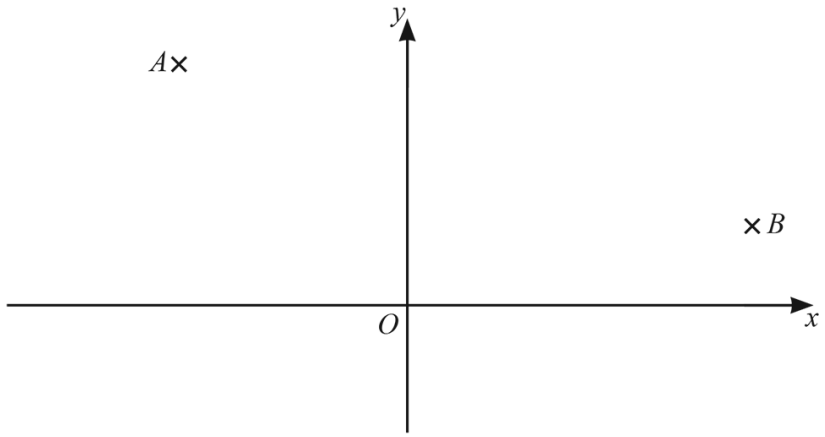
Chapter 7

Mensuration

01. 0607_m24_qp_42 Q: 9



A is the point $(-4, 6)$ and B is the point $(8, 2)$.

(a) Find the coordinates of the mid-point of AB.

(..... , ...) [2]

(b) Find the equation of AB.

..... [3]

(c) Show that the equation of the perpendicular bisector of AB is $y = 3x - 2$.

[3]

(d) The point C has coordinates (3, 7).

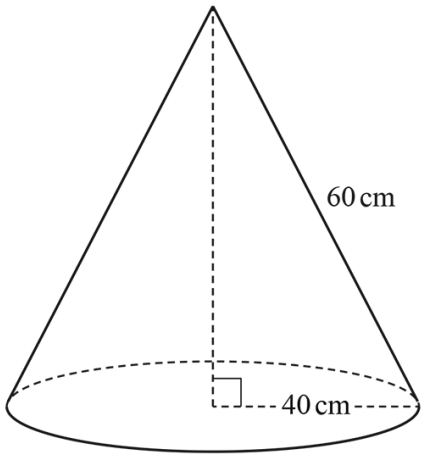
Show that C lies on the perpendicular bisector of AB.

[1]

(e) Find the area of triangle ABC.

..... [4]

02. 0607_s24_qp_41 Q: 9



NOT TO SCALE

The diagram shows a solid cone with base radius 40 cm and slant height 60 cm.

(a) Find the volume of the cone.

..... cm^3 [3]

(b) Show that the total surface area of the cone is $4000\pi\,cm^2$.

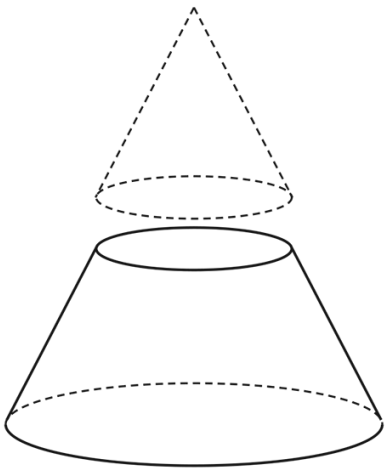
[2]

(c) A mathematically similar cone has a surface area of $1000\pi\,cm^2$.

Show that the radius of this cone is 20 cm.

[2]

(d)



A cone with radius 20 cm is removed from the top of the cone with radius 40 cm to leave a solid.

Calculate the surface area of the remaining solid.

..... cm^2 [3]

03. 0607_s24_qp_42 Q: 1

(a) The volume of a triangular prism is $476\,cm^3$.
The base of the triangle is 8 cm and the perpendicular height is 7 cm.

Calculate the length of the prism.

