4.14 Cylinders: Test Pack

EDEXCEL 1MA1 · Calculator allowed · about 60 minutes

Total Marks

Name: _____ Date: ____ / ____ / _____

Answer ALL questions. Show all your working.

Formulae You May Need

Revision Library formulae reminder, styled on Edexcel 1MA1 formulae-sheet conventions; wording is original.

Volume of a cylinder = pi x r^2 x h

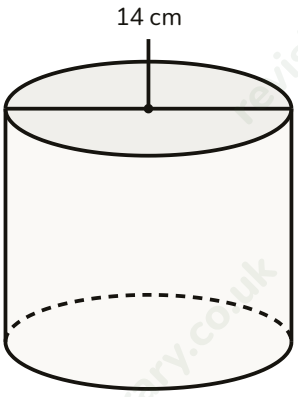
Curved surface area of a cylinder = 2 x pi x r x h

Total surface area of a cylinder = 2 x pi x r x h + 2 x pi x r^2 = 2 x pi x r x (h + r)

The cylinder volume formula follows from prism volume = cross-sectional area x length and circle area = pi x r^2. Derive surface areas from the curved surface and the required circular ends.

1 A cylinder has a diameter of 14 cm. Work out the radius of the cylinder.

Diagram NOT accurately drawn



(Total for Question 1 is 1 mark)

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2 Which of these is the correct formula for the curved surface area of a cylinder with radius r and height h?

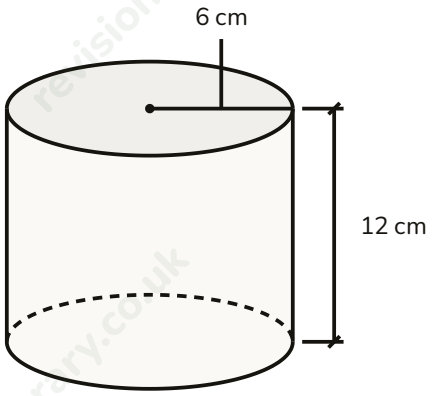
- ☐ A) $A = \pi \times r^2 \times h$
- ☐ B) $A = 2 \times \pi \times r^2$
- ☐ C) $A = 2 \times \pi \times r \times h$
- ☐ D) $A = \pi \times r \times h$

(Total for Question 2 is 1 mark)

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3 A metal storage can is a cylinder with radius 6 cm and height 12 cm. Find the volume of the can in litres. Give your answer correct to 3 significant figures.

Diagram NOT accurately drawn



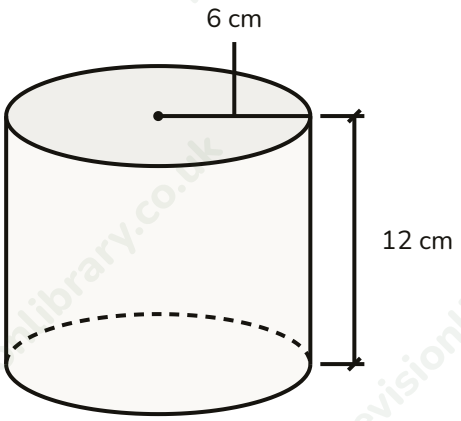
(Total for Question 3 is 3 marks)

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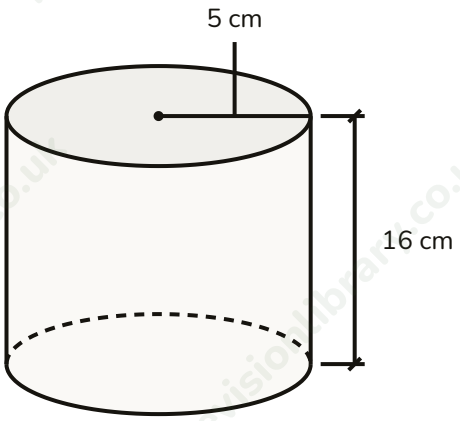
4 Cylinder A has radius 6 cm and height 12 cm. Cylinder B has radius 5 cm and height 16 cm. Show that Cylinder A has the greater volume.

