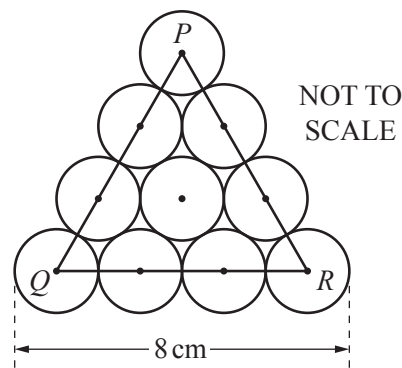


1. Question | 0580 Feb-March 2016 P4 V2 Q10

- 10 (a) The ten circles in the diagram each have radius 1 cm.
The centre of each circle is marked with a dot.

Calculate the height of triangle PQR .

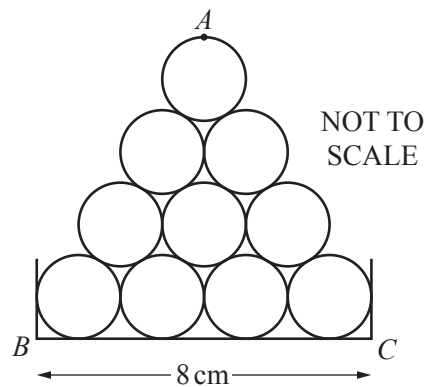


..... cm [3]

- (b) Mr Patel uses whiteboard pens that are cylinders of radius 1 cm.

- (i) The diagram shows 10 pens stacked in a tray.
The tray is 8 cm wide.
The point A is the highest point in the stack.

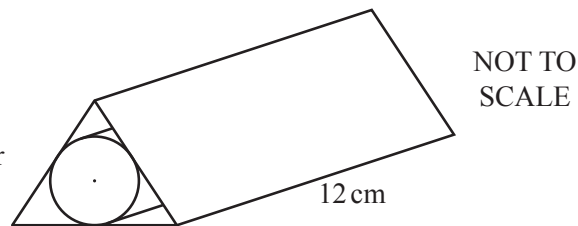
Find the height of A above the base, BC , of the tray.



..... cm [1]

- (ii) The diagram shows a box that holds one pen.
The box is a prism of length 12 cm.
The cross section of the prism is an equilateral triangle.
The pen touches each of the three rectangular faces of the box.

Calculate the volume of this box.



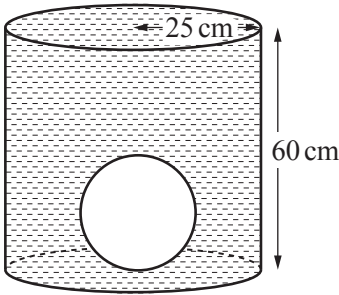
..... cm^3 [5]

2. Question part 1/2 | 0580 May-June 2016 P4 V1 Q4

- 4 (a) Calculate the volume of a metal sphere of radius 15 cm and show that it rounds to 14 140 cm³, correct to 4 significant figures.
[The volume, V , of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

[2]

- (b) (i) The sphere is placed inside an empty cylindrical tank of radius 25 cm and height 60 cm. The tank is filled with water.

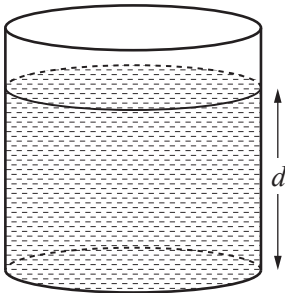


NOT TO
SCALE

Calculate the volume of water required to fill the tank.

..... cm³ [3]

- (ii) The sphere is removed from the tank.



NOT TO
SCALE

Calculate the depth, d , of water in the tank.

$d =$ cm [2]

(c) The sphere is melted down and the metal is made into a solid cone of height 54 cm.

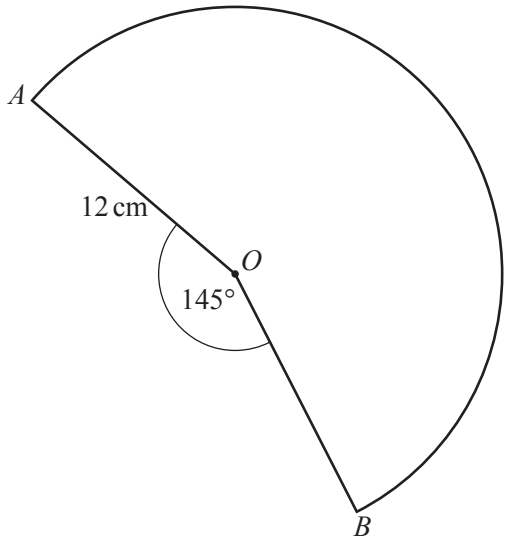
- (i) Calculate the radius of the cone.
[The volume, V , of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

..... cm [3]

- (ii) Calculate the **total** surface area of the cone.
[The curved surface area, A , of a cone with radius r and slant height l is $A = \pi r l$.]

..... cm² [4]

9



NOT TO
SCALE

The diagram shows a sector, centre O , and radius 12 cm .

(a) Calculate the area of the sector.

..... cm^2 [3]

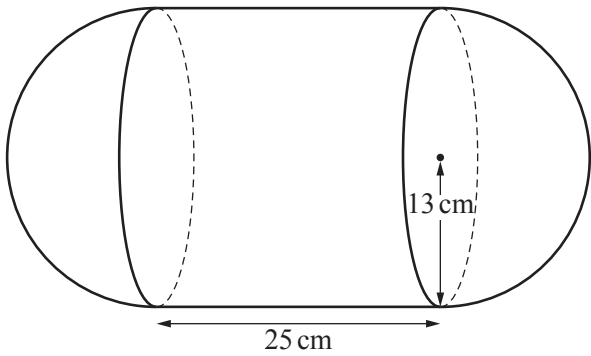
(b) The sector is made into a cone by joining OA to OB .

Calculate the volume of the cone.
[The volume, V , of a cone with base radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

..... cm^3 [6]

4. Question part 1/2 | 0580 Oct-Nov 2016 P4 V1 Q3

3 (a)



NOT TO
SCALE

The diagram shows a solid made up of a cylinder and two hemispheres.
The radius of the cylinder and the hemispheres is 13 cm.
The length of the cylinder is 25 cm.

- (i) One cubic centimetre of the solid has a mass of 2.3 g.

Calculate the mass of the solid.
Give your answer in kilograms.

[The volume, V , of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

..... kg [4]

- (ii) The surface of the solid is painted at a cost of \$4.70 per square metre.

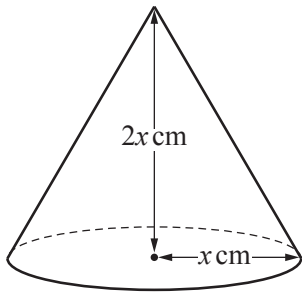
Calculate the cost of painting the solid.

[The surface area, A , of a sphere with radius r is $A = 4\pi r^2$.]

\$..... [4]

4. Question part 2/2 | 0580 Oct-Nov 2016 P4 V1 Q3

(b)



NOT TO
SCALE

The cone in the diagram has radius $x\text{ cm}$ and height $2x\text{ cm}$.
The volume of the cone is 500 cm^3 .

Find the value of x .

[The volume, V , of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

$x = \dots\dots\dots$ [3]

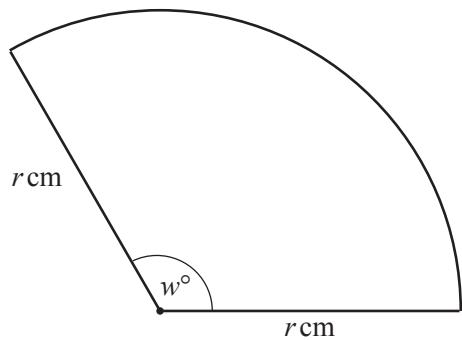
- (c) Two mathematically similar solids have volumes of 180 cm^3 and 360 cm^3 .
The surface area of the smaller solid is 180 cm^2 .

Calculate the surface area of the larger solid.

$\dots\dots\dots\text{cm}^2$ [3]

5. Question part 1/2 | 0580 Oct-Nov 2016 P4 V1 Q10

10 (a)



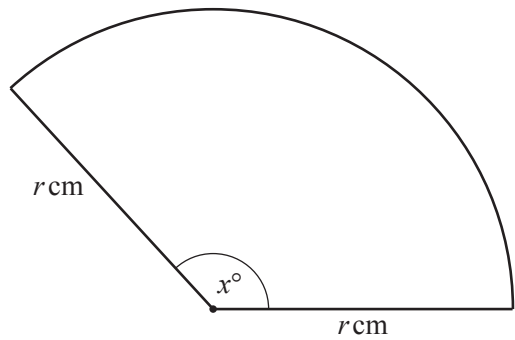
NOT TO
SCALE

The area of this sector is r^2 square centimetres.

Find the value of w .

$w = \dots\dots\dots [3]$

(b)



NOT TO
SCALE

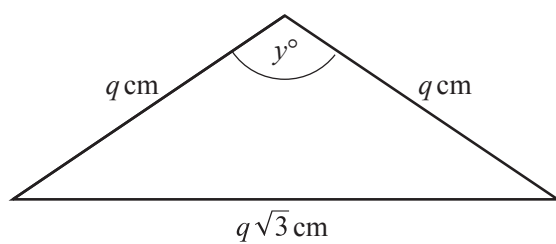
The perimeter of this sector is $2r + \frac{7\pi r}{10}$ centimetres.

Find the value of x .

$x = \dots\dots\dots [3]$

5. Question part 2/2 | 0580 Oct-Nov 2016 P4 V1 Q10

(c)

NOT TO
SCALE

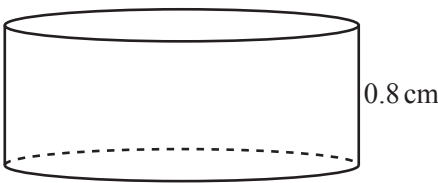
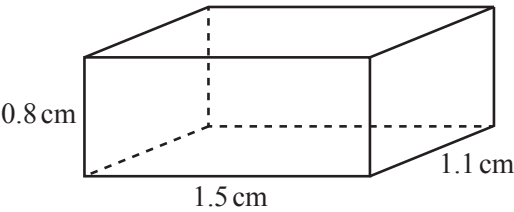
The perimeter of the isosceles triangle is $2q + q\sqrt{3}$ centimetres.

Find the value of y .

$y = \dots\dots\dots$ [4]

6. Question part 1/2 | 0580 Oct-Nov 2016 P4 V2 Q6

6 (a)



NOT TO
SCALE

The diagram shows two sweets.
The cuboid has length 1.5 cm, width 1.1 cm and height 0.8 cm.
The cylinder has height 0.8 cm and the same volume as the cuboid.

(i) Calculate the volume of the cuboid.

.....cm³ [2]

(ii) Calculate the radius of the cylinder.

..... cm [2]

(iii) Calculate the difference between the surface areas of the two sweets.

.....cm² [5]

6. Question part 2/2 | 0580 Oct-Nov 2016 P4 V2 Q6

- (b) A bag of sweets contains x orange sweets and y lemon sweets.
Each orange sweet costs 2 cents and each lemon sweet costs 3 cents.

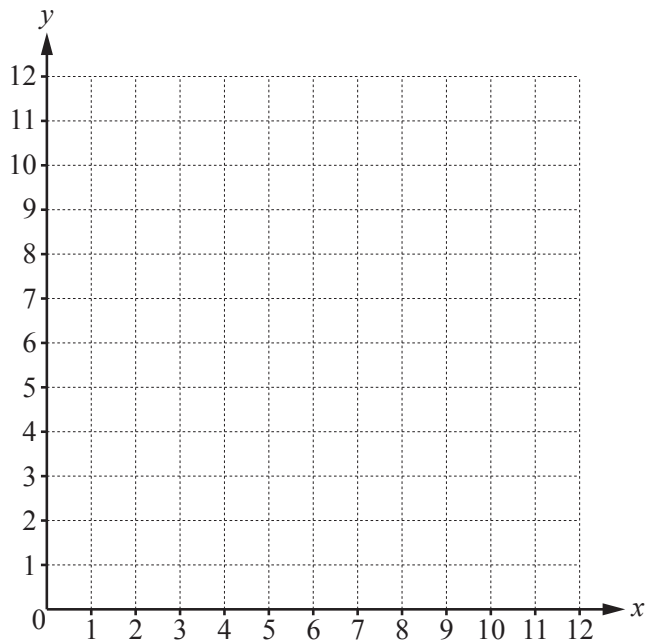
The cost of a bag of sweets is less than 24 cents.
There are at least 9 sweets in each bag.
There are at least 2 lemon sweets in each bag.

- (i) One of the inequalities that shows this information is $2x + 3y < 24$.

Write down the other two inequalities.

.....
..... [2]

- (ii) On the grid, by shading the unwanted regions, show the region which satisfies the three inequalities.



[4]

- (iii) Find the lowest cost of a bag of sweets.
Write down the value of x and the value of y that give this cost.

Lowest cost = ... cents

x = ...

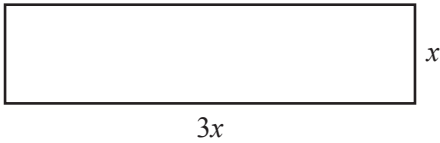
y = ... [3]

10 The **perimeter** of each of the three shapes is 60 cm.

Find x in each part.

(a)

Rectangle

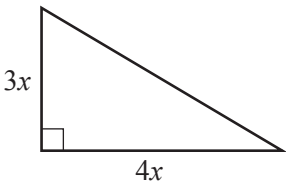


NOT TO
SCALE

$x = \dots\dots\dots$ cm [2]

(b)

Triangle

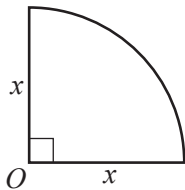


NOT TO
SCALE

$x = \dots\dots\dots$ cm [3]

(c)

Sector



NOT TO
SCALE

$x = \dots\dots\dots$ cm [3]

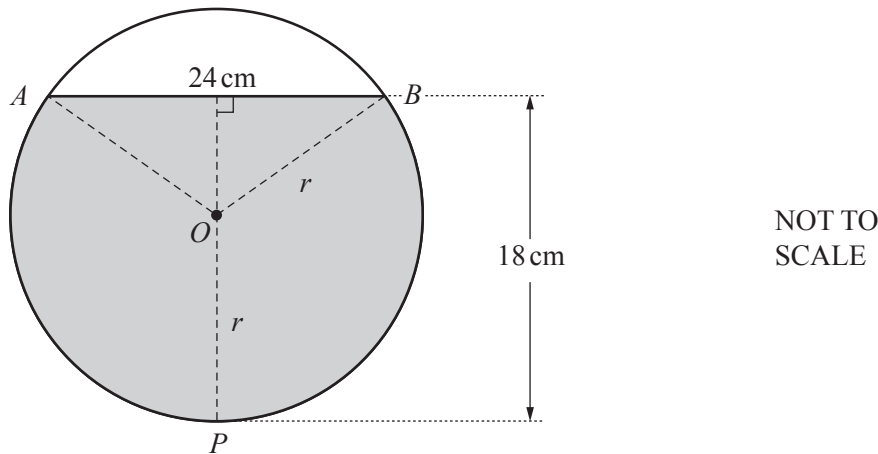
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8. Question part 1/2 | 0580 Oct-Nov 2016 P4 V3 Q8

8



The diagram shows the cross section of a cylinder, centre O , radius r , lying on its side.
The cylinder contains water to a depth of 18 cm.
The width, AB , of the surface of the water is 24 cm.

(a) Use an algebraic method to show that $r = 13$ cm.

[4]

(b) Show that angle $AOB = 134.8^\circ$, correct to 1 decimal place.

[2]

(c) (i) Calculate the area of the major sector $OAPB$.

.....cm² [3]

8. Question part 2/2 | 0580 Oct-Nov 2016 P4 V3 Q8

(ii) Calculate the area of the shaded segment APB .

.....cm² [3]

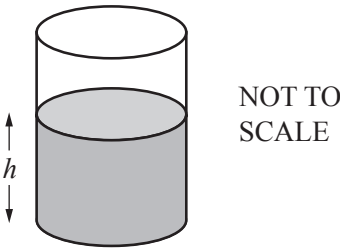
(iii) The length of the cylinder is 40 cm.

Calculate the volume of water in the cylinder.

.....cm³ [1]

(d) The cylinder is turned so that it stands on one of its circular ends.
In this position, the depth of the water is h .

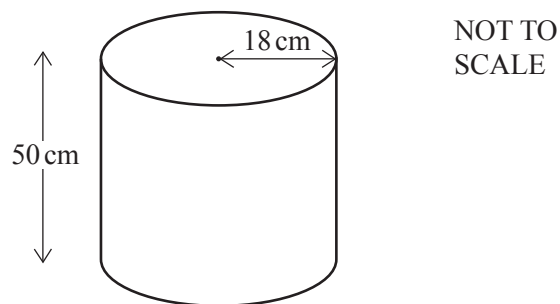
Find h .



$h =$ cm [2]

9. Question part 1/2 | 0580 May-June 2017 P4 V1 Q5

- 5 (a) The diagram shows a cylindrical container used to serve coffee in a hotel.



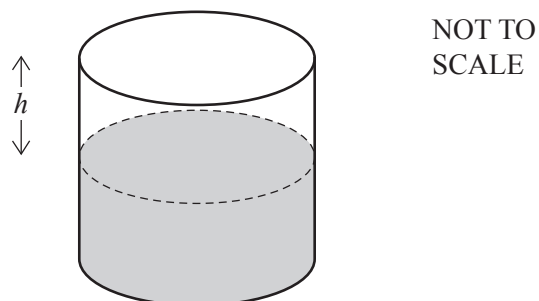
The container has a height of 50 cm and a radius of 18 cm.

- (i) Calculate the volume of the cylinder and show that it rounds to $50\,900\text{ cm}^3$, correct to 3 significant figures.

[2]

- (ii) 30 litres of coffee are poured into the container.

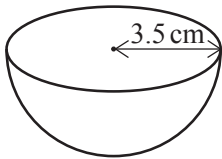
Work out the height, h , of the empty space in the container.



$h = \dots\dots\dots$ cm [3]

9. Question part 2/2 | 0580 May-June 2017 P4 V1 Q5

- (iii) Cups in the shape of a hemisphere are filled with coffee from the container.
The radius of a cup is 3.5 cm.



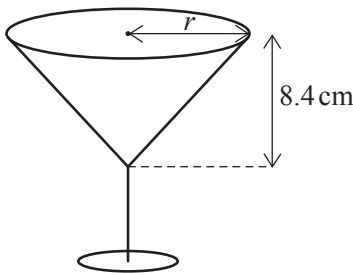
NOT TO
SCALE

Work out the maximum number of these cups that can be completely filled from the 30 litres of coffee in the container.

[The volume, V , of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

..... [4]

- (b) The hotel also uses glasses in the shape of a cone.



NOT TO
SCALE

The capacity of each glass is 95 cm³.

- (i) Calculate the radius, r , and show that it rounds to 3.3 cm, correct to 1 decimal place.

[The volume, V , of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

[3]

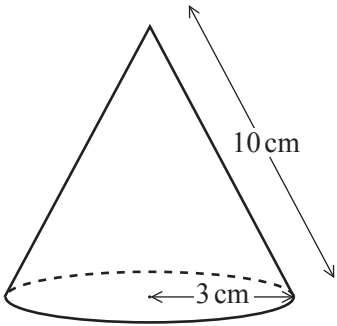
- (ii) Calculate the curved surface area of the cone.

[The curved surface area, A , of a cone with radius r and slant height l is $A = \pi r l$.]

..... cm² [4]

10. Question part 1/2 | 0580 May-June 2017 P4 V2 Q5

5



NOT TO
SCALE

The diagram shows a hollow cone with radius 3 cm and slant height 10 cm.