..... cm [3]

(b) The volume of a solid steel cube is $8000\,cm^3$.

(i) The mass of $1\,cm^3$ of the steel is 7.86 g.

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

..... kg [1]

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

..... cm^2 [3]

(iii) The steel cube is melted down and made into spheres with radius 3.5 cm.

Calculate the number of these spheres that are made.

..... [3]

04. 0607_s24_qp_42 Q: 5

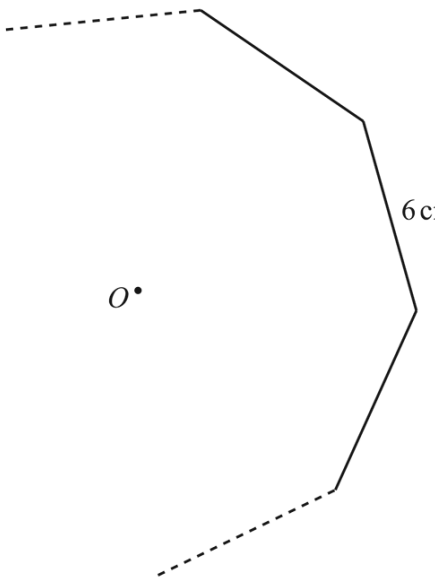
(a) Calculate the area of an equilateral triangle with side length 12 cm.

..... cm^2 [2]

(b) Calculate the area of a circle with circumference 60 cm.

..... cm^2 [3]

(c)

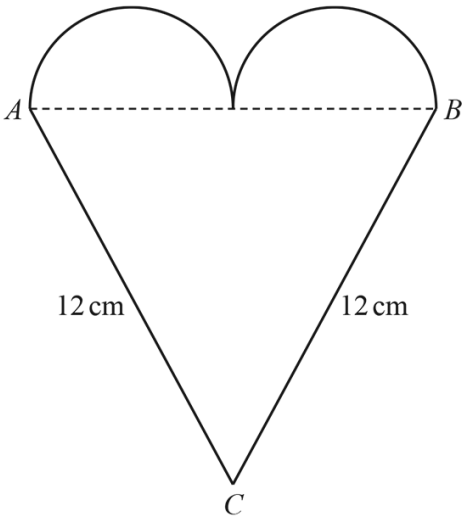


NOT TO SCALE

The diagram shows part of a regular 10-sided polygon with centre O and side length 6 cm.

Calculate the area of the polygon.

..... cm^2 [4]



NOT TO SCALE

The diagram shows a logo made from an isosceles triangle and two semicircles.
The perimeter of the logo is 37 cm.

(a) Show that the diameter of each semicircle is 4.14 cm, correct to 3 significant figures.

[2]

(b) Calculate angle ACB.

Angle ACB = ... [3]

(c) Calculate the area of the logo.

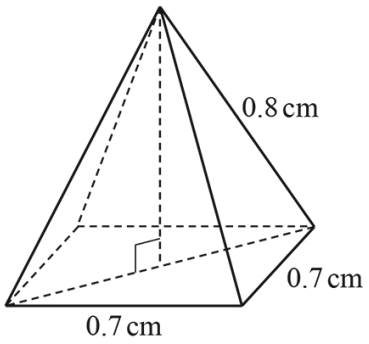
..... cm^2 [3]

(d) A mathematically similar logo has an area of 35 cm^2.

Calculate the perimeter of this logo.