Diagram NOT accurately drawn

Cylinder A



Cylinder B



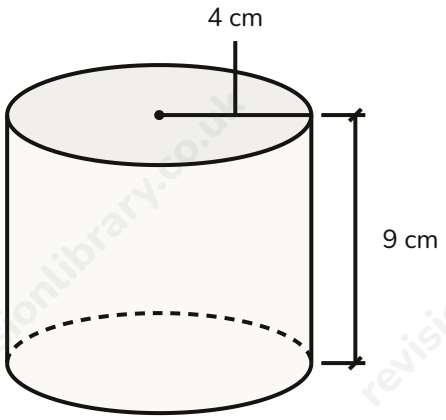
(Total for Question 4 is 4 marks)

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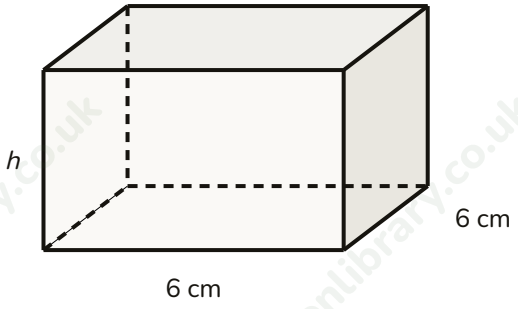
5 A solid cylinder of radius 4 cm and height 9 cm is melted down and recast, with no loss of metal, into a cuboid with a square base of side 6 cm.
Work out the height of the cuboid. Give your answer correct to 1 decimal place.

Diagram NOT accurately drawn

Cylinder



Cuboid

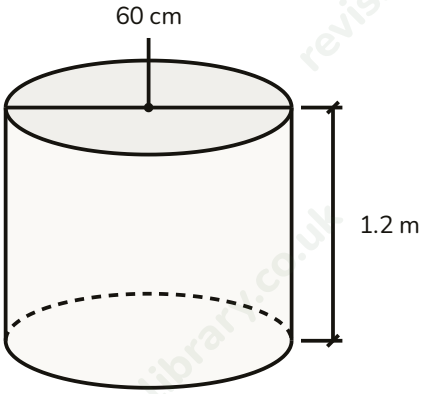


(Total for Question 5 is 4 marks)

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6 A cylindrical water butt has diameter 60 cm and height 1.2 m.
Calculate the volume of the water butt in cm^3. Give your answer correct to 3 significant figures.

Diagram NOT accurately drawn

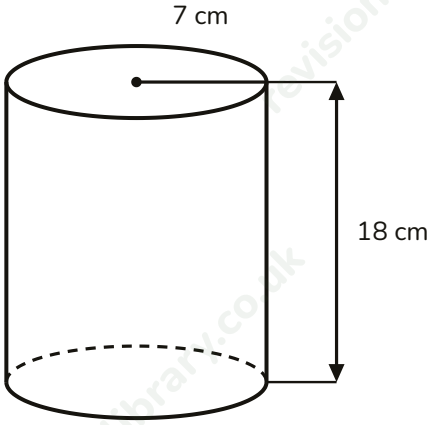


(Total for Question 6 is 3 marks)

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7 A cylindrical tin of paint has radius 7 cm and height 18 cm.

Diagram NOT accurately drawn



(a) Calculate the volume of the tin. Give your answer correct to the nearest whole number. **(2)**

.....

(b) 1 litre = 1000 cm^3. The tin is filled with paint to 90% of its volume. **(2)**
Work out the volume of paint in the tin, in litres. Give your answer correct to 2 decimal places.

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(Total for Question 7 is 4 marks)

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8 The volume of a cylinder is given by $V = \pi \times r^2 \times h$.
Which of these is the correct rearrangement to make h the subject?

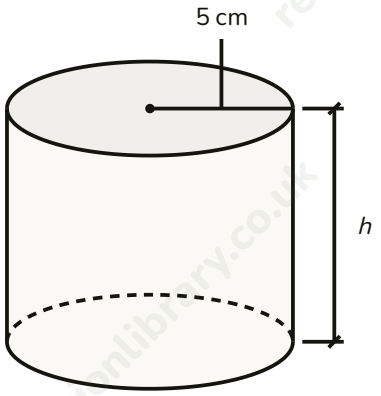
- ☐ A) $h = V / (\pi \times r^2)$
- ☐ B) $h = V \times \pi \times r^2$
- ☐ C) $h = (V/\pi) / r$
- ☐ D) $h = V - \pi \times r^2$

(Total for Question 8 is 1 mark)

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9 A cylinder has radius 5 cm. The volume of the cylinder is 942 cm^3, correct to 3 significant figures.
Work out the height of the cylinder. Give your answer correct to 1 decimal place.