(a) (i) Calculate the curved surface area of the cone.

[The curved surface area, A , of a cone with radius r and slant height l is $A = \pi r l$.]

..... cm² [2]

(ii) Calculate the perpendicular height of the cone.

..... cm [3]

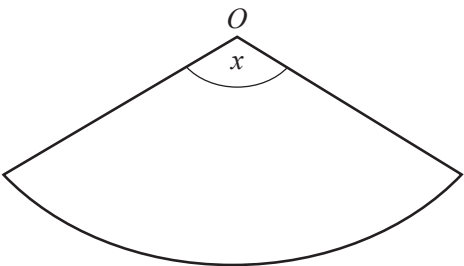
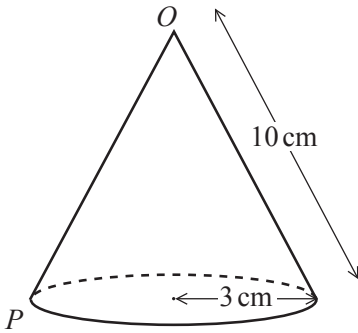
(iii) Calculate the volume of the cone.

[The volume, V , of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

..... cm³ [2]

10. Question part 2/2 | 0580 May-June 2017 P4 V2 Q5

(b)



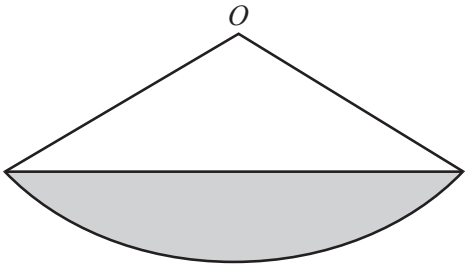
NOT TO
SCALE

The cone is cut along the line OP and is opened out into a sector as shown in the diagram.

Calculate the sector angle x .

$x = \dots\dots\dots$ [4]

(c)



NOT TO
SCALE

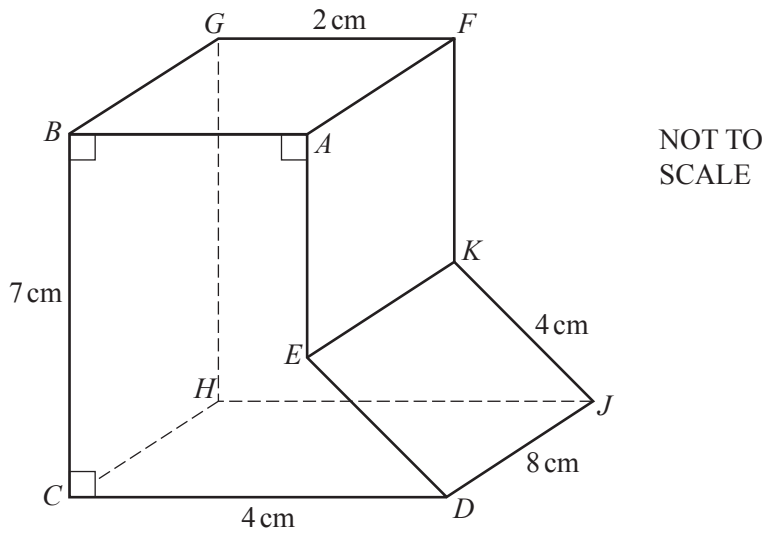
The diagram shows the same sector as in **part (b)**.

Calculate the area of the shaded segment.

$\dots\dots\dots \text{cm}^2$ [4]

11. Question part 1/2 | 0580 May-June 2017 P4 V3 Q4

4 (a) The diagram shows a solid metal prism with cross section $ABCDE$.



(i) Calculate the area of the cross section $ABCDE$.

.....cm² [6]

(ii) The prism is of length 8 cm.

Calculate the volume of the prism.

.....cm³ [1]

11. Question part 2/2 | 0580 May-June 2017 P4 V3 Q4

- (b) A cylinder of length 13 cm has volume 280 cm^3 .
- (i) Calculate the radius of the cylinder.

..... cm [3]

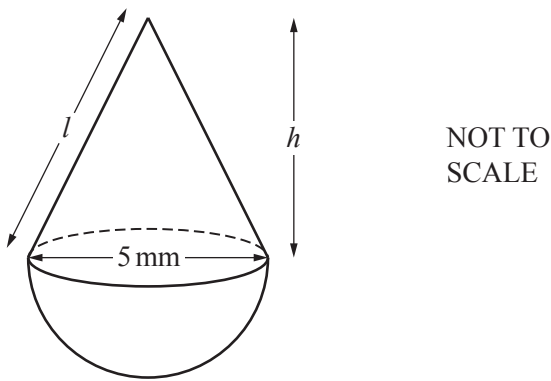
- (ii) The cylinder is placed in a box that is a cube of side 14 cm.

Calculate the percentage of the volume of the box that is occupied by the cylinder.

..... % [3]

12. Question part 1/2 | 0580 Oct-Nov 2017 P4 V1 Q8

8



The diagram shows a solid made from a hemisphere and a cone.
The base diameter of the cone and the diameter of the hemisphere are each 5 mm.

- (a) The total surface area of the solid is $\frac{115\pi}{4}$ mm².

Show that the slant height, l , is 6.5 mm.

[The curved surface area, A , of a cone with radius r and slant height l is $A = \pi rl$.]
[The surface area, A , of a sphere with radius r is $A = 4\pi r^2$.]

[4]

- (b) Calculate the height, h , of the cone.

$h = \dots\dots\dots$ mm [3]

12. Question part 2/2 | 0580 Oct-Nov 2017 P4 V1 Q8

(c) Calculate the volume of the solid.

[The volume, V , of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

[The volume, V , of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

.....mm³ [4]

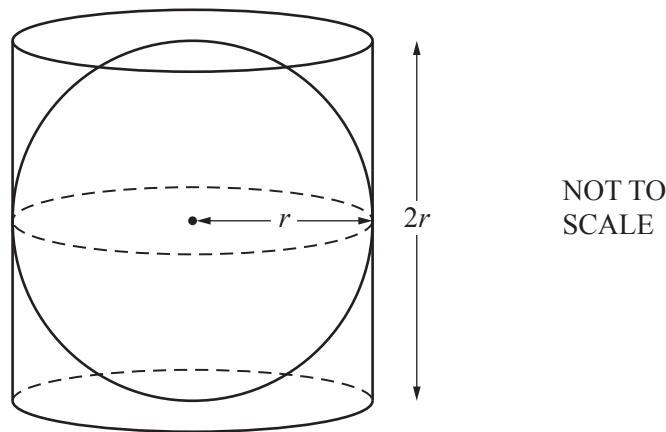
(d) The solid is made from gold.
1 **cubic centimetre** of gold has a mass of 19.3 grams.
The value of 1 gram of gold is \$38.62 .

Calculate the value of the gold used to make the solid.

\$..... [3]

13. Question part 1/2 | 0580 Oct-Nov 2017 P4 V2 Q2

2 (a)



A sphere of radius r is inside a closed cylinder of radius r and height $2r$.

[The volume, V , of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

(i) When $r = 8\text{ cm}$, calculate the volume inside the cylinder which is **not** occupied by the sphere.

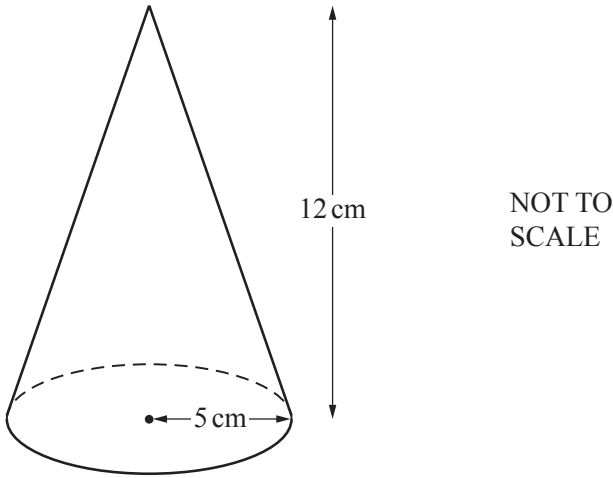
..... cm^3 [3]

(ii) Find r when the volume inside the cylinder **not** occupied by the sphere is 36 cm^3 .

$r =$ cm [3]

13. Question part 2/2 | 0580 Oct-Nov 2017 P4 V2 Q2

(b)



The diagram shows a solid cone with radius 5 cm and perpendicular height 12 cm.

- (i) The **total** surface area is painted at a cost of \$0.015 per cm².

Calculate the cost of painting the cone.

[The curved surface area, A , of a cone with radius r and slant height l is $A = \pi rl$.]

\$ [4]

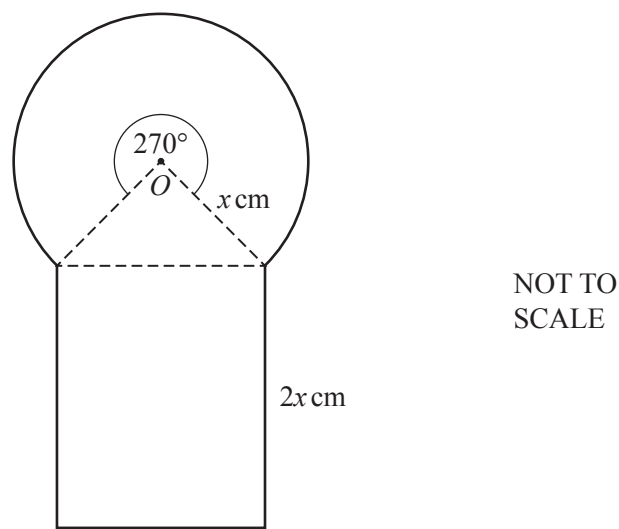
- (ii) The cone is made of metal and is melted down and made into smaller solid cones with radius 1.25 cm and perpendicular height 3 cm.

Calculate the number of smaller cones that can be made.

..... [3]

14. Question | 0580 Oct-Nov 2017 P4 V2 Q10

10



The diagram shows a sector of a circle, a triangle and a rectangle.
The sector has centre O , radius x cm and angle 270° .
The rectangle has length $2x$ cm.

The total area of the shape is $kx^2 \text{ cm}^2$.

(a) Find the value of k .

$k = \dots\dots\dots [5]$

(b) Find the value of x when the total area is 110 cm^2 .

$x = \dots\dots\dots [2]$

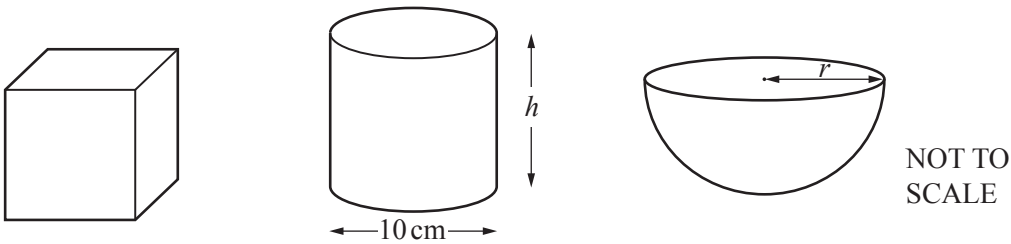
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15. Question part 1/2 | 0580 Oct-Nov 2017 P4 V3 Q6

6 (a)



The diagrams show a cube, a cylinder and a hemisphere.
The volume of each of these solids is 2000 cm^3 .

(i) Work out the height, h , of the cylinder.

$h = \dots\dots\dots\text{ cm [2]}$

(ii) Work out the radius, r , of the hemisphere.

[The volume, V , of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

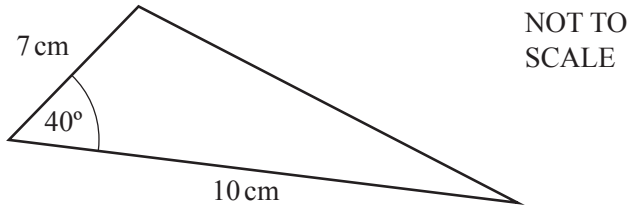
$r = \dots\dots\dots\text{ cm [3]}$

(iii) Work out the surface area of the cube.

$\dots\dots\dots\text{ cm}^2 [3]$

15. Question part 2/2 | 0580 Oct-Nov 2017 P4 V3 Q6

(b)



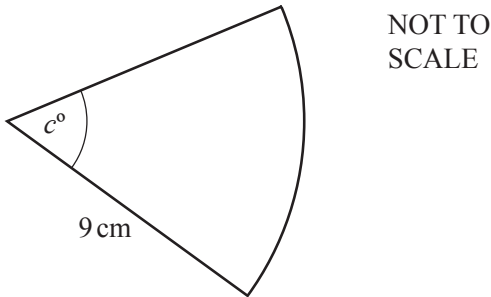
(i) Calculate the area of the triangle.

.....cm² [2]

(ii) Calculate the perimeter of the triangle and show that it is 23.5 cm, correct to 1 decimal place.
Show all your working.

[5]

(c)



The perimeter of this sector of a circle is 28.2 cm.

Calculate the value of c .

$c =$ [3]

16. Question part 1/2 | 0580 May-June 2018 P4 V1 Q6

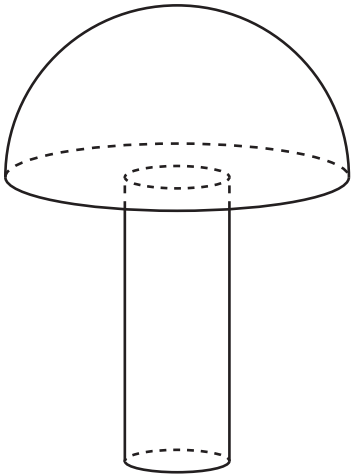
6 A solid hemisphere has volume 230 cm^3 .

(a) Calculate the radius of the hemisphere.

[The volume, V , of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

..... cm [3]

(b) A solid cylinder with radius 1.6 cm is attached to the hemisphere to make a toy.



NOT TO
SCALE

The total volume of the toy is 300 cm^3 .

(i) Calculate the height of the cylinder.

..... cm [3]

16. Question part 2/2 | 0580 May-June 2018 P4 V1 Q6

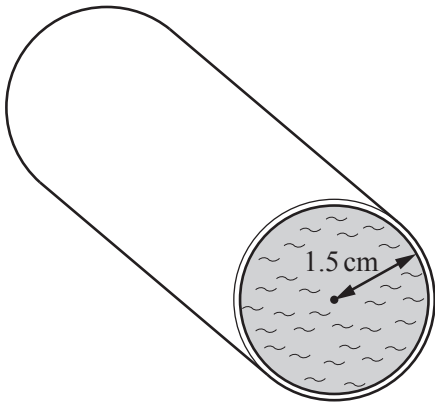
(ii) A mathematically similar toy has volume $19\,200\text{ cm}^3$.

Calculate the radius of the cylinder for this toy.

..... cm [3]

17. Question part 1/2 | 0580 May-June 2018 P4 V3 Q7

7 (a)



NOT TO
SCALE

Water flows through a cylindrical pipe at a speed of 8 cm/s.
The radius of the circular cross-section is 1.5 cm and the pipe is always completely full of water.

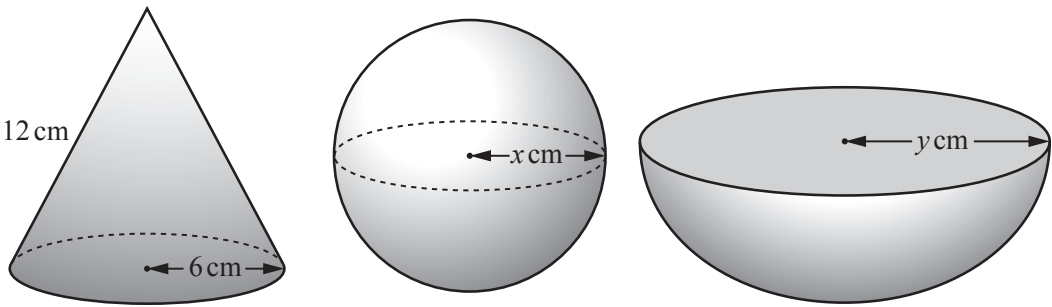
Calculate the amount of water that flows through the pipe in 1 hour.
Give your answer in litres.

..... litres [4]

17. Question part 2/2 | 0580 May-June 2018 P4 V3 Q7

(b)

NOT TO
SCALE



The diagram shows three solids.
The base radius of the cone is 6 cm and the slant height is 12 cm.
The radius of the sphere is x cm and the radius of the hemisphere is y cm.
The **total** surface area of each solid is the same.

(i) Show that the total surface area of the cone is $108\pi\text{ cm}^2$.

[The curved surface area, A , of a cone with radius r and slant height l is $A = \pi rl$.]

[2]

(ii) Find the value of x and the value of y .

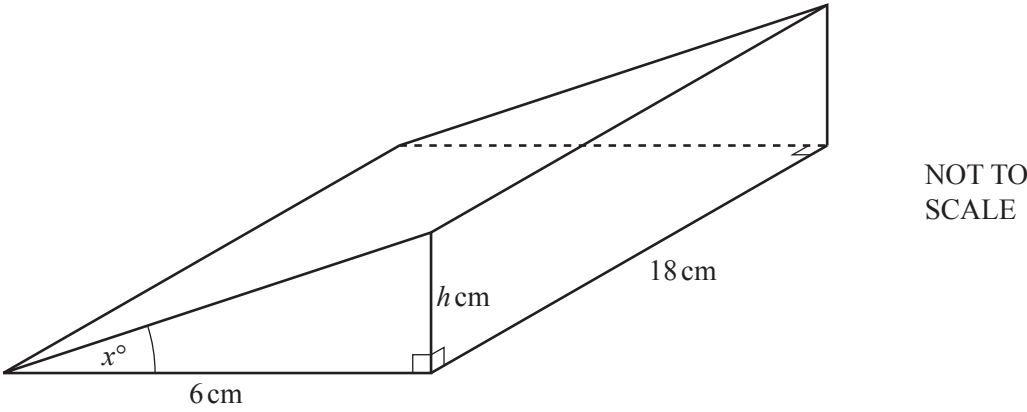
[The surface area, A , of a sphere with radius r is $A = 4\pi r^2$.]

$x = \dots\dots\dots$

$y = \dots\dots\dots$ [4]

18. Question | 0580 Oct-Nov 2018 P4 V1 Q5

5



The diagram shows a prism with length 18 cm and volume 253.8 cm^3 .
The cross-section of the prism is a right-angled triangle with base 6 cm and height h cm.

(a) (i) Show that the value of h is 4.7 .

[3]

(ii) Calculate the value of x .

$x = \dots\dots\dots$ [2]

(b) Calculate the total surface area of the prism.

$\dots\dots\dots\text{ cm}^2$ [6]

19. Question part 1/2 | 0580 Oct-Nov 2018 P4 V2 Q10

- 10 (a)** The lake behind a dam has an area of 55 hectares.
When the gates in the dam are open, water flows out at a rate of 75 000 litres per second.
- (i)** Show that 90 million litres of water flows out in 20 minutes.

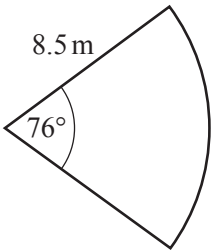
[1]

- (ii)** Beneath the surface, the lake has vertical sides.

Calculate the drop in the water level of the lake when the gates are open for 20 minutes.
Give your answer in centimetres.
[1 hectare = 10^4 m^2 , 1000 litres = 1 m^3]

..... cm [3]

- (iii)**

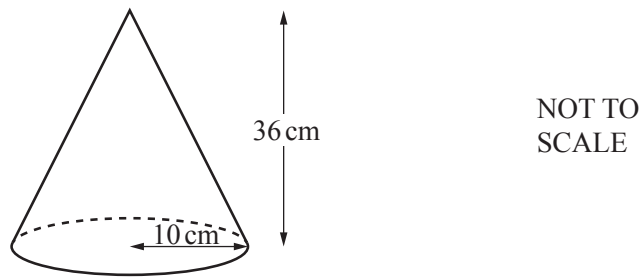


NOT TO
SCALE

The cross-section of a gate is a sector of a circle with radius 8.5 m and angle 76° .
Calculate the perimeter of the sector.