..... cm [3]

06. 0607_s24_qp_43 Q: 8



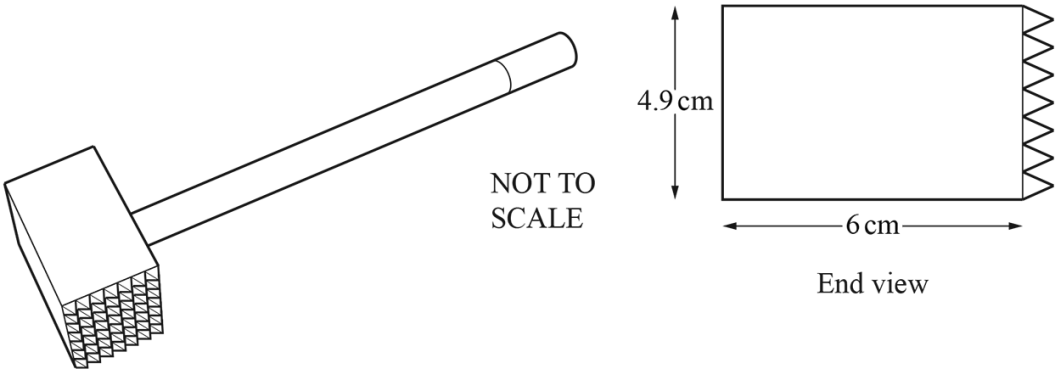
NOT TO SCALE

The diagram shows a square-based pyramid.
The side of the base of the pyramid is 0.7 cm.
The length of each sloping edge is 0.8 cm.

(a) Show that the perpendicular height of the pyramid is 0.628 cm, correct to 3 significant figures.

[4]

(b)

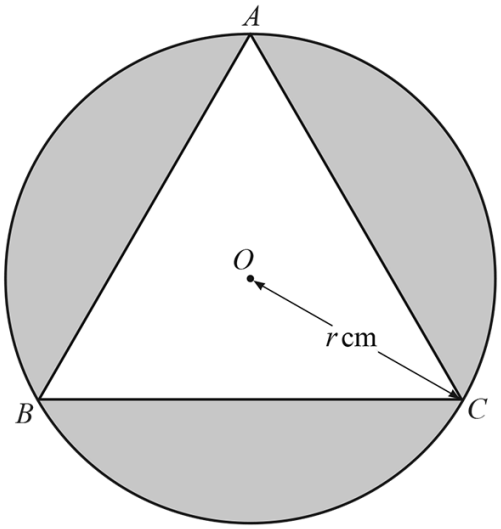


The diagram shows a kitchen tool made from wood.
The tool is formed from a cuboid, a cylinder and 49 of the square-based pyramids from **part (a)**.

The cylinder has a radius of 1.2 cm and length 25 cm.
The cuboid measures 4.9 cm by 4.9 cm by 6 cm.
The mass of 1 cm^3 of the wood is 0.63 grams.

Calculate the total mass of the tool.

..... g [5]



NOT TO SCALE

The diagram shows an equilateral triangle ABC touching a circle, centre O and radius r cm.

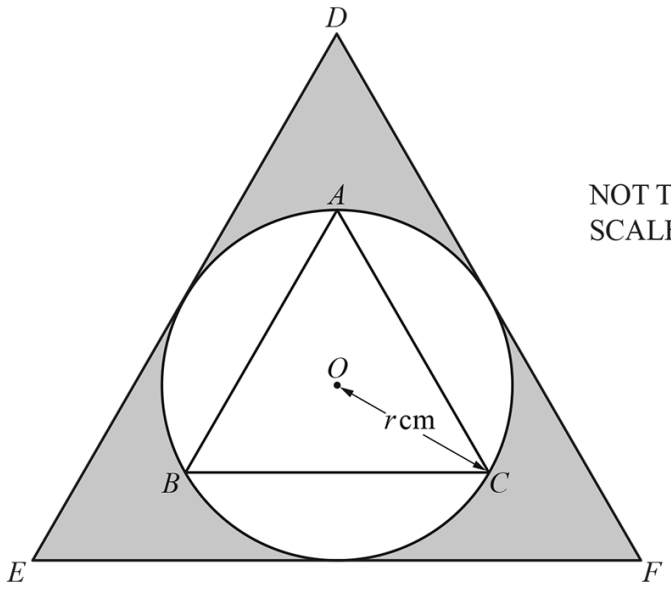
(a) (i) Show that the area of triangle ABC is $\frac{3\sqrt{3}}{4}r^2$ cm^2.

