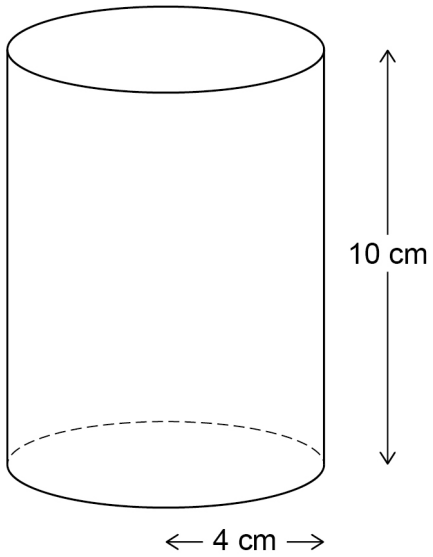
1 Here are two solids.

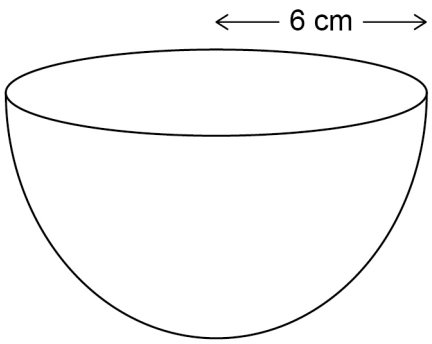
Cylinder

radius 4 cm height 10 cm



Hemisphere

radius 6 cm



volume of a hemisphere $= \frac{2}{3}\pi r^3$ where r is the radius

Which solid has the greater volume?

You **must** show your working.

[4 marks]

Volume of cylinder : $\pi \times 4^2 \times 10$

$= 160\pi$ (1)

Volume of a hemisphere : $\frac{2}{3} \times \pi \times 6^3$ (1)

$= \frac{2}{3}(216) \times \pi$

$= 144\pi$ (1)

Answer cylinder (1)

2 Circle the solid that has 7 vertices.

[1 mark]

hexagonal prism

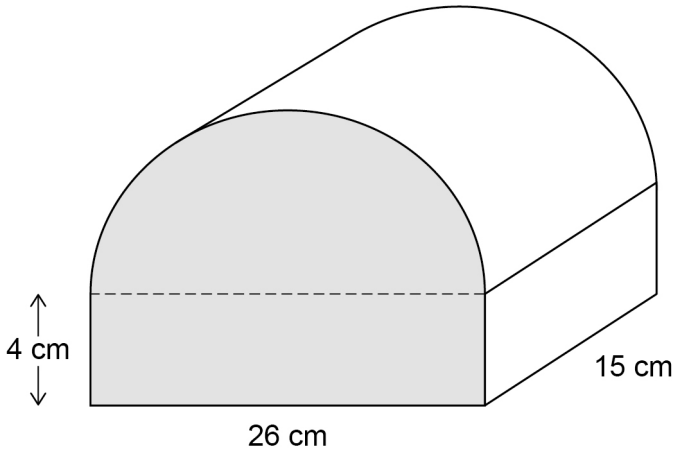
hexagon-based pyramid

pentagonal prism

pentagon-based pyramid

1

3 A box is the shape of half a cylinder on top of a cuboid.



Work out the volume of the box.

[4 marks]

Volume of rectangle = $4 \times 26 \times 15 = 1560$ (1)

Volume of half cylinder = $\frac{1}{2} \times \pi \times 13^2 \times 15$ (1)

$= 1267.5\pi$

$= 3979.95..$ (1)

Total volume = $1560 + 3979.95..$

$= 5539..$ (1)

Answer 5539 cm^3

4 The cross section of a prism has n sides.

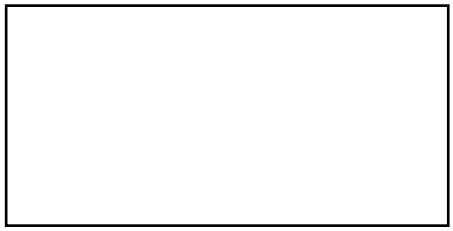
Circle the expression for the number of faces of the prism.

[1 mark]

n $2n$ $3n$ $n + 2$

1

5 Here is the plan of a solid.



Circle the solid that it could be.