..... m [3]

(b)



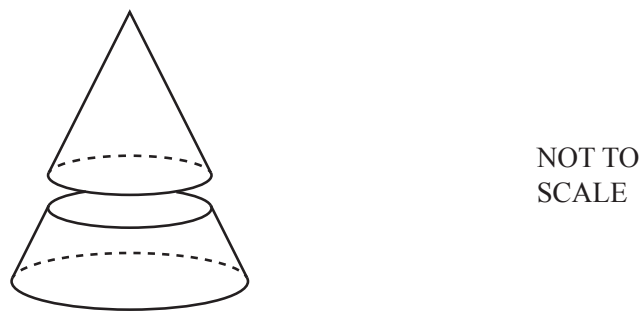
A solid metal cone has radius 10 cm and height 36 cm.

(i) Calculate the volume of this cone.

[The volume, V , of a cone with radius r and height h is $V = \frac{1}{3} \pi r^2 h$.]

..... cm³ [2]

(ii) The cone is cut, parallel to its base, to give a smaller cone.



The volume of the smaller cone is half the volume of the original cone.
The smaller cone is melted down to make two different spheres.
The ratio of the radii of these two spheres is 1 : 2.

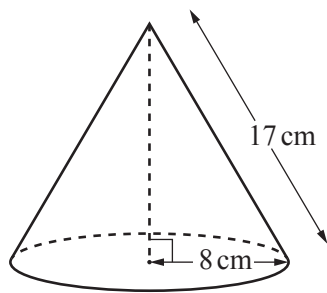
Calculate the radius of the smaller sphere.

[The volume, V , of a sphere with radius r is $V = \frac{4}{3} \pi r^3$.]

..... cm [4]

20. Question part 1/2 | 0580 Oct-Nov 2018 P4 V3 Q3

3 (a)



NOT TO
SCALE

The diagram shows a solid cone.
The radius is 8 cm and the slant height is 17 cm.

(i) Calculate the curved surface area of the cone.

[The curved surface area, A , of a cone with radius r and slant height l is $A = \pi r l$.]

..... cm² [2]

(ii) Calculate the volume of the cone.

[The volume, V , of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

..... cm³ [4]

(iii) The cone is made of wood and 1 cm³ of the wood has a mass of 0.8 g.

Calculate the mass of the cone.

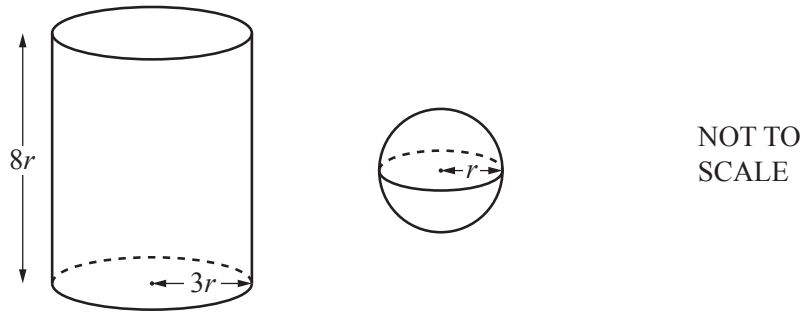
..... g [1]

(iv) The cone is placed in a box.
The total mass of the cone and the box is 1.2 kg.

Calculate the mass of the box.
Give your answer in grams.

..... g [1]

(b)



The diagram shows a solid cylinder and a solid sphere.
The cylinder has radius $3r$ and height $8r$.
The sphere has radius r .

- (i) Find the volume of the sphere as a fraction of the volume of the cylinder.
Give your answer in its lowest terms.

[The volume, V , of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

..... [4]

- (ii) The surface area of the sphere is $81\pi \text{ cm}^2$.

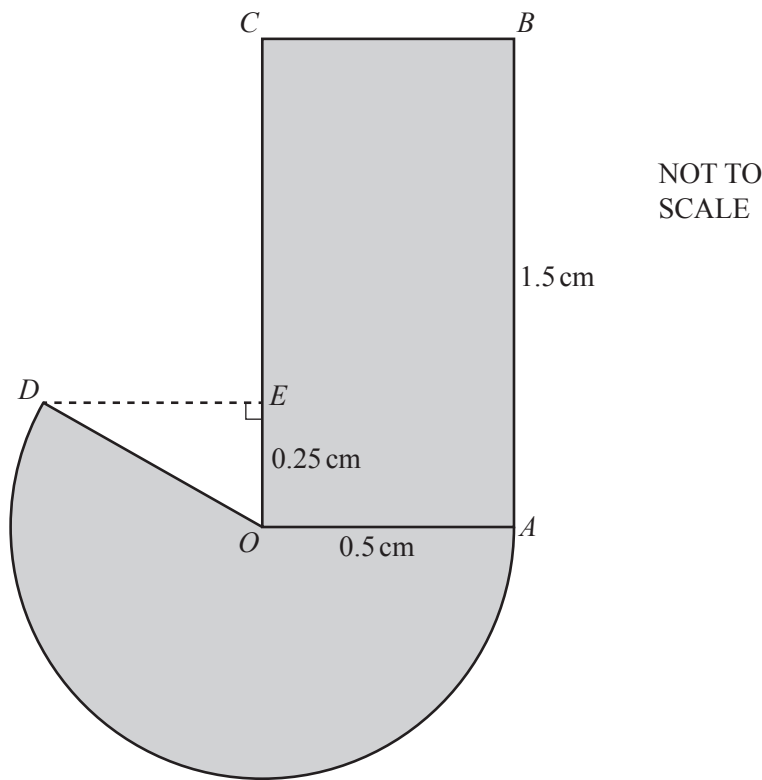
Find the **curved** surface area of the cylinder.
Give your answer in terms of π .

[The surface area, A , of a sphere with radius r is $A = 4\pi r^2$.]

..... cm^2 [4]

21. Question part 1/2 | 0580 Feb-March 2019 P4 V2 Q6

6



The diagram shows a company logo made from a rectangle and a major sector of a circle.
The circle has centre O and radius OA .
 $OA = OD = 0.5\text{ cm}$ and $AB = 1.5\text{ cm}$.
 E is a point on OC such that $OE = 0.25\text{ cm}$ and angle $OED = 90^\circ$.

(a) Calculate the perimeter of the logo.

..... cm [5]

(b) Calculate the area of the logo.

..... cm^2 [3]

(c) A mathematically similar logo is drawn.
The area of this logo is 77.44 cm^2 .

(i) Calculate the radius of the major sector in this logo.

..... cm [3]

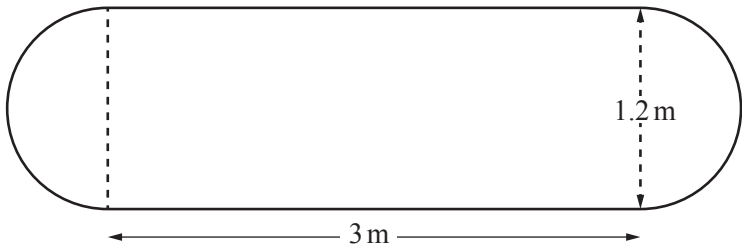
(ii) A gold model is made.
This model is a prism with a cross-section of area 77.44 cm^2 .

This gold model is 15 mm thick.
One cubic centimetre of gold has a mass of 19 grams.

Calculate the mass of the gold model in kilograms.

..... kg [3]

5



NOT TO
SCALE

The diagram shows the surface of a garden pond, made from a rectangle and two semicircles. The rectangle measures 3 m by 1.2 m.

(a) Calculate the area of this surface.

..... m² [3]

(b) The pond is a prism and the water in the pond has a depth of 20 cm.

Calculate the number of litres of water in the pond.

..... litres [3]

(c) After a rainfall, the number of litres of water in the pond is 1007.

Calculate the increase in the depth of water in the pond.
Give your answer in centimetres.

..... cm [3]

23. Question part 1/2 | 0580 May-June 2019 P4 V1 Q10

10 The volume of each of the following solids is 1000 cm^3 .

Calculate the value of x for each solid.

(a) A cube with side length $x\text{ cm}$.

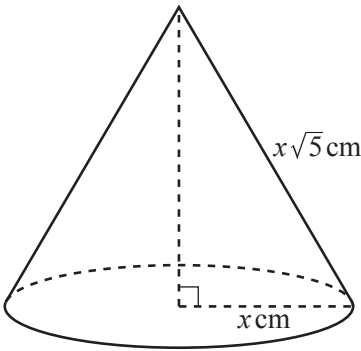
$x = \dots\dots\dots$ [1]

(b) A sphere with radius $x\text{ cm}$.

[The volume, V , of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

$x = \dots\dots\dots$ [3]

(c)



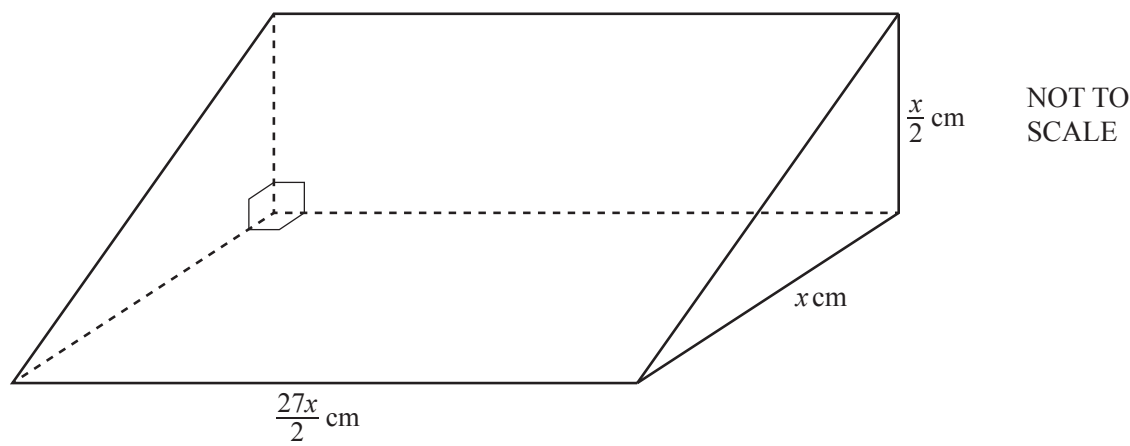
NOT TO
SCALE

A cone with radius $x\text{ cm}$ and slant height $x\sqrt{5}\text{ cm}$.

[The volume, V , of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

$x = \dots\dots\dots$ [4]

(d)



A prism with a right-angled triangle as its cross-section.

$x = \dots\dots\dots$ [4]

Question 11 is printed on the next page.

24. Question part 1/2 | 0580 May-June 2019 P4 V2 Q10

10 (a) The volume of a solid metal sphere is $24\,430\text{ cm}^3$.

(i) Calculate the radius of the sphere.

[The volume, V , of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

..... cm [3]

(ii) The metal sphere is placed in an empty tank.
The tank is a cylinder with radius 50 cm, standing on its circular base.
Water is poured into the tank to a depth of 60 cm.

Calculate the number of litres of water needed.

..... litres [3]

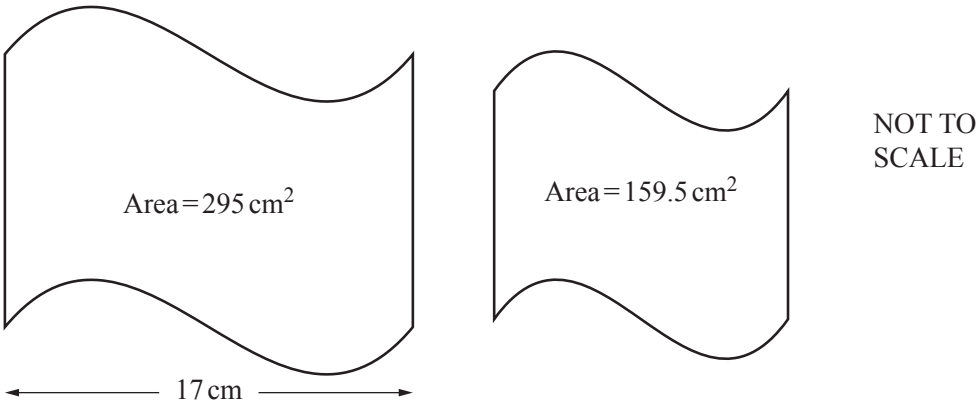
(b) A different tank is a cuboid measuring 1.8 m by 1.5 m by 1.2 m.
Water flows from a pipe into this empty tank at a rate of 200 cm^3 per second.

Find the time it takes to fill the tank.
Give your answer in hours and minutes.

..... hours minutes [4]

24. Question part 2/2 | 0580 May-June 2019 P4 V2 Q10

(c)



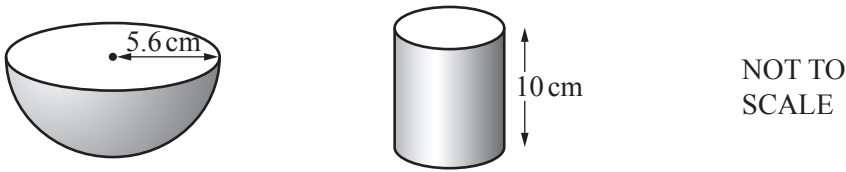
The diagram shows two mathematically similar shapes with areas 295 cm^2 and 159.5 cm^2 .
The width of the larger shape is 17 cm.

Calculate the width of the smaller shape.

..... cm [3]

25. Question part 1/2 | 0580 May-June 2019 P4 V3 Q4

4 (a)



The diagram shows a hemispherical bowl of radius 5.6 cm and a cylindrical tin of height 10 cm.

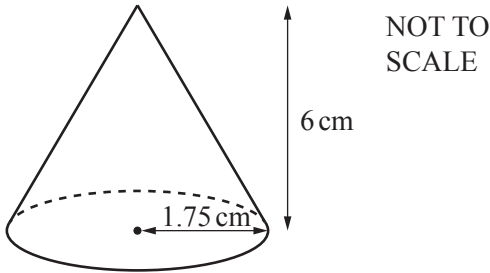
- (i) Show that the volume of the bowl is 368 cm^3 , correct to the nearest cm^3 .
[The volume, V , of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

[2]

- (ii) The tin is completely full of soup.
When all the soup is poured into the empty bowl, 80% of the volume of the bowl is filled.
- Calculate the radius of the tin.

..... cm [4]

(b)

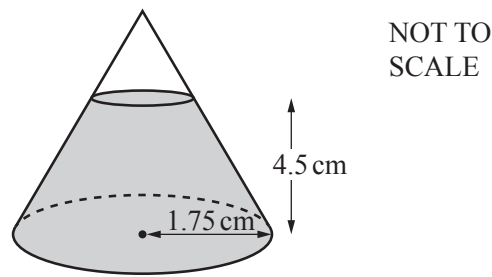


The diagram shows a cone with radius 1.75 cm and height 6 cm.

- (i) Calculate the total surface area of the cone.
[The curved surface area, A , of a cone with radius r and slant height l is $A = \pi rl$.]

..... cm^2 [5]

(ii)



The cone contains salt to a depth of 4.5 cm.
The top layer of the salt forms a circle that is parallel to the base of the cone.

- (a) Show that the volume of the salt inside the cone is 18.9 cm^3 , correct to 1 decimal place.
[The volume, V , of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

[4]

- (b) The salt is removed from the cone at a constant rate of 200 mm^3 per second.

Calculate the time taken for the cone to be completely emptied.
Give your answer in seconds, correct to the nearest second.

..... s [3]

26. Question part 1/2 | 0580 Oct-Nov 2019 P4 V1 Q4

4 (a) (i) Calculate the **external curved** surface area of a cylinder with radius 8 m and height 19 m.

..... m² [2]

(ii) This surface is painted at a cost of \$0.85 per square metre.

Calculate the cost of painting this surface.

\$ [2]

(b) A solid metal sphere with radius 6 cm is melted down and all of the metal is used to make a solid cone with radius 8 cm and height h cm.

(i) Show that $h = 13.5$.

[The volume, V , of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

[The volume, V , of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

[2]

(ii) Calculate the slant height of the cone.

..... cm [2]

(iii) Calculate the curved surface area of the cone.

[The curved surface area, A , of a cone with radius r and slant height l is $A = \pi rl$.]

..... cm² [1]

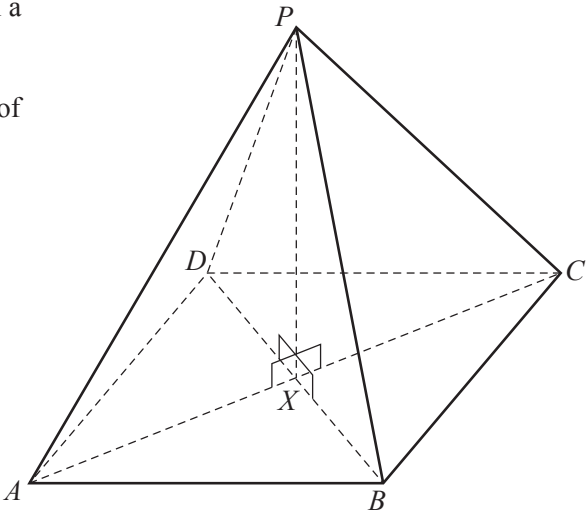
- (c) Two cones are mathematically similar.
The total surface area of the smaller cone is 80 cm^2 .
The total surface area of the larger cone is 180 cm^2 .
The volume of the smaller cone is 168 cm^3 .

Calculate the volume of the larger cone.

..... cm^3 [3]

- (d) The diagram shows a pyramid with a square base $ABCD$.
 $DB = 8\text{ cm}$.
 P is vertically above the centre, X , of the base and $PX = 5\text{ cm}$.

NOT TO
SCALE

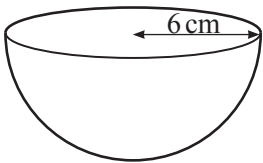


Calculate the angle between PB and the base $ABCD$.

..... [3]

27. Question part 1/2 | 0580 Oct-Nov 2019 P4 V2 Q4

4 (a)



NOT TO
SCALE

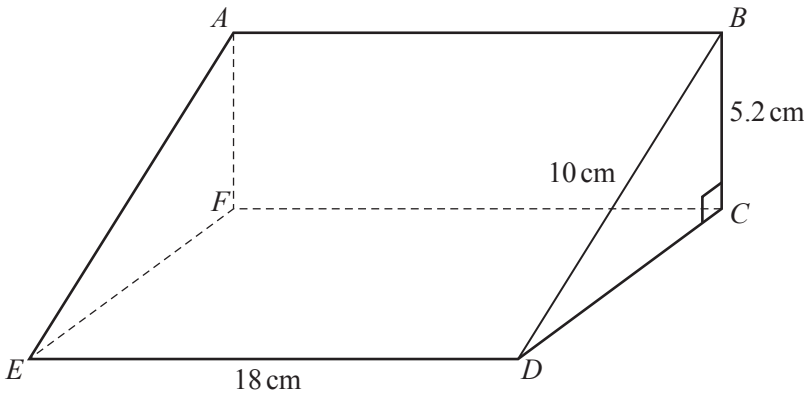
The diagram shows a hemisphere with radius 6 cm.

Calculate the volume.
Give the units of your answer.

[The volume, V , of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

..... [3]

(b)



NOT TO
SCALE

The diagram shows a prism $ABCDEF$.
The cross-section is a right-angled triangle BCD .
 $BD = 10$ cm, $BC = 5.2$ cm and $ED = 18$ cm.