[4]

(ii) Find an expression, in terms of π and r, for the exact value of the shaded area.

..... cm^2 [1]

(b)



Another equilateral triangle *DEF* is touching the same circle.

Find an expression, in terms of π and *r*, for the exact value of this shaded area.

..... cm^2 [3]

(c) Find in its simplest form the ratio

perimeter of triangle *ABC* : perimeter of triangle *DEF* .

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

08. 0607_s23_qp_41 Q: 2

(a) Calculate the volume of each shape.

(i) A cuboid with a square base of side 5 cm and height 3 cm.

..... cm^3 [2]

(ii) A sphere with radius 4 cm.

..... cm^3 [2]

(b) A cylinder has volume 120 cm^3 and height 6 cm.

Calculate its radius.

..... cm [2]

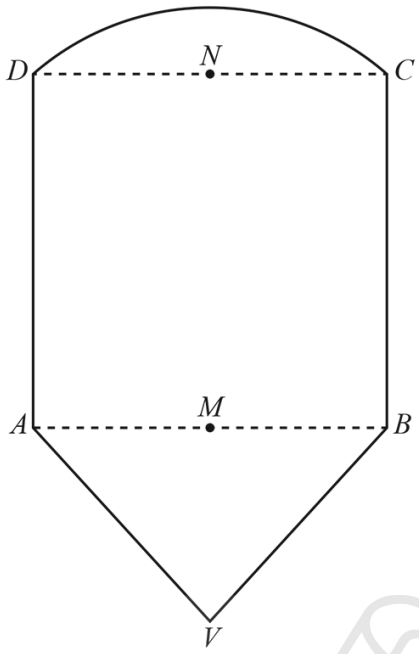
(c) A cone has volume 120 cm^3 and height 6 cm.

Calculate the length of its sloping edge.

..... cm [3]

09. 0607_s23_qp_41 Q: 7

(a)



NOT TO SCALE

The diagram shows a shape *AVBCD*.
ABCD is a square of side 12 cm.
M is the mid-point of *AB* and *N* is the mid-point of *DC*.
Triangle *AVB* is isosceles with $AV = VB = 10$ cm.
The arc *CD* is part of a circle with centre *M*.

(i) Calculate angle *CMN*.

Angle *CMN* = ... [2]

(ii) Calculate the length of *CM*.

CM = ... cm [2]

(iii) Calculate the perimeter of the shape *AVBCD*.

..... cm [3]

(iv) Calculate the area of the shape $AVBCD$.

..... cm^2 [5]

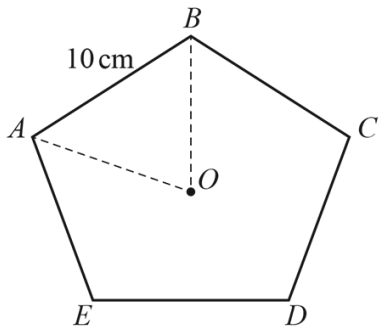
(b) Two solids are mathematically similar with volumes $240\,cm^3$ and $810\,cm^3$.
The surface area of the larger solid is $558\,cm^2$.

Calculate the surface area of the smaller solid.

..... cm^2 [3]

10. 0607_s23_qp_42 Q: 5

(a) The diagram shows a regular pentagon with sides of 10 cm and centre O.



NOT TO SCALE

(i) Find angle AOB.

Angle AOB = ... [1]

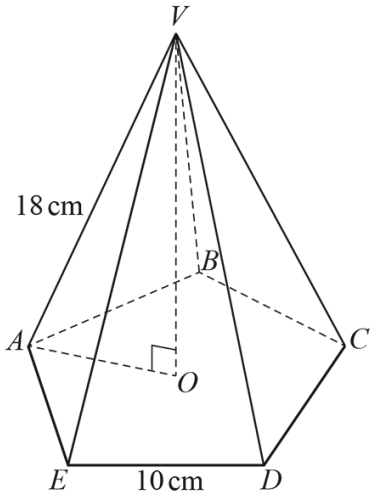
(ii) Show that $OA = 8.51$ cm correct to 3 significant figures.

