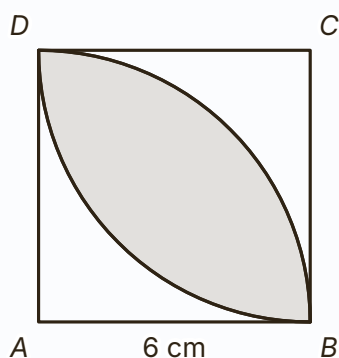
Answer

- E3** A solid cylinder has radius r and height $2r$. A solid sphere has the same volume as the cylinder. [4 marks]

Work out the radius of the sphere in terms of r . Give the number correct to 3 significant figures.

Answer

- E4** $ABCD$ is a square of side 6 cm. One quarter circle has its centre at A and radius 6 cm. Another quarter circle has its centre at C and radius 6 cm. Work out the area of the shaded region where the two quarter circles overlap. Give your answer correct to 3 significant figures. [4 marks]



Not drawn accurately

Answer

F How did it go?

Colour one circle on each line.

	Not yet	Nearly	Yes
I can work out the circumference and area of a circle, and the arc length and area of a sector.	☐	☐	☐
I can work out the area of a parallelogram and a trapezium.	☐	☐	☐
I can work out the volume and surface area of prisms and cylinders.	☐	☐	☐
I can work out the volume and surface area of pyramids, cones and spheres.	☐	☐	☐

Extension hints

Use one hint at a time. Cover the ones below it with a sheet of paper.

-
- | | | |
|-----------|---------------|---|
| E1 | Hint 1 | The diagonals of the square are diameters of the circle. |
| | Hint 2 | Each diagonal is 10 cm. A square with diagonal 10 cm can be split into two triangles with base 10 cm and height 5 cm. |
| | Hint 3 | The square has area 50 cm^2 and the circle has area $25\pi \text{ cm}^2$. |
-
- | | | |
|-----------|---------------|--|
| E2 | Hint 1 | The arc of the sector becomes the circumference of the base of the cone. |
| | Hint 2 | The arc is $\frac{288}{360} \times 2\pi \times 10 = 16\pi$, so the base radius is 8 cm. |
| | Hint 3 | The 10 cm radius becomes the slant height, so the height is $\sqrt{10^2 - 8^2}$. |
-
- | | | |
|-----------|---------------|--|
| E3 | Hint 1 | Write the volume of the cylinder in terms of r . |
| | Hint 2 | The cylinder has volume $\pi r^2 \times 2r = 2\pi r^3$. |
| | Hint 3 | Set $\frac{4}{3}\pi R^3 = 2\pi r^3$ and solve for R . |
-
- | | | |
|-----------|---------------|---|
| E4 | Hint 1 | The diagonal BD cuts the shaded region into two equal pieces. |
| | Hint 2 | Each piece is a quarter circle with the triangle ABD taken away:
$\frac{1}{4} \times \pi \times 6^2 - \frac{1}{2} \times 6 \times 6$. |
| | Hint 3 | That is $9\pi - 18$ for each piece, so the region is $2(9\pi - 18)$. |
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