(i) (a) Work out the volume of the prism.

..... cm³ [6]

(b) Calculate angle BEC .

Angle $BEC = \dots\dots\dots$ [4]

(ii) The point G lies on the line ED and $GD = 7\text{ cm}$.

Work out angle BGE .

Angle $BGE = \dots\dots\dots$ [3]

28. Question part 1/2 | 0580 Oct-Nov 2019 P4 V2 Q8

8 **(a)** Make p the subject of

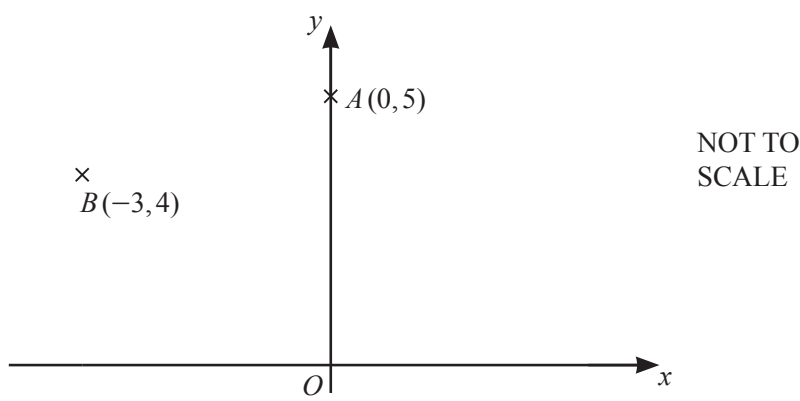
(i) $5p + 7 = m,$

$p = \dots\dots\dots$ [2]

(ii) $y^2 - 2p^2 = h.$

$p = \dots\dots\dots$ [3]

(b)



(i) Write $\overrightarrow{OA}$ as a column vector.

$\overrightarrow{OA} = \begin{pmatrix} \\ \end{pmatrix}$ [1]

(ii) Write $\overrightarrow{AB}$ as a column vector.

$\overrightarrow{AB} = \begin{pmatrix} \\ \end{pmatrix}$ [1]

(iii) A and B lie on a circle, centre O .
Calculate the length of the arc AB .

..... [6]

- 3 (a) Manjeet uses 220 litres of water each day.
She reduces the amount of water she uses by 15%.

Calculate the number of litres of water she now uses each day.

..... litres [2]

- (b) Manjeet has two mathematically similar bottles in her bathroom.
The large bottle holds 1.35 litres and is 29.7 cm high.
The small bottle holds 0.4 litres.

Calculate the height of the small bottle.

..... cm [3]

- (c) Water from Manjeet’s shower flows at a rate of 12 litres per minute.
The water from the shower flows into a tank that is a cuboid of length 90 cm and width 75 cm.

Calculate the increase in the level of water in the tank when the shower is used for 7 minutes.

..... cm [3]

30. Question | 0580 Feb-March 2020 P4 V2 Q4

4 A solid metal cone has radius 1.65 cm and slant height 4.70 cm.

- (a) Calculate the **total** surface area of the cone.
[The curved surface area, A , of a cone with radius r and slant height l is $A = \pi rl$.]

..... cm² [2]

- (b) Find the angle the slant height makes with the base of the cone.

..... [2]

- (c) (i) Calculate the volume of the cone.
[The volume, V , of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

..... cm³ [4]

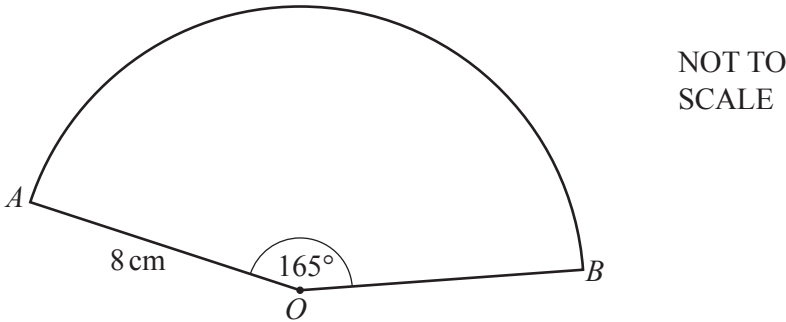
- (ii) A metal sphere with radius 5 cm is melted down to make cones identical to this one.

Calculate the number of complete identical cones that are made.
[The volume, V , of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

..... [4]

31. Question part 1/2 | 0580 May-June 2020 P4 V1 Q9

9



The diagram shows a sector of a circle with centre O , radius 8 cm and sector angle 165° .

(a) Calculate the total perimeter of the sector.

..... cm [3]

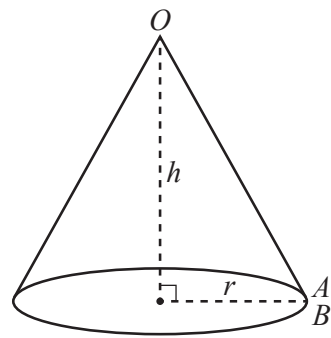
(b) The surface area of a sphere is the same as the area of the sector.

Calculate the radius of the sphere.
[The surface area, A , of a sphere with radius r is $A = 4\pi r^2$.]

..... cm [4]

31. Question part 2/2 | 0580 May-June 2020 P4 V1 Q9

(c)



NOT TO
SCALE

A cone is made from the sector by joining OA to OB .

(i) Calculate the radius, r , of the cone.

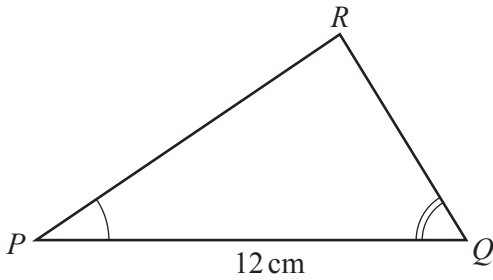
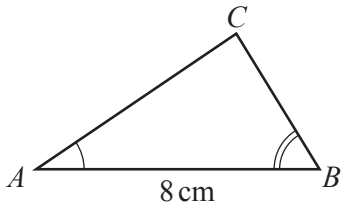
$r = \dots\dots\dots$ cm [2]

(ii) Calculate the volume of the cone.
[The volume, V , of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

$\dots\dots\dots$ cm³ [4]

32. Question part 1/2 | 0580 May-June 2020 P4 V2 Q8

8 (a)



NOT TO
SCALE

Triangle ABC is mathematically similar to triangle PQR .
The area of triangle ABC is 16 cm^2 .

(i) Calculate the area of triangle PQR .

..... cm^2 [2]

(ii) The triangles are the cross-sections of prisms which are also mathematically similar.
The volume of the smaller prism is 320 cm^3 .

Calculate the length of the larger prism.

..... cm [3]

- (b) A cylinder with radius 6 cm and height h cm has the same volume as a sphere with radius 4.5 cm.

Find the value of h .

[The volume, V , of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

$$h = \dots\dots\dots [3]$$

- (c) A solid metal cube of side 20 cm is melted down and made into 40 solid spheres, each of radius r cm.

Find the value of r .

[The volume, V , of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

$$r = \dots\dots\dots [3]$$

- (d) A solid cylinder has radius x cm and height $\frac{7x}{2}$ cm.

The surface area of a sphere with radius R cm is equal to the total surface area of the cylinder.

Find an expression for R in terms of x .

[The surface area, A , of a sphere with radius r is $A = 4\pi r^2$.]

$$R = \dots\dots\dots [3]$$

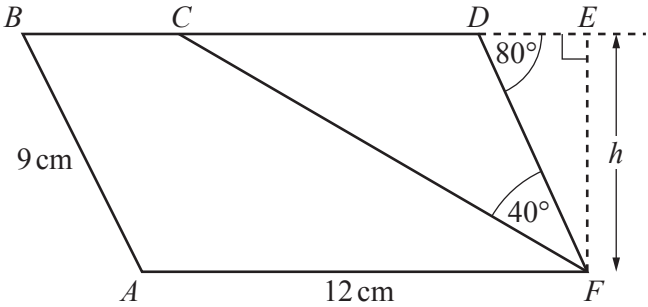
33. Question part 1/2 | 0580 Oct-Nov 2020 P4 V1 Q4

- 4 (a) A rectangle measures 8.5 cm by 10.7 cm, both correct to 1 decimal place.

Calculate the upper bound of the perimeter of the rectangle.

..... cm [3]

(b)



NOT TO
SCALE

$ABDF$ is a parallelogram and $BCDE$ is a straight line.
 $AF = 12\text{ cm}$, $AB = 9\text{ cm}$, angle $CFD = 40^\circ$ and angle $FDE = 80^\circ$.

- (i) Calculate the height, h , of the parallelogram.

$h =$ cm [2]

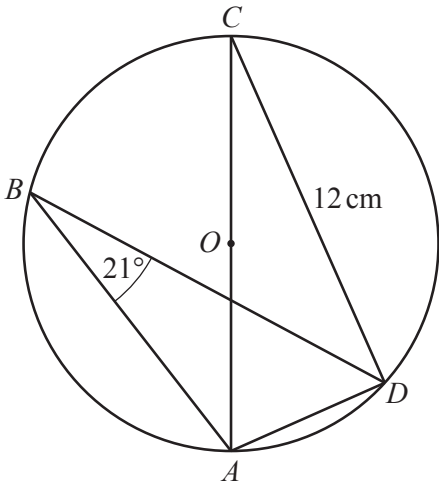
- (ii) Explain why triangle CDF is isosceles.

.....
..... [2]

- (iii) Calculate the area of the **trapezium** $ABCF$.

..... cm^2 [3]

(c)



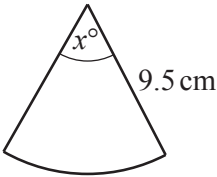
NOT TO
SCALE

A, B, C and D are points on the circle, centre O .
Angle $ABD = 21^\circ$ and $CD = 12\text{ cm}$.

Calculate the area of the circle.

..... cm^2 [5]

(d)



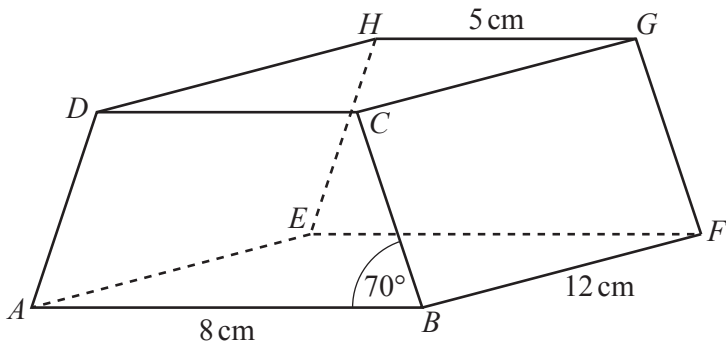
NOT TO
SCALE

The diagram shows a square with side length 8 cm and a sector of a circle with radius 9.5 cm and sector angle x° .
The perimeter of the square is equal to the perimeter of the sector.

Calculate the value of x .

$x =$ [3]

9



NOT TO
SCALE

The diagram shows a prism with a rectangular base, $ABFE$.
The cross-section, $ABCD$, is a trapezium with $AD = BC$.
 $AB = 8\text{ cm}$, $GH = 5\text{ cm}$, $BF = 12\text{ cm}$ and angle $ABC = 70^\circ$.

(a) Calculate the total surface area of the prism.

..... cm^2 [6]

(b) The perpendicular from G onto EF meets EF at X .

(i) Show that $EX = 6.5$ cm.

[1]

(ii) Calculate AX .

$AX =$ cm [2]

(iii) Calculate the angle between the diagonal AG and the base $ABFE$.

..... [2]

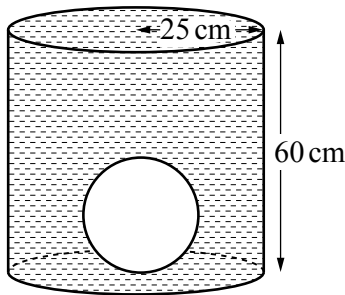
35. Question part 1/2 | 0580 Specimen 2020 P4 Q10

- 10 (a) Show that the volume of a metal sphere of radius 15 cm is $14\,140\text{ cm}^3$, correct to 4 significant figures.

[The volume, V , of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

[2]

- (b) (i) The sphere is placed inside an empty cylindrical tank of radius 25 cm and height 60 cm. The tank is filled with water.

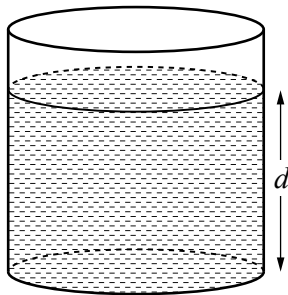


NOT TO
SCALE

Calculate the volume of water needed to fill the tank.

..... cm^3 [3]

- (ii) The sphere is removed from the tank.

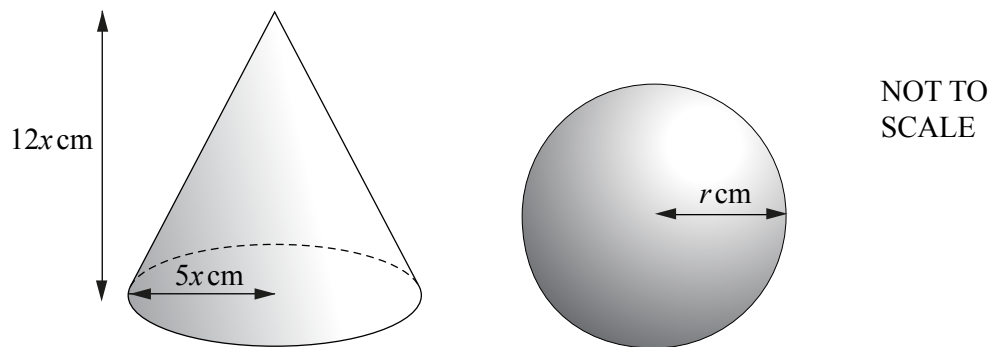


NOT TO
SCALE

Calculate the depth, d , of water in the tank.

$d =$ cm [2]

- (c) The diagram below shows a solid circular cone and a solid sphere.



The cone has radius $5x \text{ cm}$ and height $12x \text{ cm}$.

The sphere has radius $r \text{ cm}$.

The cone has the same **total** surface area as the sphere.

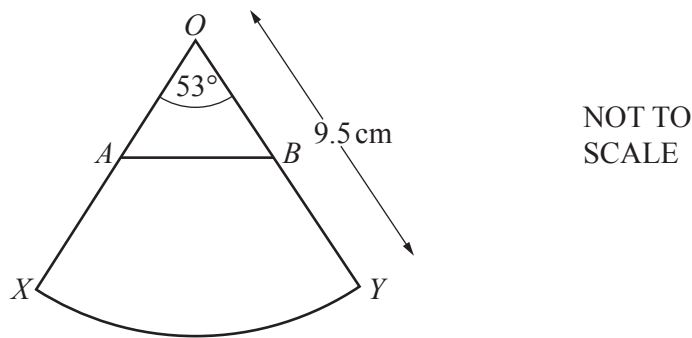
Show that $r^2 = \frac{45}{2}x^2$.

[The curved surface area, A , of a cone with radius r and slant height l is $A = \pi rl$.]

[The surface area, A , of a sphere with radius r is $A = 4\pi r^2$.]

36. Question part 1/2 | 0580 Feb-March 2021 P4 V2 Q8

8 (a)



The diagram shows a sector OXY of a circle with centre O and radius 9.5 cm.
The sector angle is 53° .
 A lies on OX , B lies on OY and $OA = OB$.

(i) Show that the area of the sector is 41.7 cm^2 , correct to 1 decimal place.

[2]

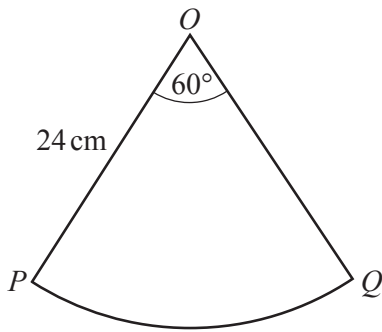
(ii) The area of triangle OAB is $\frac{1}{3}$ of the area of sector OXY .

Calculate OA .

$OA = \dots\dots\dots\text{ cm}$ [4]

36. Question part 2/2 | 0580 Feb-March 2021 P4 V2 Q8

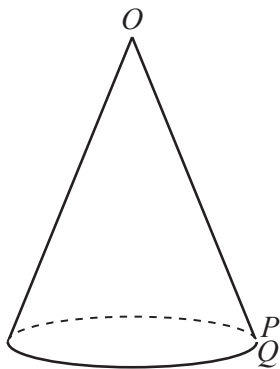
(b)



NOT TO
SCALE

The diagram shows a sector OPQ of a circle with centre O and radius 24 cm .
The sector angle is 60° .

A cone is made from this sector by joining OP to OQ .



NOT TO
SCALE

Calculate the volume of the cone.

[The volume, V , of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

..... cm^3 [6]

0580 Mathematics Paper 4 - Mensuration

Topical questions | 81 questions

37. Question | 0580 Feb-March 2021 P4 V2 Q10

- 10 (a)** A box is a cuboid with length 45 cm, width 30 cm and height 42 cm.
The box is completely filled with 90.72 kg of sand.

Calculate the density of this sand in kg/m^3 .
[Density = mass $\div$ volume]

..... kg/m^3 [3]

- (b)** A bag contains 15000cm^3 of sand.
Some of this sand is used to completely fill a hole in the shape of a cylinder.
The hole is 30 cm deep and has radius 10 cm.

Calculate the percentage of the sand from the bag that is used.

..... % [3]

- (c)** Sand costs \$98.90 per tonne.
This cost includes a tax of 15%.

Calculate the amount of tax paid per tonne of sand.

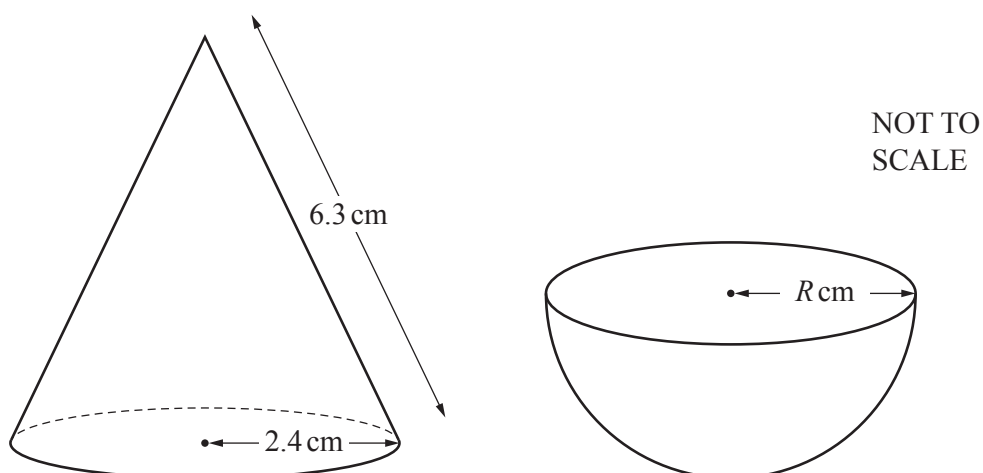
\$ [3]

- (d)** Raj buys some sand for 3540 rupees.

Calculate the cost in dollars when the exchange rate is \$1 = 70.8 rupees.

\$ [2]

3 (a)



The diagram shows a solid cone and a solid hemisphere.

The cone has radius 2.4 cm and slant height 6.3 cm.

The hemisphere has radius R cm.

The **total** surface area of the cone is equal to the **total** surface area of the hemisphere.