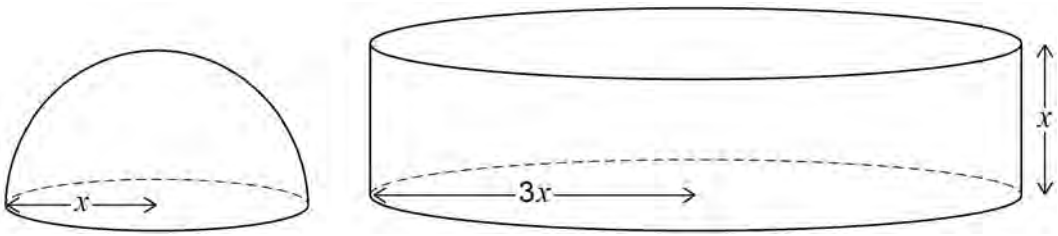
[1 mark]

sphere cone hemisphere cylinder

1

6 A solid hemisphere has radius x.

A solid cylinder has radius $3x$ and height x.



Surface area of a sphere = $4\pi r^2$
where r is the radius

Work out the ratio

total surface area of the hemisphere : total surface area of the cylinder

Give your answer in its simplest form.

You **must** show your working.

[3 marks]

surface area of hemisphere : $\frac{4\pi x^2}{2} + \pi x^2 = 3\pi x^2$ (1)

Surface area of cylinder : $2 \times \pi (3x)^2 +$

$: 18\pi x^2 + 2\pi (3x) x$

$: 18\pi x^2 + 6\pi x^2 = 24\pi x^2$ (1)

s.a. of hemisphere : s.a of cylinder $= 3\pi x^2 : 24\pi x^2$

$= 3 : 24$

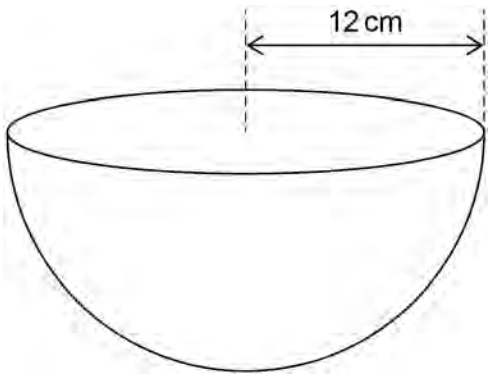
$= 1 : 8$ (1)

Answer 1 : 8

7

Volume of a sphere $= \frac{4}{3}\pi r^3$

A bowl is a hemisphere with radius 12 cm



Water is poured into the bowl

at a rate of 325 cm^3 per second

for 8 seconds.

Does the water fill **more than** 70% of the bowl?

You **must** show your working.

[4 marks]

Volume of water = $325 \times 8 = 2600$ (1)

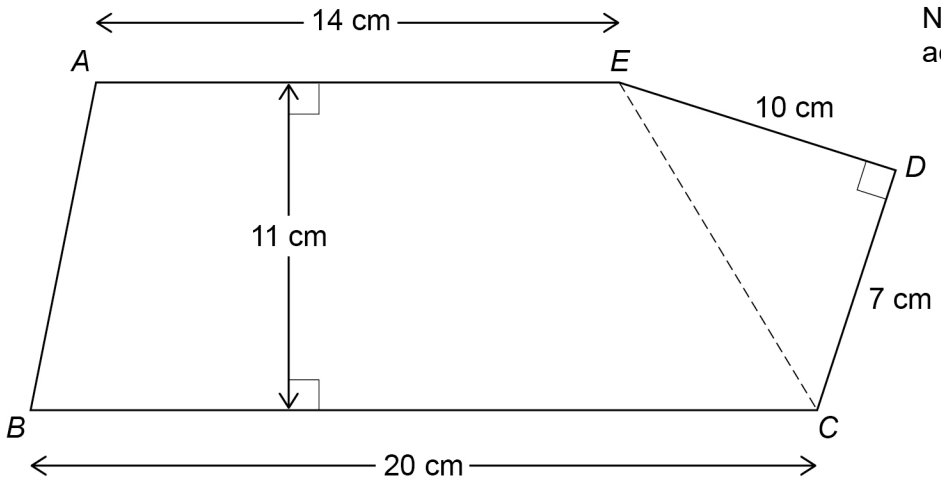
volume of hemisphere = $\frac{1}{2} \times \frac{4}{3} \times \pi \times 12^3$

$= 3620$ (1)

$\frac{2600}{3620} \times 100\% = 71.8\%$ (1)

Yes. The water fills 71.8% of the bowl. (1)

8 *ABCDE* is a pentagon.



Not drawn accurately

Work out the area of the pentagon.