[3]

(iii) Find the area of the pentagon.

..... cm^2 [2]

(b)



NOT TO SCALE

The regular pentagon in **part (a)** is the base of a pyramid.
The sloping edges, VA, VB, VC, VD, and VE, are each of length 18 cm.

(i) Calculate the perpendicular height, VO, of the pyramid.

$VO =$ ..... cm [3]

(ii) Calculate the volume of the pyramid.

..... cm^3 [2]

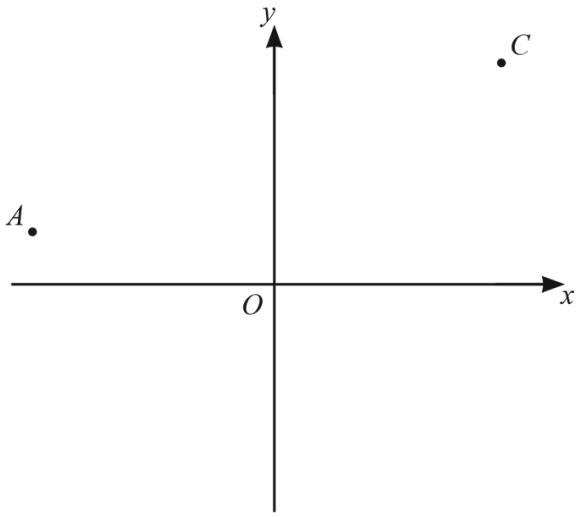
(iii) A geometrically similar pyramid has volume 1500 cm^3.

Calculate the length of a side of the base of this pyramid.

..... cm [3]

11. 0607_s23_qp_42 Q: 7

A is the point $(-8, 2)$ and C is the point $(8, 10)$.



(a) Find the equation of the line AC.

..... [3]

(b) N is the point $(4, 8)$.

Show that N lies on AC.

[1]

(c) Find the equation of the line that is perpendicular to AC and passes through N.

..... [3]

(d) A and C are two vertices of a quadrilateral $ABCD$.
B is the point (2, 12).
D is the reflection of B in the line AC.

(i) Find the coordinates of D.

(..... , ...) [2]

(ii) Write down the name of the special quadrilateral $ABCD$.

..... [1]

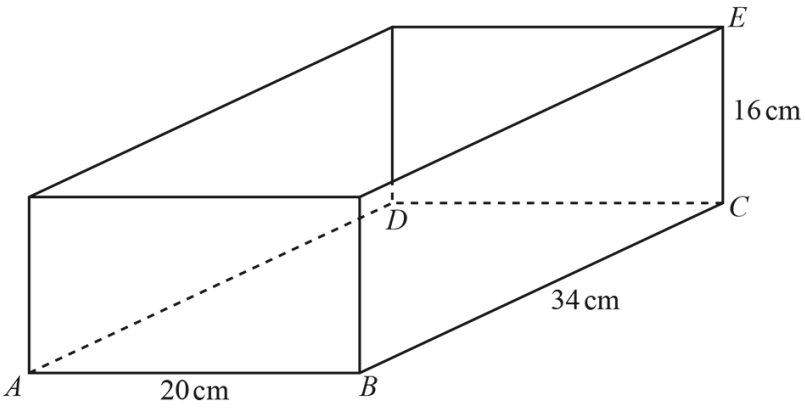
(iii) Find the length AC.

..... [2]

(iv) Find the area of the quadrilateral $ABCD$.

..... [3]

12. 0607_s23_qp_43 Q: 11



NOT TO SCALE

The diagram shows a cuboid with base $ABCD$.
$AB = 20\,\text{cm}$, $BC = 34\,\text{cm}$ and $CE = 16\,\text{cm}$.
Water is poured into the cuboid to a height of 8 cm.