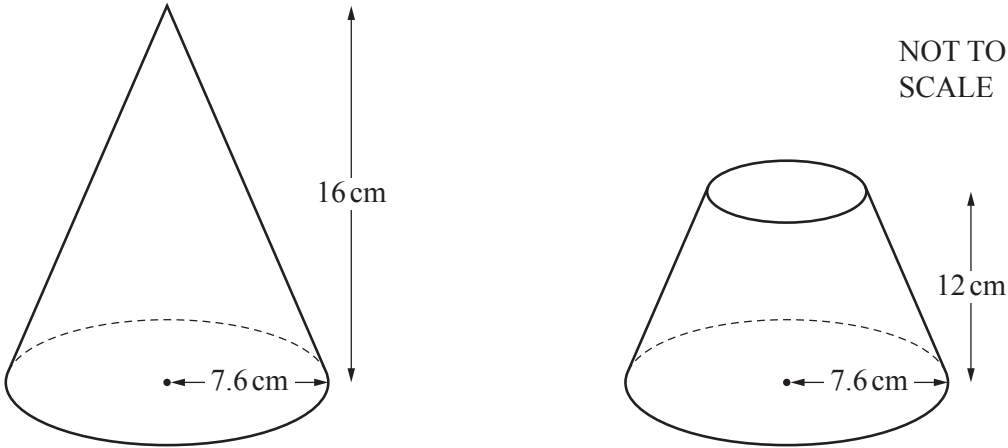
Calculate the value of R .

[The curved surface area, A , of a cone with radius r and slant height l is $A = \pi rl$.]

[The curved surface area, A , of a sphere with radius r is $A = 4\pi r^2$.]

$R =$ [4]

(b)



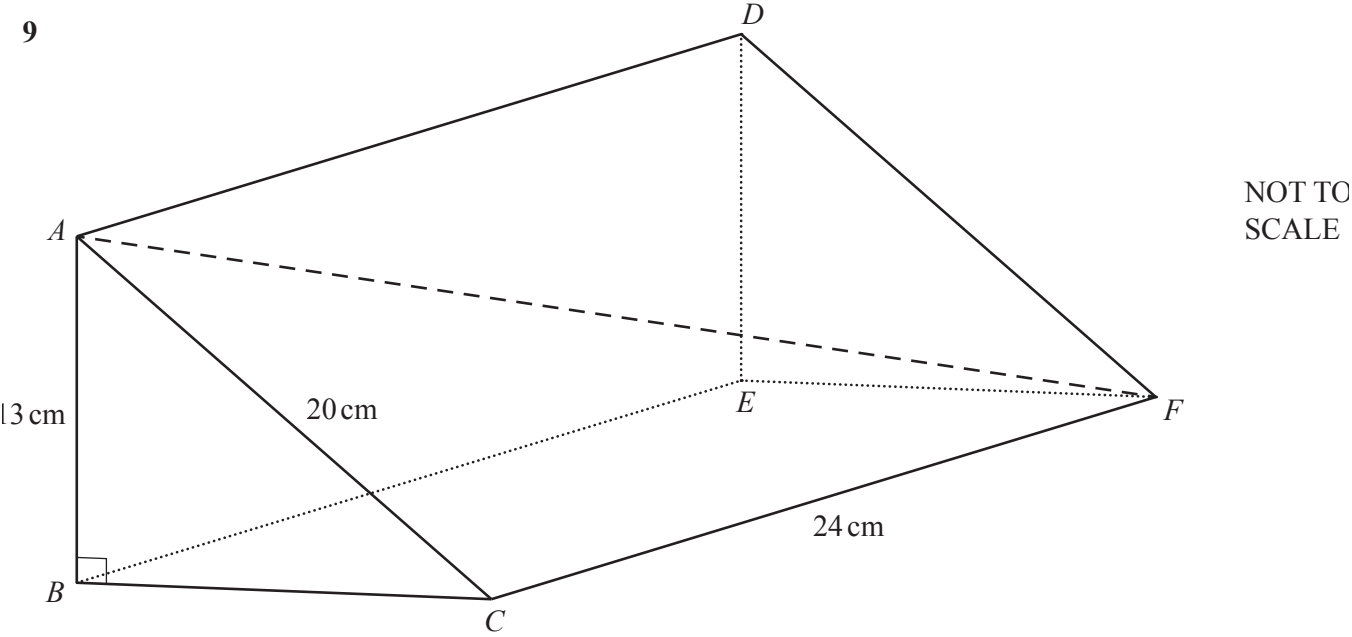
The diagram shows a solid cone with radius 7.6 cm and height 16 cm.
A cut is made parallel to the base of the cone and the top section is removed.
The remaining solid has height 12 cm, as shown in the diagram.

Calculate the volume of the remaining solid.

[The volume, V , of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

..... cm³ [4]

9



The diagram shows a prism, $ABCDEF$.
 $AB = 13\text{ cm}$, $AC = 20\text{ cm}$, $CF = 24\text{ cm}$ and angle $ABC = 90^\circ$.

(a) Calculate the total surface area of the prism.

..... cm^2 [6]

(b) Calculate the volume of the prism.

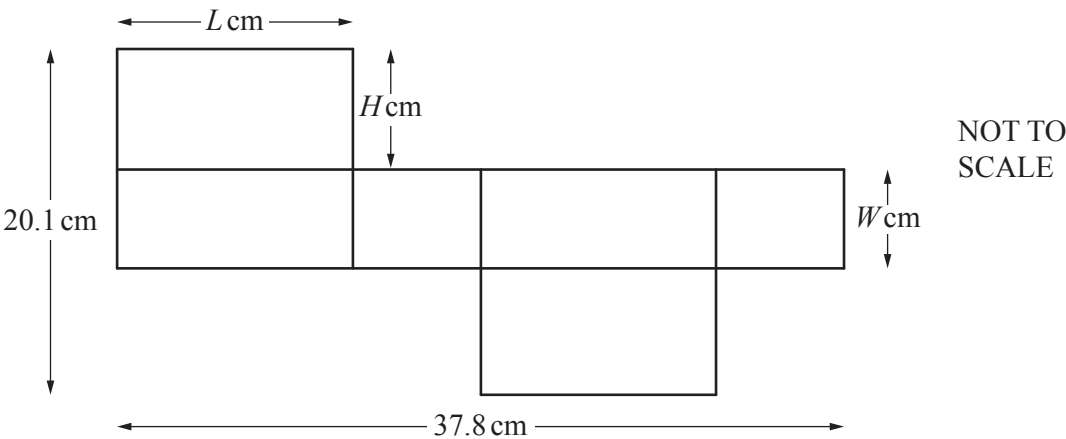
..... cm^3 [1]

(c) Calculate the angle that AF makes with the base $BCFE$.

..... [4]

40. Question part 1/2 | 0580 May-June 2021 P4 V2 Q8

8 (a) A cuboid has length L cm, width W cm and height H cm.



The diagram shows the net of this cuboid.
The ratio $W : L = 1 : 2$.

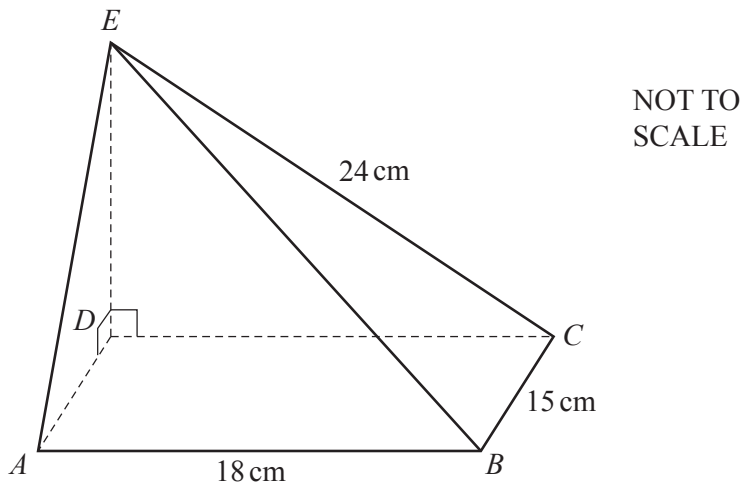
Find the value of L , the value of W and the value of H .

$L =$

$W =$

$H =$ [5]

(b)



The diagram shows a solid pyramid with a rectangular base $ABCD$.
 E is vertically above D .
Angle $EDC = \text{angle } EDA = 90^\circ$.
 $AB = 18\text{ cm}$, $BC = 15\text{ cm}$ and $EC = 24\text{ cm}$.

- (i) The pyramid is made of wood and has a mass of 800 g.

Calculate the density of the wood.
Give the units of your answer.

[The volume, V , of a pyramid is $V = \frac{1}{3} \times \text{area of base} \times \text{height}$.]
[Density = mass $\div$ volume]

..... [5]

- (ii) Calculate the angle between BE and the base of the pyramid.

..... [4]

41. Question part 1/2 | 0580 May-June 2021 P4 V3 Q8

8 (a) A solid cuboid measures 20 cm by 12 cm by 5 cm.

(i) Calculate the volume of the cuboid.

..... cm³ [1]

(ii) (a) Calculate the total surface area of the cuboid.

..... cm² [3]

(b) The surface of the cuboid is painted.
The cost of the paint used is \$1.52 .

Find the cost to paint 1cm² of the cuboid.
Give your answer in cents.

..... cents [1]

(b) A solid metal cylinder with radius x and height $\frac{9x}{2}$ is melted.
All the metal is used to make a sphere with radius r .

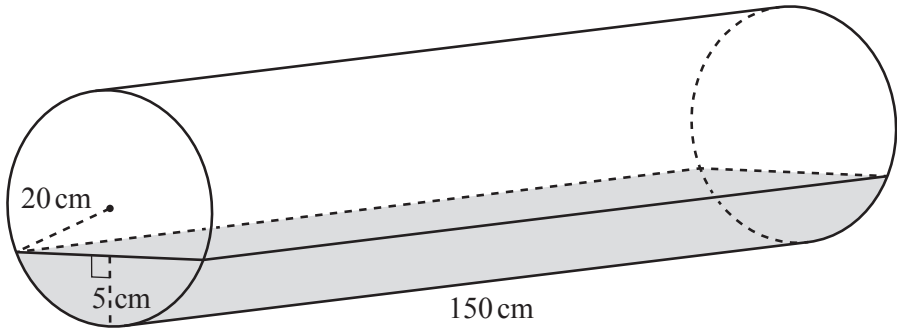
Find r in terms of x .

[The volume, V , of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

$r =$ [3]

41. Question part 2/2 | 0580 May-June 2021 P4 V3 Q8

(c)



NOT TO
SCALE

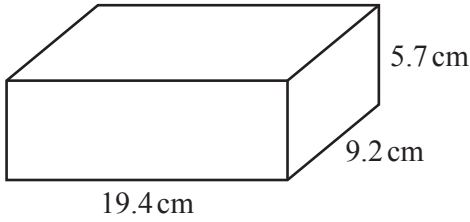
The diagram shows a cylinder of length 150 cm on horizontal ground.
The cylinder has radius 20 cm.
The cylinder contains water to a depth of 5 cm, as shown in the diagram.

Calculate the volume of water in the cylinder.
Give your answer in litres.

..... litres [7]

42. Question part 1/2 | 0580 Oct-Nov 2021 P4 V1 Q1

1 (a)



NOT TO
SCALE

The diagram shows a brick in the shape of a cuboid.

(i) Calculate the total surface area of the brick.

..... cm² [3]

(ii) The density of the brick is 1.9 g/cm³.

Work out the mass of the brick.
Give your answer in kilograms.
[Density = mass ÷ volume]

..... kg [3]

(b) 9000 bricks are needed to build a house.
200 bricks cost \$175.

Work out the cost of the bricks needed to build 5 houses.

\$ [3]

- (c) Saskia builds a wall using 1500 bricks.
She can build at the rate of 40 bricks each hour.
She works for 9 hours each day.
Saskia starts work on 6 July and works every day until the wall is completed.
- Find the date when she completes the wall.

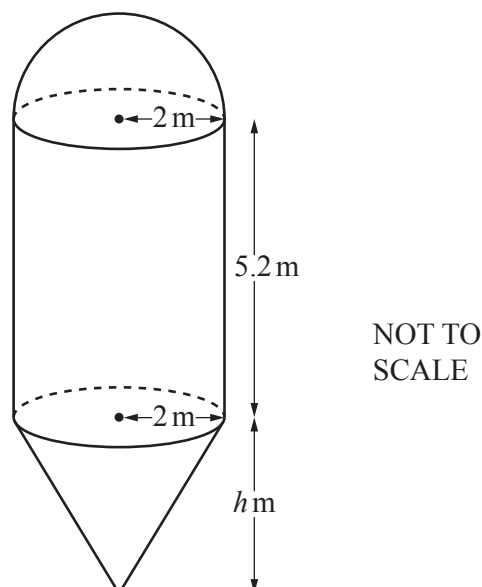
..... [3]

- (d) Rafa has a cylindrical tank.
The cylinder has a height of 105 cm and a diameter of 45 cm.
- Calculate the capacity of the tank in litres.

..... litres [3]

- 7 (a) The diagram shows a container for storing grain.

The container is made from a hemisphere, a cylinder and a cone, each with radius 2 m. The height of the cylinder is 5.2 m and the height of the cone is h m.



- (i) Calculate the volume of the hemisphere.
Give your answer as a multiple of π .

[The volume, V , of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

..... m^3 [2]

- (ii) The total volume of the container is $\frac{88\pi}{3} \text{ m}^3$.

Calculate the value of h .

[The volume, V , of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

$h =$ [4]

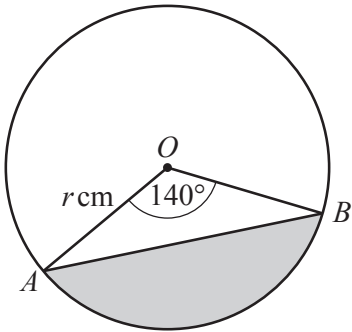
43. Question part 2/2 | 0580 Oct-Nov 2021 P4 V2 Q7

- (iii) The container is full of grain.
Grain is removed from the container at a rate of 35 000 kg per hour.
 1 m^3 of grain has a mass of 620 kg.

Calculate the time taken to empty the container.
Give your answer in hours and minutes.

..... h min [3]

(b)



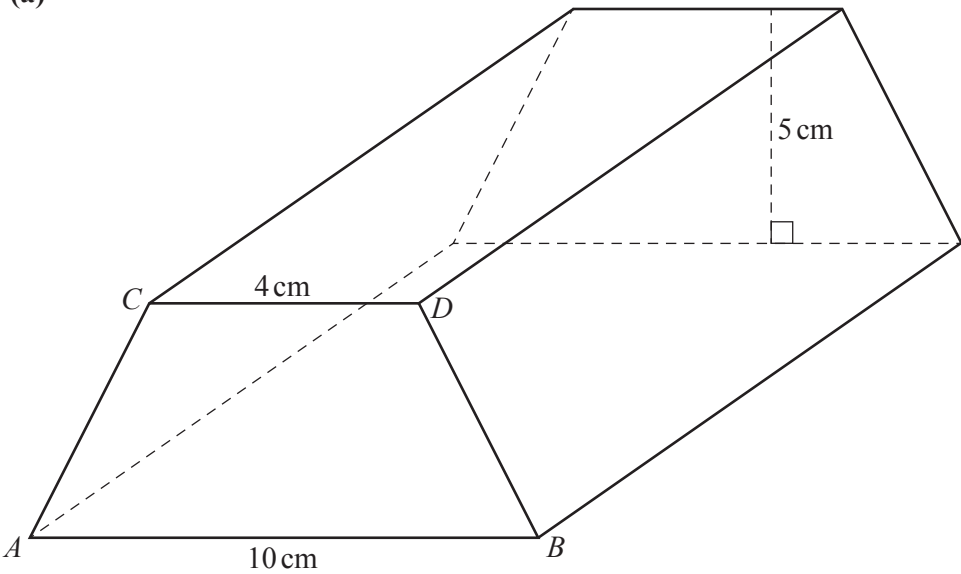
NOT TO
SCALE

A and B are points on a circle, centre O , radius $r\text{ cm}$.
The area of the shaded segment is 65 cm^2 .

Calculate the value of r .

$r =$ [4]

3 (a)



NOT TO
SCALE

The diagram shows a prism.
The cross-section of the prism is a trapezium with CD parallel to AB and $AC = BD$.
 $AB = 10\text{ cm}$, $CD = 4\text{ cm}$ and the height of the trapezium is 5 cm .
The volume of the prism is 525 cm^3 .

- (i) The prism is made of iron.
 1 cm^3 of iron has a mass of 7.8 g .

Calculate the mass of the prism.
Give your answer in kilograms.

..... kg [2]

- (ii) Calculate the length of the prism.

..... cm [3]

(iii) Calculate the total surface area of the prism.

..... cm^2 [6]

(iv) In a mathematically similar prism, the height of the trapezium is 10 cm.
Calculate the volume of this prism.

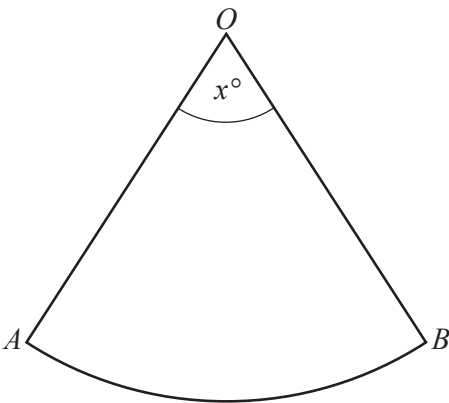
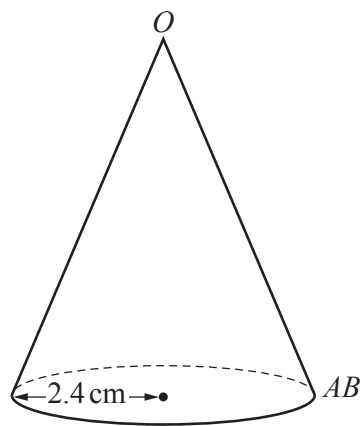
..... cm^3 [3]

(b) A cuboid measures 10 cm by 4 cm by 6 cm.
Each side is measured correct to the nearest centimetre.
Complete the inequality for the volume, V , of this cuboid.

..... $\text{cm}^3 \leq V <$ cm^3 [3]

45. Question | 0580 Feb-March 2022 P4 V2 Q9

9 (a)



NOT TO
SCALE

The volume of a paper cone of radius 2.4 cm is 95.4 cm^3 .
The paper is cut along the slant height from O to AB .
The cone is opened to form a sector OAB of a circle with centre O .

Calculate the sector angle x° .
[The volume, V , of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

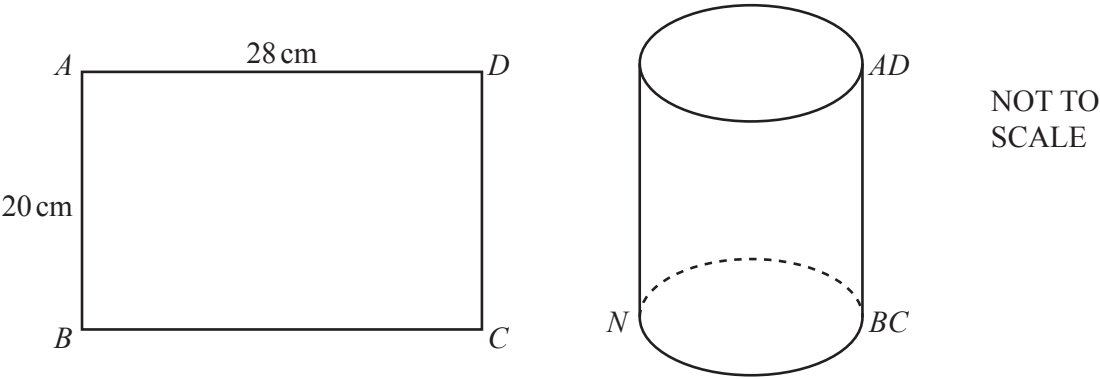
..... [6]

- (b) An empty fuel tank is filled using a cylindrical pipe with diameter 8 cm.
Fuel flows along this pipe at a rate of 2 metres per second.
It takes 24 minutes to fill the tank.