[3 marks]

Area of trapezium : $\frac{1}{2} \times (14+20) \times 11 = 187\ cm^2$ (1)

Area of triangle : $\frac{1}{2} \times 10 \times 7 = 35\ cm^2$ (1)

Total area : $187 + 35 = 222\ cm^2$ (1)

Answer 222 cm^2

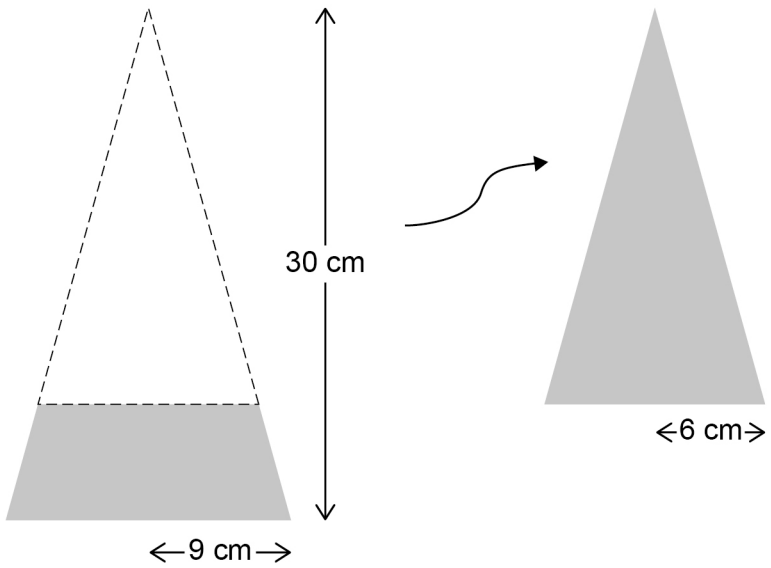
9 Alec makes a bowl for dog food from a solid wooden cone.

The sketches show how the bowl is made.

The cone has radius 9 cm and perpendicular height 30 cm

A smaller cone, with radius 6 cm, is removed.

Not drawn accurately

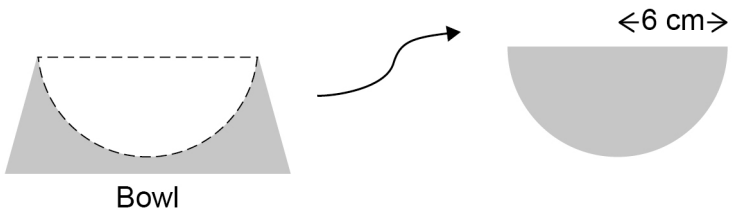


Volume of a cone $= \frac{1}{3}\pi r^2 h$

where r is the radius and h is the perpendicular height

A hemisphere with radius 6 cm is then removed.

Not drawn accurately



Volume of a hemisphere $= \frac{2}{3}\pi r^3$ where r is the radius

Work out the volume of the remaining wood that forms the bowl.

[5 marks]

Volume of large cone : $\frac{1}{3} \times \pi \times 9^2 \times 30 = 810\pi$ (1)

Volume of small cone : $\frac{1}{3} \times \pi \times 6^2 \times \left(\frac{30}{9} \times 6\right)$ (1)

$\frac{1}{3} \times \pi \times 36 \times 20 = 240\pi$

Volume of remaining cone : $810\pi - 240\pi = 570\pi$ (1)

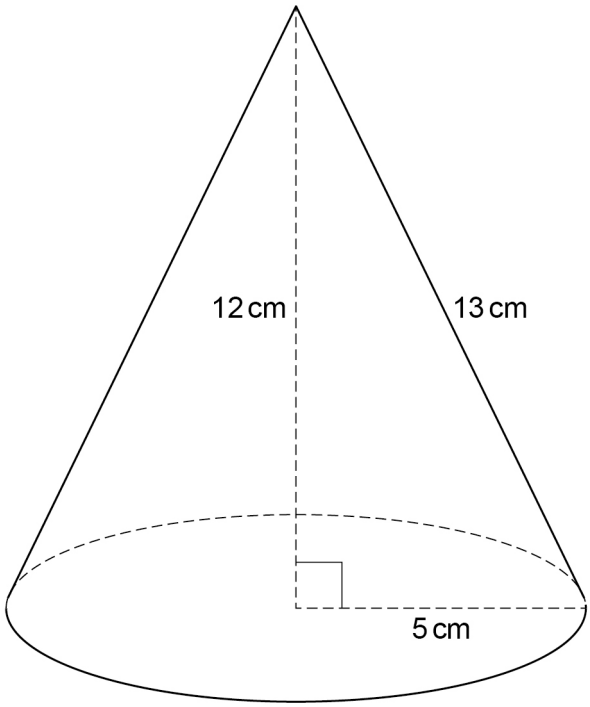
Volume of hemisphere = $\frac{2}{3} \times \pi \times 6^3 = 144\pi$ (1)

Volume of bowl : $570\pi - 144\pi$

$= 426\pi$ (1)

Answer 426π cm^3

10 Here is a cone.



10 (a)

Curved surface area of a cone $= \pi rl$ where r is the radius and l is the slant height

Beth tries to work out the curved surface area in terms of π

Curved surface area of the cone $= \pi \times 5 \times 12$ $= 60\pi \text{ cm}^2$

What mistake has she made?