Diagram NOT accurately drawn

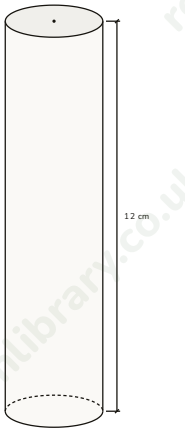


(Total for Question 9 is 3 marks)

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10 A cylinder has radius 1.5 cm and height 12 cm. Calculate the volume of the cylinder. Give your answer correct to 3 significant figures.

Diagram NOT accurately drawn

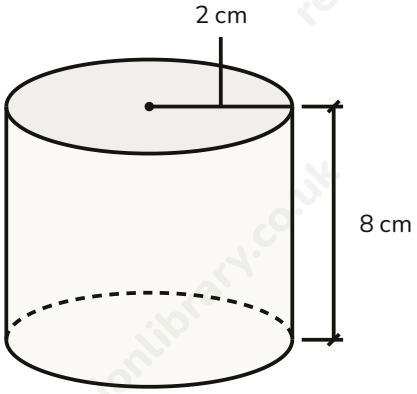


(Total for Question 10 is 2 marks)

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11 Small scented candles are cylinders with radius 2 cm and height 8 cm. A shop has a box with internal volume 5.0 litres. What is the maximum number of these candles that can fit in the box if only volume is considered? You may give an answer as a whole number.

Diagram NOT accurately drawn

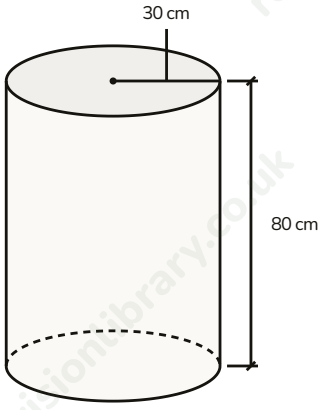


(Total for Question 11 is 3 marks)

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12 Mrs Okafor's cylindrical water butt has radius 30 cm and height 80 cm. Work out the capacity of the water butt in litres, correct to 3 significant figures (1 cm^3 = 1 ml, 1000 ml = 1 litre).

Diagram NOT accurately drawn

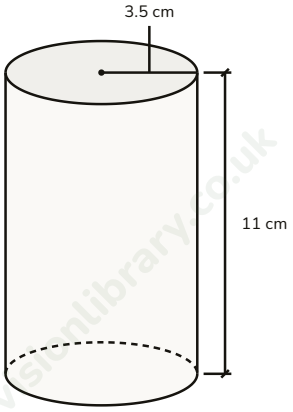


(Total for Question 12 is 3 marks)

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13 Yasmin needs 250 ml of soup for a recipe. She has one unopened tin of soup shaped like a cylinder, with internal radius 3.5 cm and internal height 11 cm. Determine whether the tin contains enough soup for the recipe. Show your working and state how much soup (in ml) would be left over, or how much extra Yasmin would need.

Diagram NOT accurately drawn



(Total for Question 13 is 4 marks)

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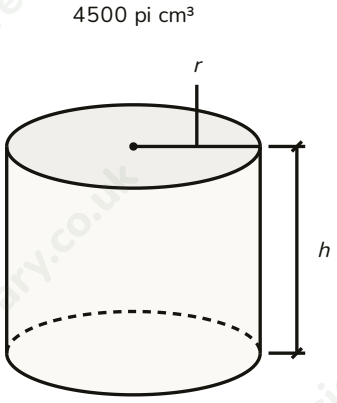
14 Show that if every linear dimension of a cylinder is multiplied by a factor k then its volume is multiplied by k^3. Write down any algebraic steps you use.

(Total for Question 14 is 4 marks)

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15 A cylinder has the property that its curved surface area is equal to the combined area of its two circular bases. If its volume is 4500 π cm^3, find the radius and height of the cylinder. Give answers to 2 decimal places.