Calculate the capacity of the tank.
Give your answer in litres.

..... litres [4]

11 (a)



A rectangular sheet of paper $ABCD$ is made into an open cylinder with the edge AB meeting the edge DC .
 $AD = 28\text{ cm}$ and $AB = 20\text{ cm}$.

(i) Show that the radius of the cylinder is 4.46 cm , correct to 3 significant figures.

[2]

(ii) Calculate the volume of the cylinder.

..... cm^3 [2]

(iii) N is a point on the base of the cylinder, such that BN is a diameter.

Calculate the angle between AN and the base of the cylinder.

..... [3]

- (b) The volume of a solid cone is 310 cm^3 .
The height of the cone is twice the radius of its base.

Calculate the slant height of the cone.

[The volume, V , of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

..... cm [5]

47. Question part 1/2 | 0580 Oct-Nov 2022 P4 V1 Q1

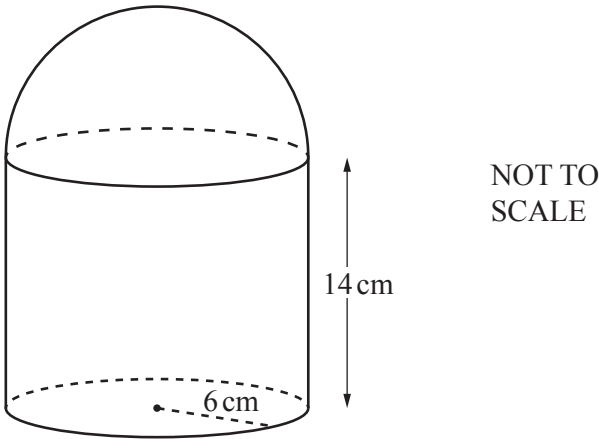
- 1 (a) Calculate the volume of
- (i) a solid cylinder with radius 6 cm and height 14 cm,

..... cm³ [2]

- (ii) a solid hemisphere with radius 6 cm.
[The volume, V , of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

..... cm³ [2]

(b)



The cylinder and hemisphere in **part (a)** are joined to form the solid in the diagram.
The solid is made of steel and 1 cm³ of steel has a mass of 7.85 g.

- (i) Show that 1 cm³ of steel has a mass of 0.007 85 kg.

[1]

- (ii) Calculate the total mass of the solid.

..... kg [2]

(c) 2000 cm³ of iron is melted down and some of it is used to make 50 spheres with radius 2 cm.

- (i) Calculate the percentage of iron that is left over.
[The volume, V , of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

..... % [3]

- (ii) The iron left over is then made into a cube.

Calculate the length of an edge of the cube.

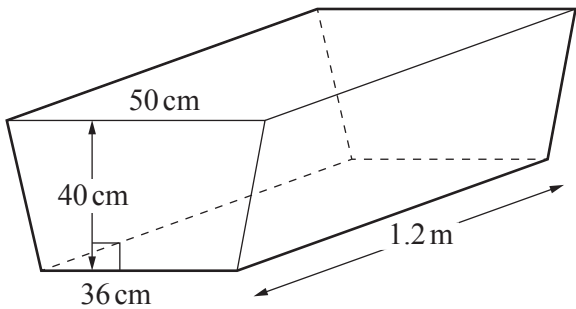
..... cm [1]

- (d) A solid cone has radius $3R$ cm and slant height $9R$ cm.
A solid cylinder has radius x cm and height $7x$ cm.
The **total** surface area of the cone is equal to the **total** surface area of the cylinder.

Given that $R = kx$, find the value of k .
[The curved surface area, A , of a cone with radius r and slant height l is $A = \pi rl$.]

$k =$ [4]

5



NOT TO
SCALE

The diagram shows a water trough in the shape of a prism.
The prism has a cross-section in the shape of an isosceles trapezium.
The trough is completely filled with water.

(a) Show that the volume of water in the trough is 206.4 litres.

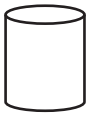
[3]

(b) The water from the trough is emptied at a rate of 600 ml per second.

Calculate the time taken, in minutes and seconds, for the trough to be emptied.

..... minutes seconds [3]

(c) All the water from the trough is emptied into a vertical cylindrical tank.
The depth of the water in the tank is 84 cm.



(i) Calculate the radius of the tank.

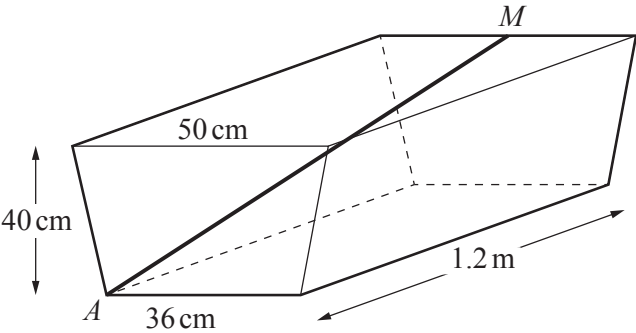
..... cm [3]

(ii) The tank is 60% full.

Calculate the height of the tank.

..... cm [2]

(d)



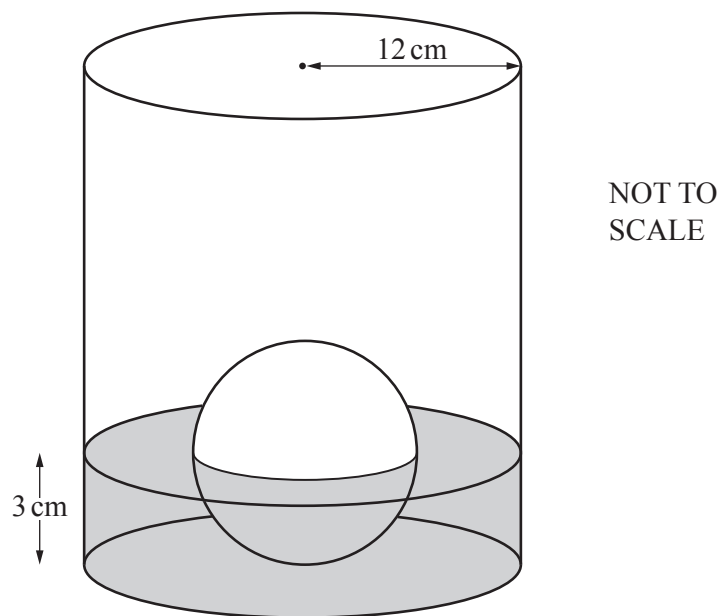
NOT TO
SCALE

A steel rod AM is placed inside the empty water trough as shown in the diagram.
 A is a vertex at the base of the isosceles trapezium and M is the midpoint of the top edge on the opposite face.

Calculate the length of the steel rod, AM .

$AM =$ cm [4]

3



The diagram shows a cylinder containing water.
There is a solid metal sphere touching the base of the cylinder.
Half of the sphere is in the water.

The radius of the cylinder is 12 cm and the radius of the sphere is 3 cm.

(a) The sphere is removed from the cylinder and the level of the water decreases by h cm.

Show that $h = 0.125$.

[The volume, V , of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

- (b) The water in the cylinder is poured into another cylinder of radius R cm.
The depth of the water in this cylinder is 18 cm.

Calculate the value of R .

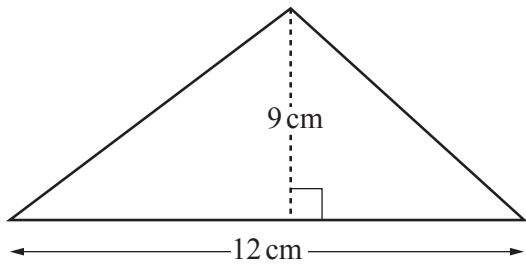
$R = \dots\dots\dots$ [3]

- (c) The sphere is melted down and some of the metal is used to make 30 cubes with
edge length 1.5 cm.

Calculate the percentage of metal **not** used.
[The volume, V , of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

$\dots\dots\dots\%$ [3]

8 (a)

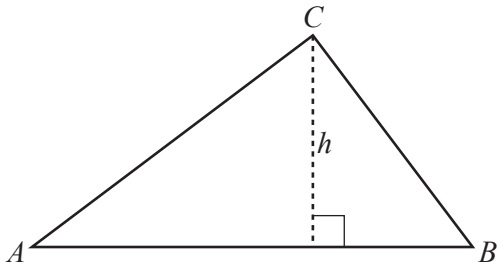


NOT TO
SCALE

Calculate the area of the triangle.

..... cm^2 [2]

(b)



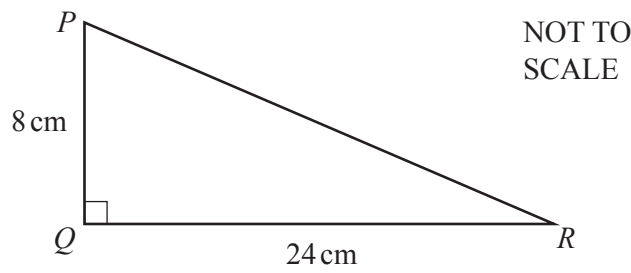
NOT TO
SCALE

$AB = (2x + 3)\text{cm}$ and $h = (x + 5)\text{cm}$.
The area of triangle $ABC = 50\text{ cm}^2$.
Find the value of x , giving your answer correct to 2 decimal places.
You must show all your working.

$x =$ [6]

51. Question part 1/2 | 0580 May-June 2023 P4 V1 Q4

4 (a)



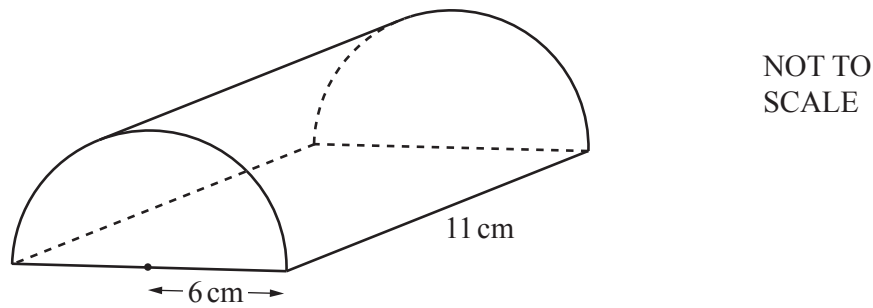
(i) Calculate the area of triangle PQR .

..... cm^2 [2]

(ii) Calculate angle PRQ .

Angle $PRQ =$ [2]

(b)

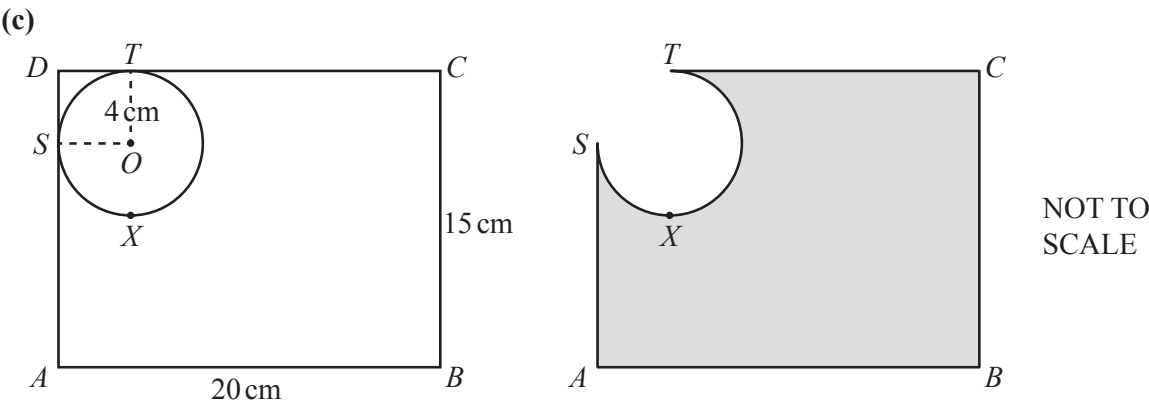


The diagram shows a half-cylinder of radius 6 cm and length 11 cm.

Calculate the volume of the half-cylinder.

..... cm^3 [2]

51. Question part 2/2 | 0580 May-June 2023 P4 V1 Q4



- (i) $ABCD$ is a rectangle with $AB = 20\text{ cm}$ and $BC = 15\text{ cm}$.
 S , X and T are points on a circle centre O , such that DSA and DTC are tangents to the circle.
The radius of the circle is 4 cm and TX is a diameter of the circle.
The shape $DSXT$ is removed from the corner of the rectangle, leaving the shaded shape shown in the second diagram.

Calculate the area of the shaded shape.

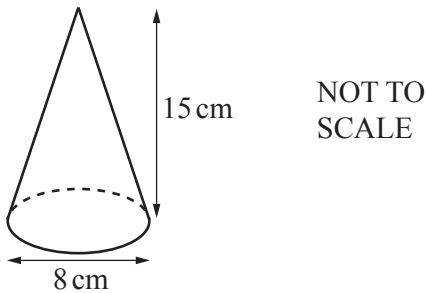
..... cm^2 [5]

- (ii) Calculate the perimeter of the shaded shape.

..... cm [3]

52. Question part 1/2 | 0580 May-June 2023 P4 V2 Q5

5 (a)



A cone has base diameter 8 cm and perpendicular height 15 cm.

- (i) Calculate the volume of the cone.
[The volume, V , of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

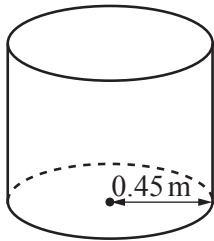
..... cm^3 [2]

- (ii) A label completely covers the curved surface area of the cone.

Calculate the area of the label as a percentage of the **total** surface area of the cone.
[The curved surface area, A , of a cone with radius r and slant height l is $A = \pi r l$.]

..... % [5]

(b)



NOT TO
SCALE

An empty cylindrical container has radius 0.45 m.
300 litres of water is poured into the container at a rate of 375 ml per second.

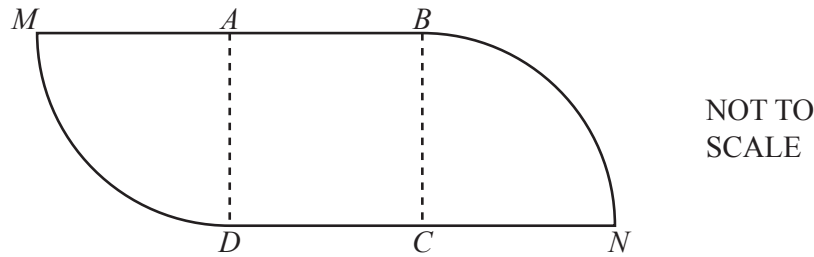
(i) Find the time taken, in minutes and seconds, for all the water to be poured into the container.

..... min s [3]

(ii) Calculate the height of the water in the container.

..... m [3]

9 (a)



The diagram shows a shape made from a square $ABCD$ and two equal sectors of a circle.
The square has side 11 cm.
 MAB and DCN are straight lines.

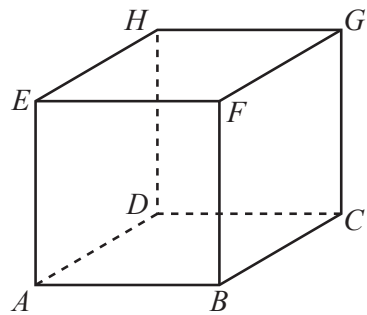
(i) Calculate the area of the shape.

..... cm^2 [3]

(ii) Calculate the perimeter of the shape.

..... cm [3]

(b)



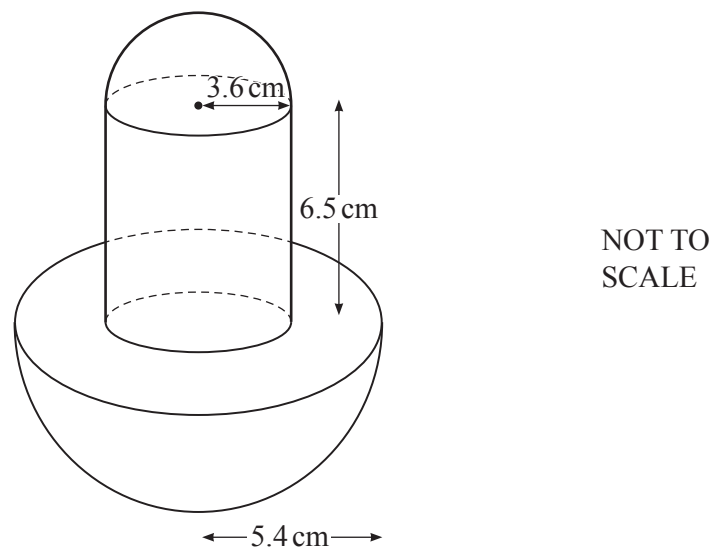
NOT TO
SCALE

The diagram shows a cube $ABCDEFGH$ of edge 7 cm .

Calculate the angle between AG and the base of the cube.

..... [4]

8 (a)



The diagram shows a solid formed by joining two hemispheres and a cylinder.
The radius of the large hemisphere is 5.4 cm.
The radius of the small hemisphere and the radius of the cylinder are both 3.6 cm.
The height of the cylinder is 6.5 cm.

(i) Show that the volume of the solid is 692 cm^3 , correct to the nearest cubic centimetre.

[The volume, V , of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

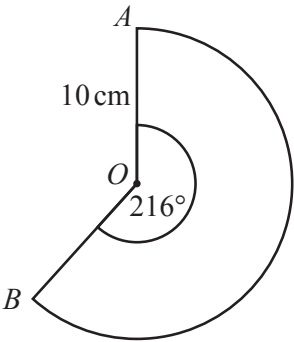
[4]

(ii) A mathematically similar solid is made of silver.
In this solid, the cylinder has radius 0.6 cm.
 1 cm^3 of silver has a mass of 10.49 grams.

Calculate the total mass of this silver solid.

..... g [4]

(b)



NOT TO
SCALE

AOB is a sector of a circle, centre O .
 $AO = 10\text{ cm}$ and the sector angle is 216° .

- (i) Calculate the length of the arc of this sector.
Give your answer as a multiple of π .

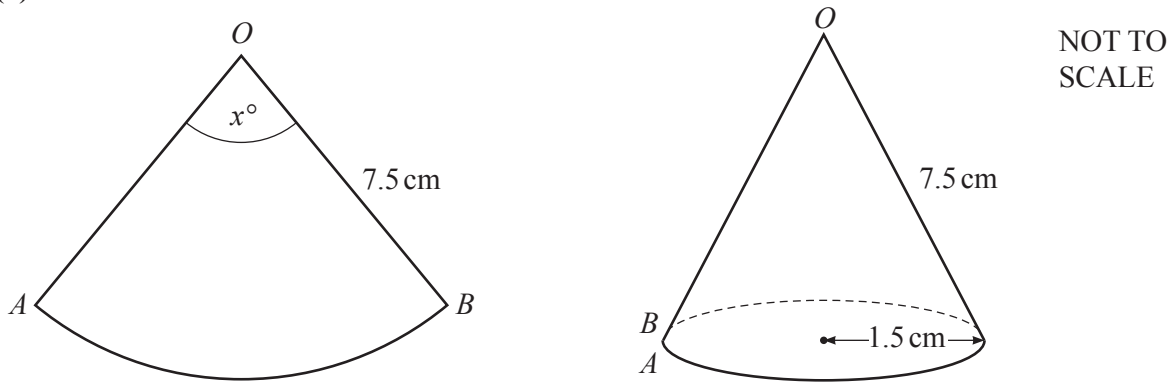
.....cm [2]

- (ii) A cone is made from this sector by joining OA to OB .