(a) Find the volume of water in the cuboid.

..... cm^3 [2]

(b) A sphere of radius 4 cm is placed so that it rests on the base of the cuboid.
The water level is now q cm above the base of the cuboid.

Find the value of q.

..... [4]

(c) The sphere is removed from the cuboid.
15 identical cubes of side x cm are placed so that they rest on the base of the cuboid.

(i) Find the maximum value of x.

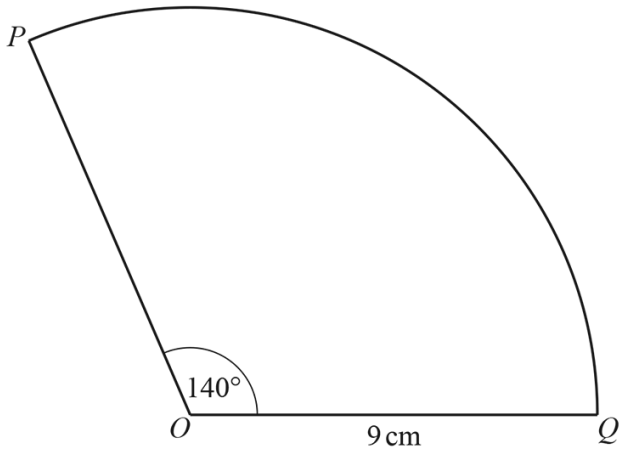
$x =$ ..... [3]

(ii) The water level is now p cm above the base of the cuboid.

Find the maximum value of p.

$p =$ ..... [3]

13. 0607_w23_qp_41 Q: 8



NOT TO SCALE

The diagram shows the sector of a circle with radius 9 cm and sector angle 140°.

(a) Calculate the length of the arc PQ.

..... cm [2]

(b) Calculate the area of the sector.

..... cm^2 [2]

(c) The sector is the cross-section of a solid of length 20 cm.

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

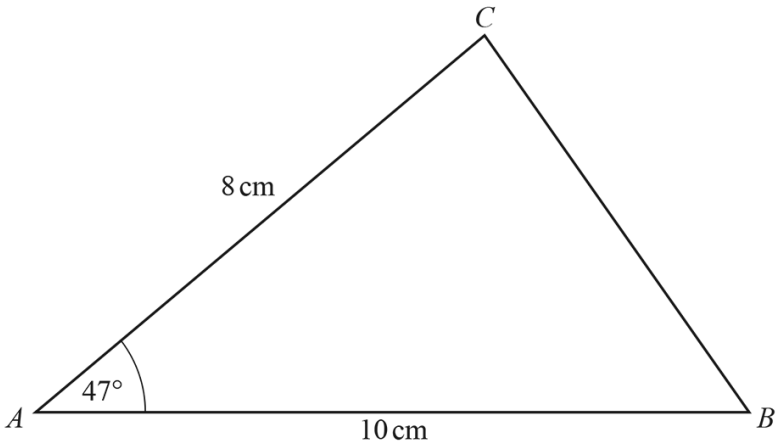
..... cm^2 [4]

(d) Another solid is mathematically similar to the solid in **part (c)**.
The radius of the sector in this solid is 10 cm.

Calculate the total surface area of this solid.

..... cm^2 [2]

14. 0607_w23_qp_41 Q: 11



NOT TO SCALE

(a) Calculate the area of triangle ABC.