[1 mark]

The value of l should be 13 instead of 12 ✓0

10 (b) Adam uses $\pi = 3$ to estimate the area of the **base** of the cone.

Work out his estimate.

[2 marks]

Area of the base of the cone = $\pi \times r^2$

$= 3 \times 5^2$ ✓1

$= 3 \times 25$

$= 75 \text{ cm}^2$ ✓1

Answer 75 cm^2

10 (c) Beth uses $\pi = 3.14$ to estimate the area of the **base** of the cone.

Is Beth's estimate more than or less than Adam's estimate?

Tick a box.

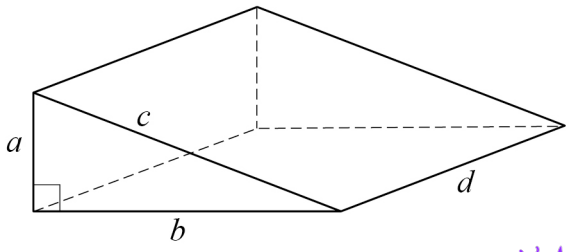
More than ☑ Less than ☐

Give a reason for your answer.

[1 mark]

3.14 is larger than 3. ✓1

11 Here is a right-angled triangular prism.



Volume of prism = $\frac{1}{2} \times (a \times b) \times d$

The ratio of the edges is $a : b : c : d = 3 : 4 : 5 : 12$

The **volume** of the prism is $1125\,cm^3$

Work out the total length of **all** of the edges of the prism.

[5 marks]

let length of edges is variable of x.

Volume of prism = $\frac{1}{2} \times 3x \times 4x \times 12x = 1125$ ✓1

$144x^3 = 2250$

$x^3 = 15.625$ ✓1

$x = \sqrt[3]{15.625}$

$= 2.5$ ✓1

$a = 3 \times 2.5 = 7.5$ cm

$b = 4 \times 2.5 = 10$ cm

$c = 5 \times 2.5 = 12.5$ cm

$d = 12 \times 2.5 = 30$ cm

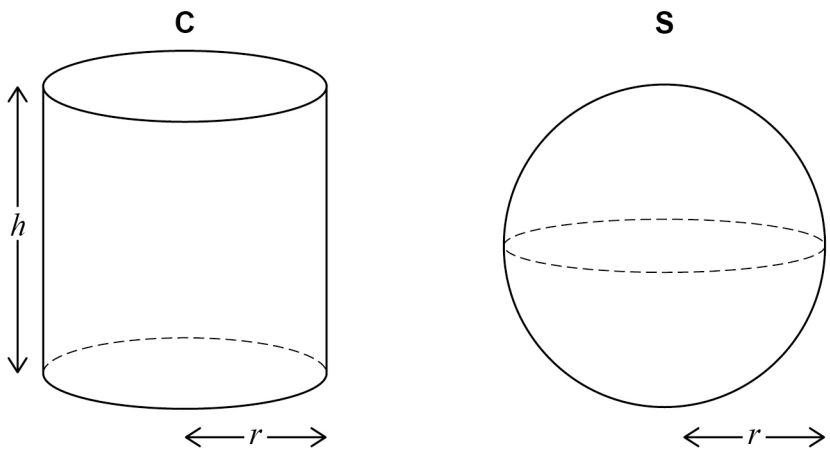
Total length of edges = $2(7.5) + 2(10) +$ ✓1 $2(12.5) + 3(30)$

$= 150$ cm ✓1

Answer 150 cm

12 A cylinder, C, and a sphere, S, each have radius r

C has height h



Volume of a sphere $= \frac{4}{3}\pi r^3$

where r is the radius

12 (a) volume of C = volume of S

Work out the ratio $r : h$

You **must** show your working.

[3 marks]

Volume of C $= \pi r^2 h$ ✓(1)

Volume of S $= \frac{4}{3}\pi r^3$

$\pi r^2 h = \frac{4}{3}\pi r^3$

$h = \frac{4}{3}r$ ✓(1)

$\frac{r}{h} = \frac{3}{4}$

Answer 3 : 4 ✓(1)

12 (b) A **different cylinder** has radius $3r$ and height $2h$.

How many times bigger is the volume of this cylinder than the volume of C?

[2 marks]

$V = \pi(3r)^2(2h)$ ✓ (1)

$= \pi(9r^2)(2h)$

$= 18(\pi r^2 h)$

Answer 18 ✓ (1)