Calculate the volume of the cone.
[The volume, V , of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

..... cm^3 [4]

4 (a)

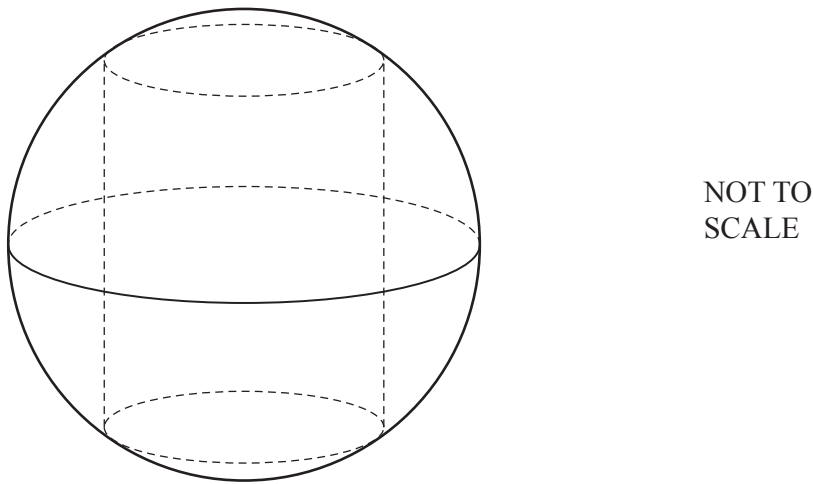


The diagram shows a sector of a circle that is made into a cone by joining OA to OB . The sector angle is x° and the radius of the sector is 7.5 cm . The base radius of the cone is 1.5 cm .

Calculate the value of x .

$x = \dots\dots\dots$ [3]

(b)



The diagram shows a cylinder with radius 8 cm inside a sphere with radius 17 cm . Both ends of the cylinder touch the curved surface of the sphere.

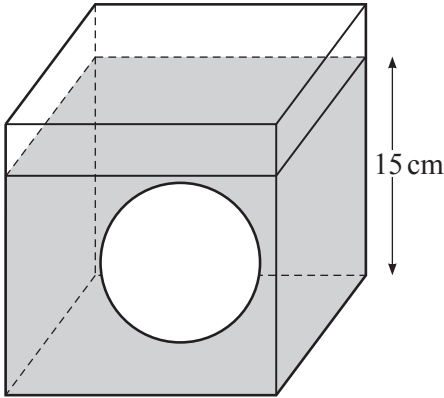
(i) Show that the height of the cylinder is 30 cm .

(ii) Calculate the volume of the cylinder as a percentage of the volume of the sphere.

[The volume, V , of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

..... % [4]

(c)



NOT TO
SCALE

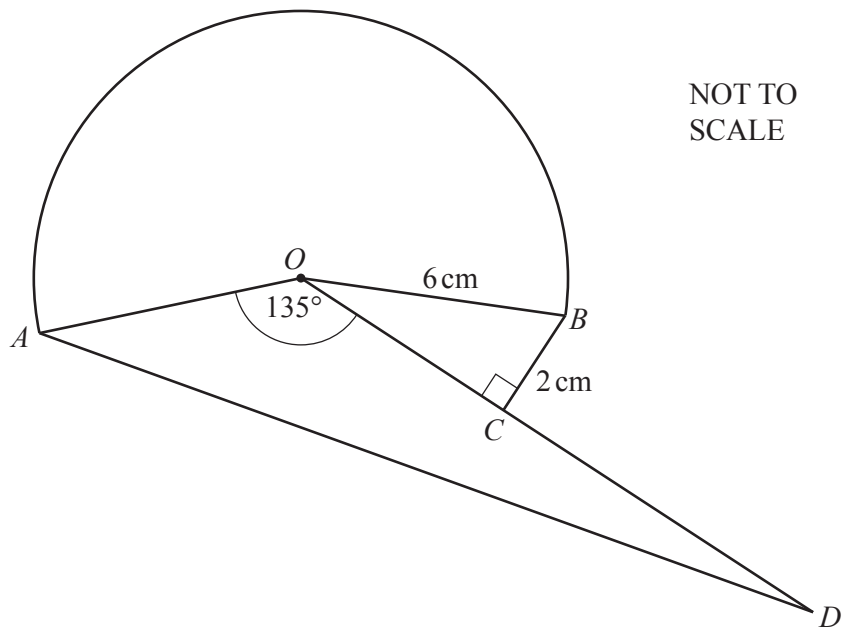
The diagram shows a solid sphere with radius 6 cm inside a cube with side length 20 cm.
The cube contains water to a depth of 15 cm.
The sphere is removed.

Calculate the new depth of water in the cube.

[The volume, V , of a sphere with radius r is $V = \frac{4}{3}\pi r^3$.]

..... cm [3]

8 (a)



The diagram shows a shape made from a major sector AOB and triangles OBC and AOD . $OB = 6\text{ cm}$, $BC = 2\text{ cm}$, obtuse angle $AOC = 135^\circ$ and angle $BCO = 90^\circ$.

(i) Show that angle $BOC = 19.5^\circ$, correct to 1 decimal place.

[2]

(ii) Calculate the area of the major sector AOB .

..... cm^2 [3]

(iii) C is the midpoint of OD .

Calculate AD .

..... cm [5]

(iv) Calculate the total area of the shape.

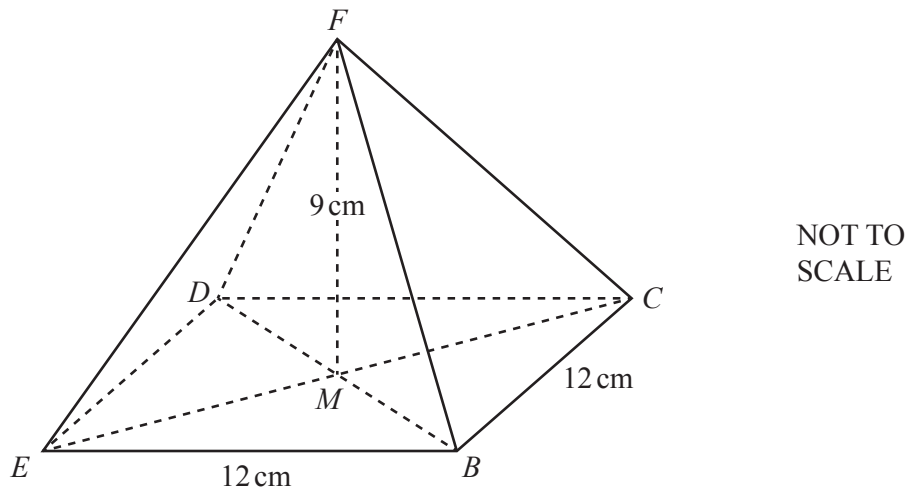
..... cm² [4]

(b) A sector of a circle has radius 8 cm and area 160 cm².
A mathematically similar sector has radius 20 cm.

Calculate the area of the larger sector.

..... cm² [3]

4 (a)



The diagram shows a pyramid with a square base $BCDE$.
The diagonals CE and BD intersect at M , and the vertex F is directly above M .
 $BE = 12\text{ cm}$ and $FM = 9\text{ cm}$.

(i) Calculate the volume of the pyramid.

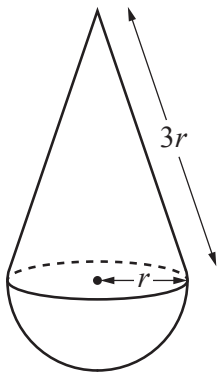
[The volume, V , of a pyramid with base area A and height h is $V = \frac{1}{3}Ah$.]

..... cm^3 [2]

(ii) Calculate the total surface area of the pyramid.

..... cm^2 [5]

(b)



NOT TO
SCALE

The diagram shows a toy made from a cone and a hemisphere.
The base radius of the cone and the radius of the hemisphere are both r cm.
The slant height of the cone is $3r$ cm.

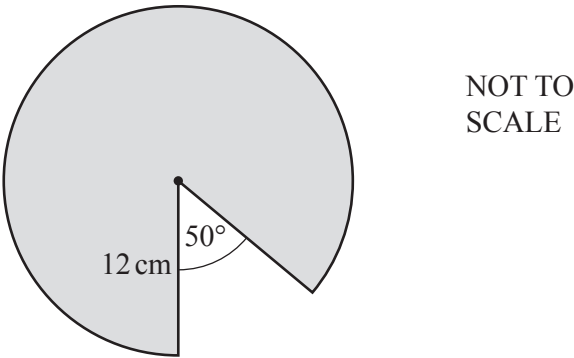
The total surface area of the toy is 304 cm^2 .

Calculate the value of r .

[The curved surface area, A , of a cone with radius r and slant height l is $A = \pi rl$.]
[The curved surface area, A , of a sphere with radius r is $A = 4\pi r^2$.]

$r =$ [4]

12 (a)



The diagram shows a circle of radius 12 cm, with a sector removed.
Calculate the perimeter of the remaining shaded shape.

..... cm [4]

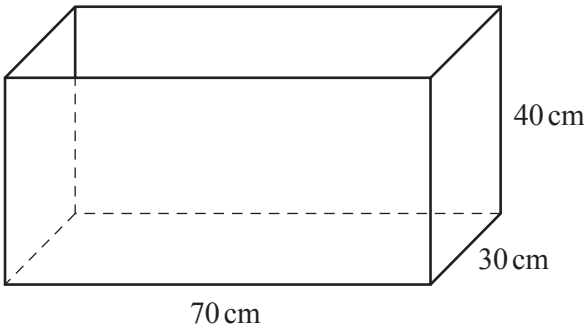
(b) The diagram in **part(a)** shows the top of a cylindrical cake with a slice removed.
The volume of cake that remains is 3510 cm^3 .

Calculate the height of the cake.

..... cm [3]

59. Question part 1/2 | 0580 May-June 2024 P4 V1 Q7

7 (a)



NOT TO
SCALE

The diagram shows a box in the shape of a cuboid.
The box is open at the top.

(i) Work out the surface area of the inside of the open box.

..... cm² [3]

(ii) Cylinders with height 20 cm and diameter 15 cm are placed in the box.

Work out the maximum number of these cylinders that can completely fit inside the box.

..... [3]

- (b) A solid bronze cone has a mass 750 g.
The density of the bronze is 8.9 g/cm^3 .

The ratio radius of cone : height of cone = 1 : 3.

- (i) Show that the radius of the cone is 2.99 cm, correct to 3 significant figures.
[Density = mass $\div$ volume]

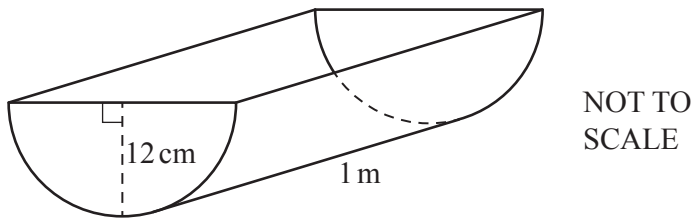
[The volume, V , of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

[4]

- (ii) Calculate the total surface area of the cone.
[The curved surface area, A , of a cone with radius r and slant height l is $A = \pi r l$.]

..... cm^2 [5]

4 (a)

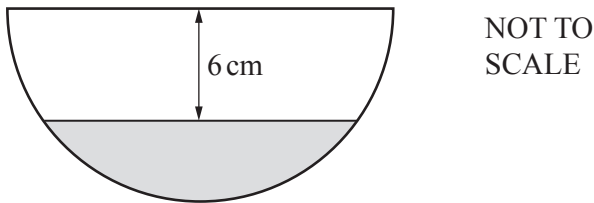


The diagram shows a tank in the shape of a half-cylinder of radius 12 cm and length 1 metre. The tank is fixed horizontally and is completely filled with water.

- (i) Calculate the volume of water in the tank.
Give your answer correct to the nearest 10 cm^3 .

..... cm^3 [3]

(ii)



Water is removed from the tank until the level of water is 6 cm below the top of the tank. The diagram shows the cross-section of the tank.

Calculate the volume of water that is now in the tank.

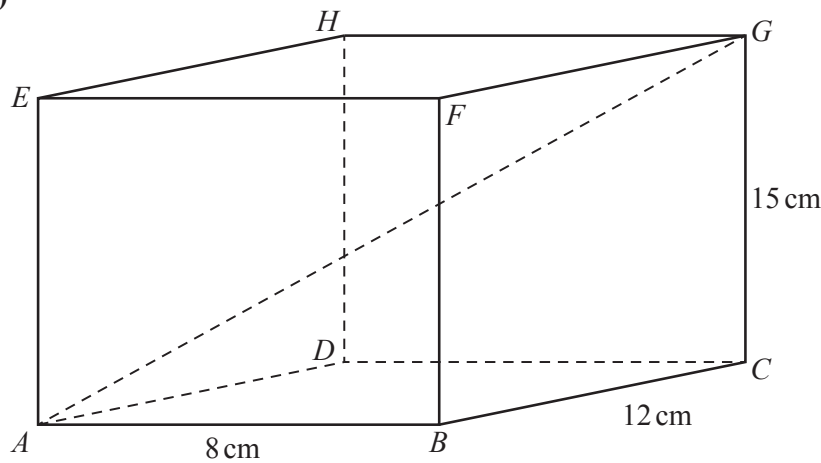
..... cm^3 [5]

- (b) A rectangular fish tank with length 42 cm and width 35 cm is full of water.
A stone lies at the bottom of the tank.
When the stone is removed from the tank, the depth of the water decreases by 0.2 cm.
The density of the stone is 2.2 g/cm^3 .

Calculate the mass of the stone in grams.
[Density = mass $\div$ volume]

..... g [3]

(c)



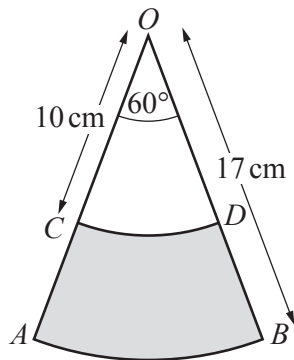
NOT TO
SCALE

The diagram shows a cuboid, $ABCDEFGH$.
Calculate the angle that AG makes with the base of the cuboid.

..... [4]

61. Question part 1/2 | 0580 May-June 2024 P4 V2 Q9

9 (a)



NOT TO
SCALE

OAB is a sector of a circle, centre O , radius 17 cm.
 OCD is a sector of a circle, centre O , radius 10 cm.
 OCA and ODB are straight lines and angle $AOB = 60^\circ$.

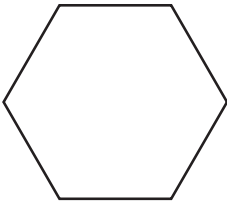
The perimeter of the shaded shape $ABDC$ can be written in the form $(a\pi + b)$ cm.

Find the value of a and the value of b .

$a =$

$b =$ [3]

(b)



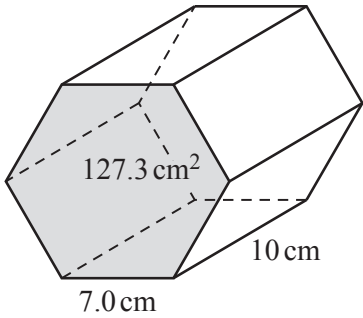
NOT TO
SCALE

The diagram shows a regular hexagon.
The area of the hexagon is 127.3 cm^2 .

(i) Show that the length of one side of the hexagon is 7.0 cm , correct to 1 decimal place.

[4]

(ii) The hexagon is the cross-section of a prism of length 10 cm .



NOT TO
SCALE

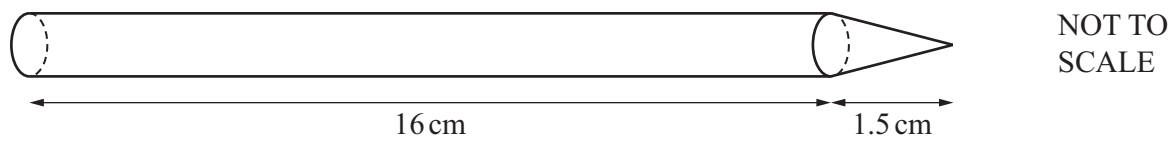
(a) Find the volume of the prism.

..... cm^3 [1]

(b) Calculate the surface area of the prism.

..... cm^2 [2]

8 (a)



The diagram shows a solid made from a cylinder and a cone.
The height of the cylinder is 16 cm and the height of the cone is 1.5 cm.
The radius of the cylinder and the base radius of the cone are each 0.35 cm.

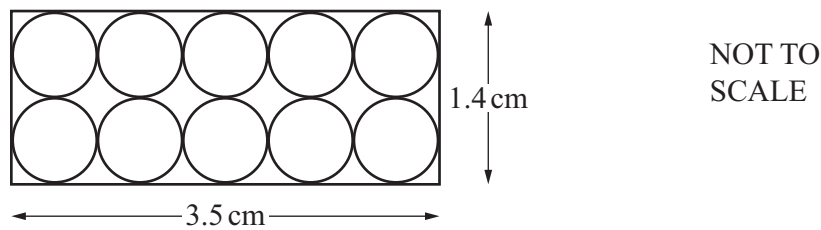
- (i) Calculate the total surface area of the solid.
[The curved surface area, A , of a cone with radius r and slant height l is $A = \pi rl$.]

..... cm^2 [5]

- (ii) Calculate the volume of the solid.
[The volume, V , of a cone with radius r and height h is $V = \frac{1}{3}\pi r^2 h$.]

..... cm^3 [3]

(iii)

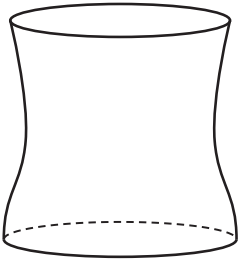
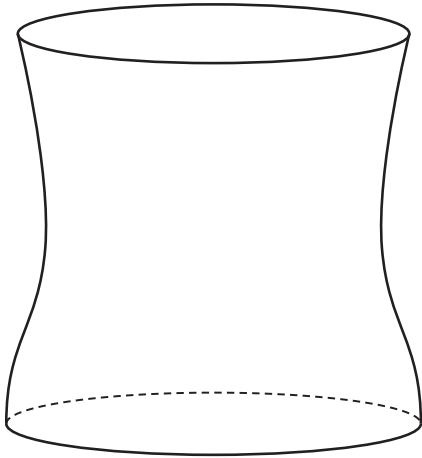


10 of the solids are placed in a box in the shape of a cuboid of length 17.5 cm.
The diagram shows one end of the box.

Calculate the volume of the empty space in the box.



(b)

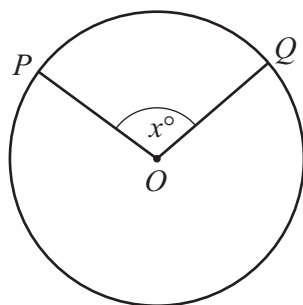


NOT TO
SCALE

The diagram shows two mathematically similar solids.
The surface area of the larger solid is 200 cm^2 and the surface area of the smaller solid is 98 cm^2 .
The volume of the larger solid is 450 cm^3 .

Calculate the volume of the smaller solid.

..... cm^3 [3]

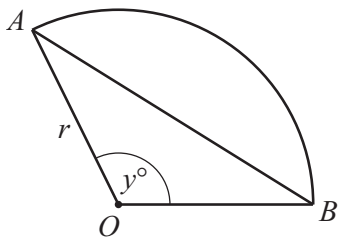
11 (a)NOT TO
SCALE

In the circle, centre O , the length of the minor arc PQ is $\frac{3}{7}$ of the length of the major arc PQ .
Show that $x = 108$.