..... cm^2 [2]

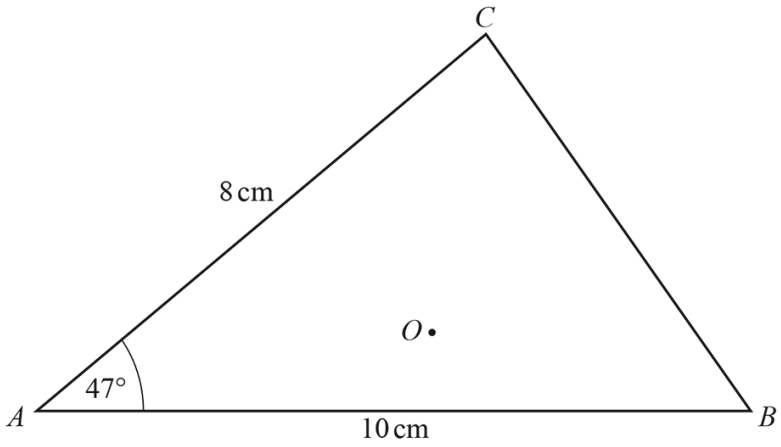
(b) Calculate the shortest distance from C to AB.

..... cm [3]

(c) Show that $BC = 7.41$ cm correct to 2 decimal places.

[3]

(d)



NOT TO SCALE

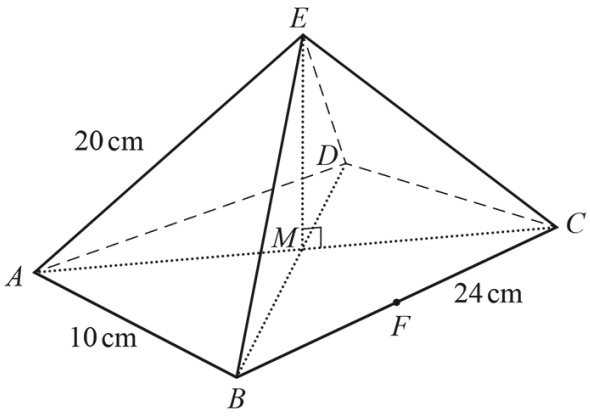
In triangle ABC, O is the centre of the circle that passes through A, B and C.

Calculate the radius of this circle.

..... cm [4]

15. 0607_w23_qp_42 Q: 8

(a)



NOT TO SCALE

ABCDE is a pyramid with a rectangular base.
$AB = 10$ cm and $BC = 24$ cm.
The length of each sloping edge is 20 cm.
Vertex E is vertically above the centre of the base, M.

(i) Calculate the length AC.

..... cm [2]

(ii) Calculate EM, the height of the pyramid.

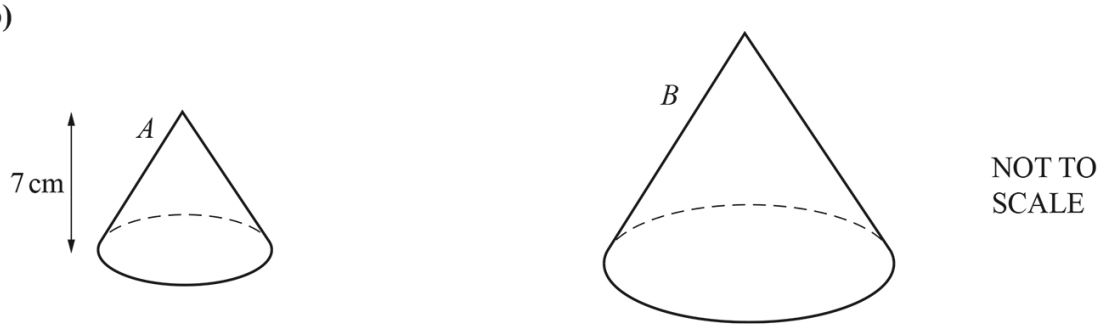
..... cm [3]

(iii) F is the mid-point of BC.

Find the angle between EF and the base of the pyramid.

..... [3]

(b)



NOT TO SCALE

Cone A is mathematically similar to cone B.
The height of cone A is 7 cm and its volume is $66\,cm^3$.
The volume of cone B is $222.75\,cm^3$.

(i) Find the height of cone B.