Diagram NOT accurately drawn



(Total for Question 15 is 4 marks)

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Mark scheme · 4.14 Cylinders: Test Pack

Question 1

7 cm cao	**B1**

Answer: 7 cm

Question 2

C cao	**B1**

Answer: C

Question 3

calculate volume in cm^3: $V = \pi * 6^2 * 12 = 432pi\ cm^3$	**M1**
convert to litres by dividing by 1000: 432pi / 1000	**M1**
1.36 litres awrt (432pi/1000 = 1.357... so 1.36 to 3 s.f.)	**A1**

Answer: 1.36 litres

Question 4

volume of A = π x 6^2 x 12 oe	**M1**
volume of A = 432pi = awrt 1357 (units cm^3)	**A1**
volume of B = π x 5^2 x 16 oe	**M1**
volume of B = 400pi = awrt 1257 (units cm^3), with conclusion that 1357 > 1257 so A is greater, cso	**A1**

Answer: Volume of A = 1357.2 cm^3, volume of B = 1256.6 cm^3, so Cylinder A has the greater volume.

Question 5

volume of cylinder = π x 4^2 x 9 oe (= 144pi)	**M1**
volume of cuboid = 6 x 6 x h oe, set equal to volume of cylinder	**M1**
h = their 144pi / 36 oe	**M1**
awrt 12.6 (units cm)	**A1**

Answer: 12.6 cm (1 d.p.)

Question 6

1.2 m converted to 120 cm	**M1**
π x 30^2 x 120 oe (radius 30 identified from diameter 60)	**M1**
awrt 339000 (units cm^3)	**A1**

Answer: 339000 cm^3 (3 s.f.)

Question 7

(a) π x 7^2 x 18 oe	**M1**
(a) awrt 2771 (units cm^3)	**A1**

(a) Answer: 2771 cm^3

(b) 0.9 x their (a) ft	**M1**
(b) awrt 2.49 (units litres), converted using 1000 cm^3 = 1 litre	**A1**

(b) Answer: 2.49 litres

Question 8

A cao	**B1**

Answer: A

Question 9

h = V / (π x r^2) oe rearrangement	**M1**
942 / (π x 5^2) oe substitution	**M1**
awrt 12.0 (units cm)	**A1**

Answer: 12.0 cm (1 d.p.)

Question 10

correct substitution into V = π x r^2 x h, e.g. π x 1.5^2 x 12 (oe)	**M1**
awrt 84.8 cm^3 (cao)	**A1**

Answer: 84.8 cm^3 (3 s.f.)

Question 11

calculate volume of one candle: $V = \pi * 2^2 * 8 = 32pi\ cm^3$	**M1**
convert box volume to cm^3: 5.0 litres = 5000 cm^3 and divide: 5000 / (32pi) = 49.74 (2 d.p.)	**M1**
49 candles (whole number, floor of 5000 / (32pi))	**A1**

Answer: 49

Question 12

correct substitution into V = π x r^2 x h, e.g. π x 30^2 x 80 (oe)	**M1**
converting their volume in cm^3 to litres (ft)	**M1**
awrt 226 litres (cao)	**A1**

Answer: 226 litres (3 s.f.)

Question 13

correct substitution into V = π x r^2 x h, e.g. π x 3.5^2 x 11 (oe)	**M1**
awrt 423 cm^3 (or ml) (cao)	**A1**
comparing their volume to 250 ml	**M1**
correct conclusion that there is enough soup, with awrt 173 ml left over (ft)	**A1**

Answer: Yes; the tin holds awrt 423 ml, which is enough, with awrt 173 ml left over.

Question 14

start with $V = \pi * r^2 * h$ and substitute r' = k r, h' = k h giving $V' = \pi * (k\ r)^2 * (k\ h)$	**M1**
simplify to $V' = \pi * k^2 * r^2 * k * h$	**M1**
simplify to $V' = k^3 * (\pi * r^2 * h)$	**A1**
conclude $V' = k^3$ V, stating that volume is multiplied by k^3 oe	**B1**

Answer: V' = k^3 V, so the volume is multiplied by k^3.

Question 15

state equation curved area = area of two bases so $2 * \pi * r * h = 2 * \pi * r^2$ and deduce h = r	**M1**
use volume $V = \pi * r^2 * h$ and substitute h = r to get $V = \pi * r^3$	**M1**
rearrange $r^3 = 4500$ and take cube root	**M1**
r = 16.51 cm, h = 16.51 cm (both to 2 d.p.) cao	**A1**

Answer: r = 16.51 cm, h = 16.51 cm

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