[3]



(b)



NOT TO
SCALE

The diagram shows a sector, OAB , of a circle with centre O and radius r .
The area of triangle OAB is half the area of the sector.
Angle $AOB = y^\circ$ and is obtuse.

(i) Show that $360 \sin y = \pi y$.

[2]

(ii) Complete the table, giving your answers correct to two decimal places.

y	$360 \sin y$	πy
108.4	341.60	340.55
108.5	341.40	340.86
108.6	341.20	
108.7		

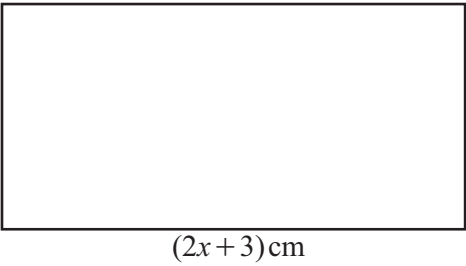
[3]

(iii) Complete the statement.

The value of y , correct to one decimal place, that satisfies
the equation $360 \sin y = \pi y$ is

[1]

10 (a)



NOT TO
SCALE

This rectangle has area 190 cm^2 .

(i) By forming and solving an equation, show that $x = 8.5$.

[4]

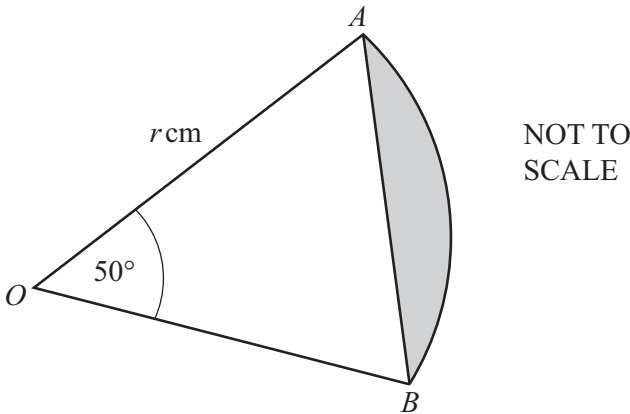
(ii) Work out the perimeter of the rectangle.

..... cm [2]

64. Question part 2/2 | 0580 Oct-Nov 2024 P4 V1 Q10



(b)



The diagram shows a sector OAB of a circle, with centre O , and a chord AB . The shaded segment has area 30 cm^2 .

(i) Show that $r = 23.7\text{ cm}$, correct to 1 decimal place.

[4]

(ii) Calculate the perimeter of the shaded segment.

..... cm [4]

65. Question part 1/2 | 0580 Oct-Nov 2024 P4 V3 Q4

- 4 (a) A box contains 50 cuboids.
Each cuboid has a mass of 135 g.
The total mass of the cuboids and the box is 7 kg.

Calculate the mass of the box.
Give your answer in grams.

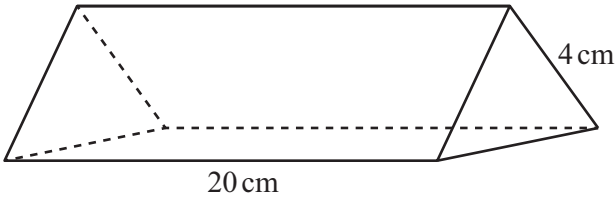
..... g [2]

- (b) A solid cube of side 4 cm is fixed to the base inside an empty cube of side 6 cm.
Water is poured into the larger cube until it reaches the top of the smaller cube.

Calculate the amount of water poured into the larger cube.

..... cm³ [2]

(c)



NOT TO
SCALE

The diagram shows a solid triangular prism of length 20 cm.
The cross-section is an equilateral triangle with side length 4 cm.
The prism is made of wood with a density of 0.85 g/cm³.

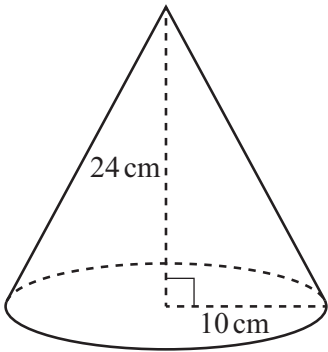
Calculate the mass of the prism.
[Density = mass ÷ volume]

..... g [4]

65. Question part 2/2 | 0580 Oct-Nov 2024 P4 V3 Q4



(d)



NOT TO
SCALE

The diagram shows a solid cone with base radius 10 cm and height 24 cm.

- (i) Show that the **total** surface area of the cone is 1131 cm^2 , correct to the nearest cm^2 .
[The curved surface area of a cone with base radius r and slant height l is $A = \pi rl$.]

[4]

- (ii) The total surface area of the cone is painted.

- (a) The cost to paint the cone is \$1.71 .

Calculate the cost to paint 1 cm^2 of the cone.
Give your answer in cents.

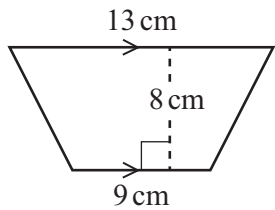
..... cents [1]

- (b) One tin of paint has enough paint to cover 2.5 m^2 .

Calculate the number of these cones that can be painted completely using one tin of paint.

..... [2]

7 (a) (i)

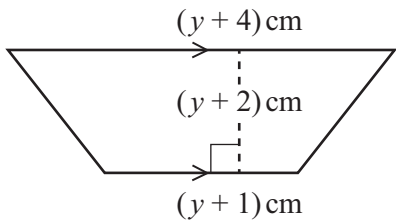


NOT TO
SCALE

Calculate the area of the trapezium.

..... cm^2 [2]

(ii)



NOT TO
SCALE

The area of this trapezium is 264 cm^2 .

(a) Show that $2y^2 + 9y - 518 = 0$.

[3]

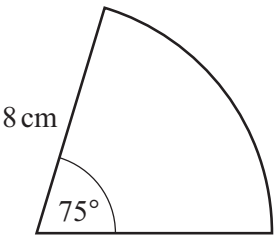
(b) Solve $2y^2 + 9y - 518 = 0$ by factorisation to find the value of y .

$y =$ [3]

66. Question part 2/2 | 0580 Oct-Nov 2024 P4 V3 Q7



(b)

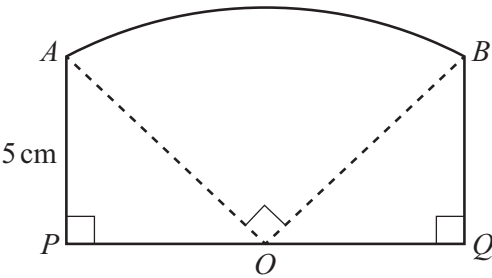


NOT TO
SCALE

The diagram shows a sector of a circle with radius 8 cm and angle 75° .
Find the perimeter of the sector.

..... cm [3]

(c)



NOT TO
SCALE

The diagram shows a shape $ABQP$ made from three straight lines and an arc of a sector of a circle.
The sector has centre O and angle 90° .
 PQ is a straight line and $AP = PO = OQ = QB = 5$ cm.

Find the area of $ABQP$.
Give your answer in the form $a + k\pi$.

..... cm^2 [4]

67. Question | 0580 Feb-March 2025 P4 V2 Q12

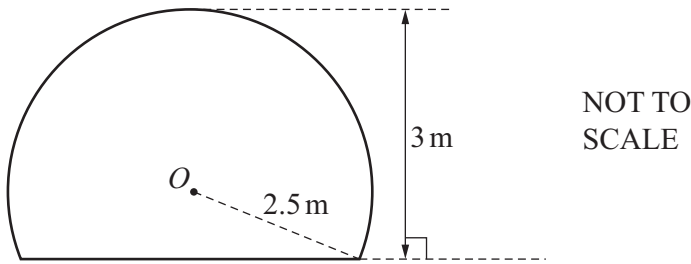
12 A cone has sloping edge 12 cm and base radius 5 cm.

Calculate the **total** surface area of the cone.

..... cm² [2]

68. Question | 0580 Feb-March 2025 P4 V2 Q23

23



The diagram shows the major segment of a circle, centre O , radius 2.5 m .
The segment is the cross section of a tunnel with height 3 m .
The length of the tunnel is 800 m and it has the same cross section throughout its length.

Calculate the volume of the tunnel.

..... m^3 [7]

69. Question | 0580 May-June 2025 P4 V1 Q11

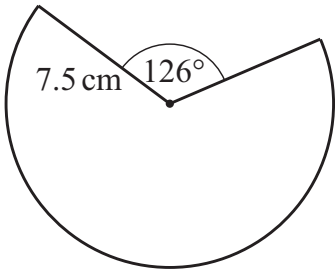
- 11** A warehouse has a floor area of 800 m^2 .
The plan of the warehouse is drawn to a scale of $1 : 50$.

Calculate the floor area on the plan.
Give your answer in square centimetres.

..... cm^2 [3]

70. Question | 0580 May-June 2025 P4 V1 Q19

19



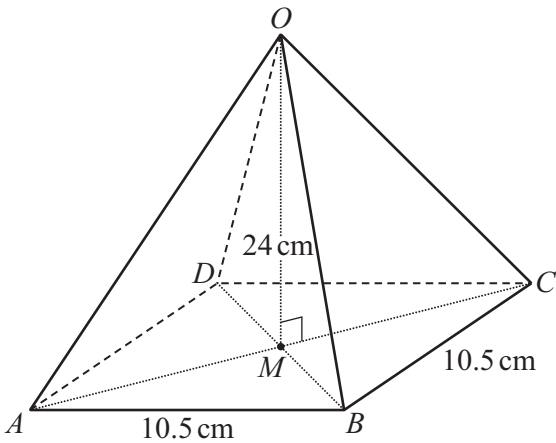
NOT TO
SCALE

The diagram shows a major sector of a circle with radius 7.5 cm .
Calculate the perimeter of the major sector.

..... cm [4]

71. Question part 1/2 | 0580 May-June 2025 P4 V1 Q20

20



NOT TO
SCALE

The diagram shows a pyramid $OABCD$.
The pyramid has a square base, $ABCD$, with sides 10.5 cm .
The vertex O is vertically above the centre of the base, M .
The height of the pyramid is 24 cm .

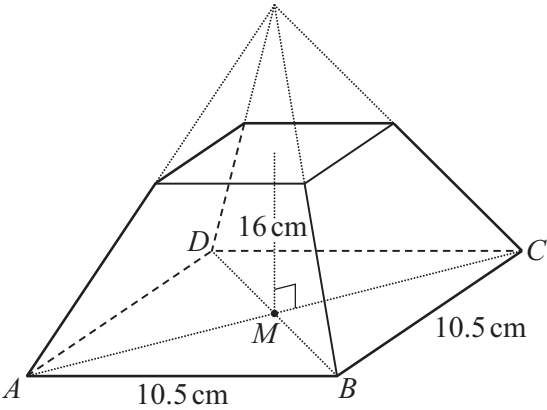
(a) Calculate the angle that OA makes with the base.

..... [4]

71. Question part 2/2 | 0580 May-June 2025 P4 V1 Q20



(b)



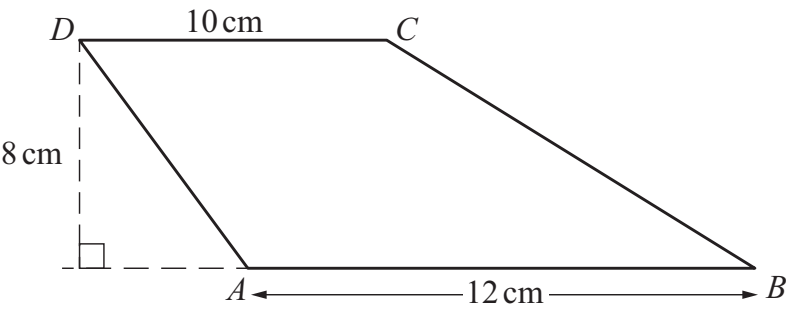
NOT TO
SCALE

The diagram shows a frustum of the pyramid $OABCD$.
The height of the frustum is 16 cm.

Calculate the volume of the frustum.

..... cm^3 [5]

4



NOT TO
SCALE

ABCD is a trapezium.

Work out the area of the trapezium.

..... cm^2 [2]

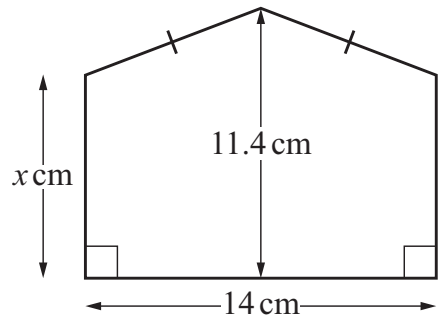
- 6 A solid wooden cone has base radius 4 cm and height 12 cm.
The density of the wood is 0.74 g/cm^3 .

Calculate the mass of the cone.
[Density = Mass $\div$ Volume]

..... g [3]

74. Question | 0580 May-June 2025 P4 V3 Q4

4 The diagram shows a pentagon made from two congruent trapeziums.



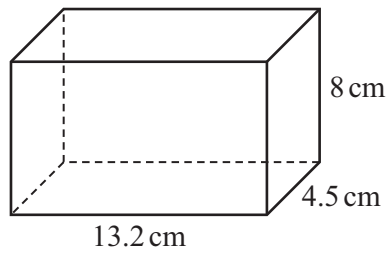
The area of the pentagon is 130.2 cm^2 .

Calculate the value of x .

$x = \dots\dots\dots$ [3]

75. Question | 0580 May-June 2025 P4 V3 Q18

18



NOT TO
SCALE

The diagram shows a solid cuboid with sides of length 4.5 cm, 8 cm and 13.2 cm.

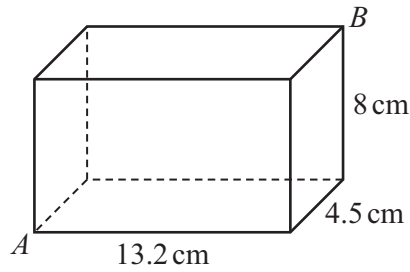
(a) Calculate the volume of the cuboid.

..... cm³ [1]

(b) Calculate the total surface area of the cuboid.

..... cm² [3]

(c)



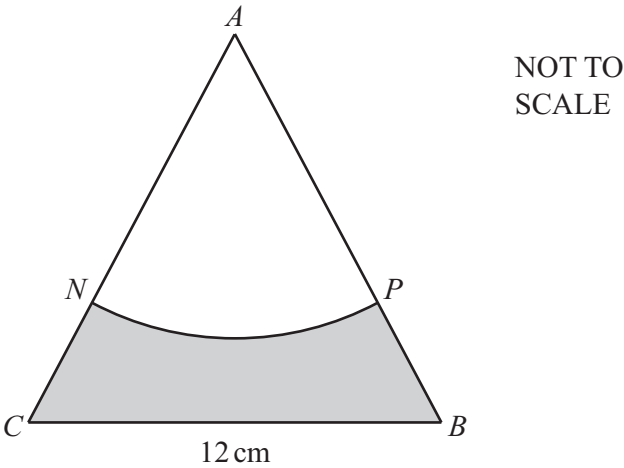
NOT TO
SCALE

Calculate the angle between AB and the horizontal base of the cuboid.

..... [4]

76. Question | 0580 May-June 2025 P4 V3 Q21

21

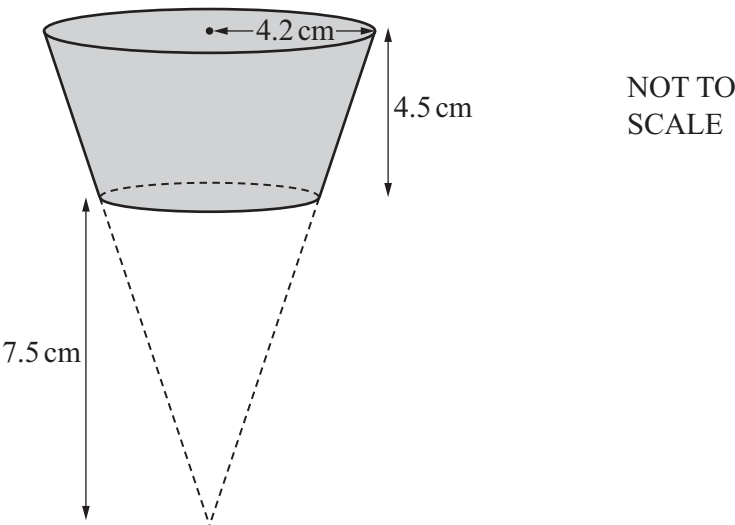


The diagram shows an equilateral triangle ABC with all sides of length 12 cm .
 ANP is a sector of a circle, centre A .
 N lies on AC such that $AN : NC = 2 : 1$.
 P lies on AB such that $AP : PB = 2 : 1$.

Calculate the area of the shaded region.

..... cm^2 [4]

23



The diagram shows a frustum made by removing a small cone from a large cone.
The height of the small cone is 7.5 cm.
The height of the frustum is 4.5 cm.
The radius of the large cone is 4.2 cm.

Work out the volume of the frustum.

..... cm³ [4]

78. Question part 1/2 | 0580 Oct-Nov 2025 P4 V1 Q14

14 A cube contains a solid metal sphere.
The sphere touches all the faces of the cube.
The side length of the cube is 8 cm.

(a) Show that the volume of the sphere is $\frac{256}{3}\pi \text{ cm}^3$.

[1]

(b) Calculate the percentage of the cube that is **not** occupied by the sphere.

..... % [3]

(c) The density of the metal of the sphere is 7.86 g/cm^3 .

Calculate the mass of the sphere.
Give your answer in kilograms.
[Density = mass $\div$ volume]

..... kg [2]

78. Question part 2/2 | 0580 Oct-Nov 2025 P4 V1 Q14



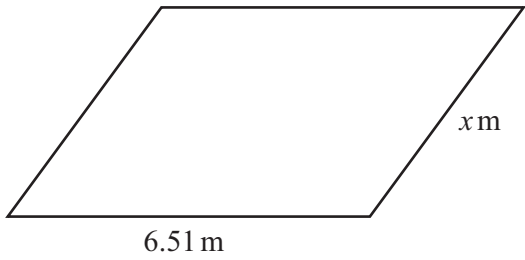
(d) The sphere is melted down and made into a solid cylinder with radius 3.1 cm.

Calculate the **total** surface area of the cylinder.

..... cm² [4]

79. Question | 0580 Oct-Nov 2025 P4 V2 Q7

7 The diagram shows a parallelogram.



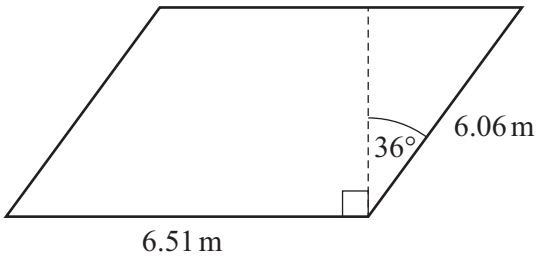
NOT TO
SCALE

The parallelogram has the same perimeter as a circle with radius 4 m.

(a) Show that $x = 6.06$ m, correct to 2 decimal places.

[4]

(b)



NOT TO
SCALE

The floor of a room is in the shape of this parallelogram.
It costs \$18 per square metre to tile the floor.

Calculate the total cost of tiling the floor.

\$ [4]

6 A solid metal cuboid has a volume of 600 cm^3 .

(a) The base of the cuboid is 10 cm by 12 cm.

Calculate the height of the cuboid.

..... cm [2]

(b) The solid metal cuboid is melted and made into 1120 spheres, each with radius 0.45 cm.

Find the volume of metal **not** used in making these spheres.

..... cm^3 [2]

19 The cross-section of a prism is an equilateral triangle of side 6 cm.
The length of the prism is 20 cm.

Calculate the total surface area of the prism.

.....cm² [4]