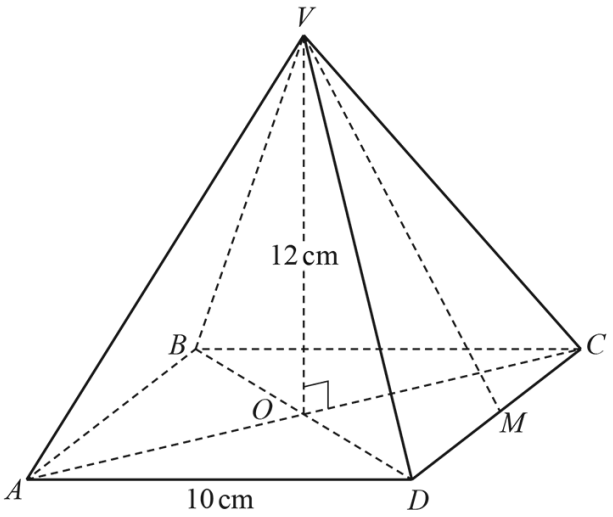
..... cm [3]

(ii) A sphere also has volume $66\,cm^3$.

Calculate the radius of the sphere.

..... cm [2]

16. 0607_w23_qp_43 Q: 6



NOT TO SCALE

$VABCD$ is a square-based pyramid.
V is vertically above the centre of the base O.
$AD = 10\,\text{cm}$ and $VO = 12\,\text{cm}$.

(a) (i) Calculate the volume of the pyramid.

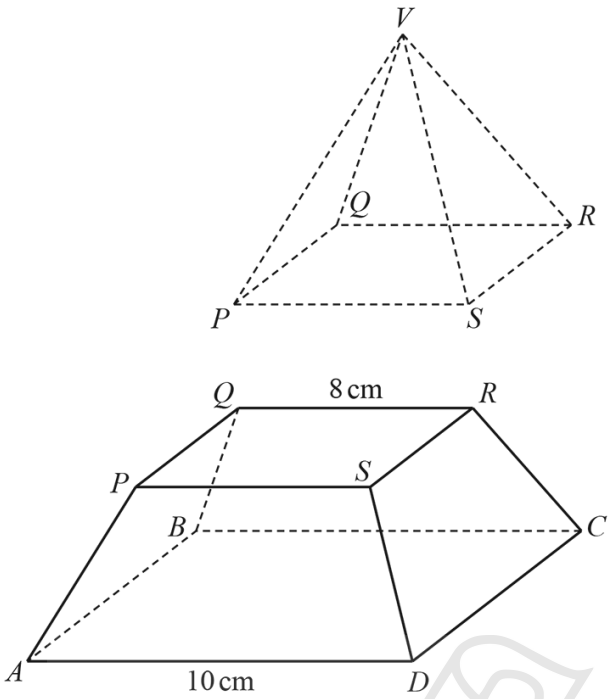
..... cm^3 [2]

(ii) M is the mid-point of CD.

Show that $VM = 13\,\text{cm}$.

[2]

(b)



NOT TO SCALE

A pyramid *VPQRS* is cut from the larger pyramid so that the face *PQRS* is parallel to the face *ABCD*.
$QR = 8\,\text{cm}$.

(i) Calculate the volume of the remaining solid, *ABCDPQRS*.

..... cm^3 [4]

(ii) Calculate the total surface area of the remaining solid.

..... cm^2 [4]

17. 0607_w20_qp_41 Q: 2

(a) Write the number 25.0467

(i) correct to 1 decimal place,

..... [1]

(ii) correct to 3 significant figures,

..... [1]

(iii) correct to the nearest 10,

..... [1]

(iv) correct to the nearest 0.001,

..... [1]

(v) in standard form.

..... [1]

(b) Change

(i) 20 cm into metres,

..... m [1]

(ii) $20\,m^2$ into square centimetres,

..... cm^2 [1]

(iii) 18 km/h into metres per second.

.....m/s [2]

18. 0607_s15_qp_41 Q: 3

A car of length 4.5 metres is travelling at 72 km/h.
The car approaches a tunnel of length 260 metres.

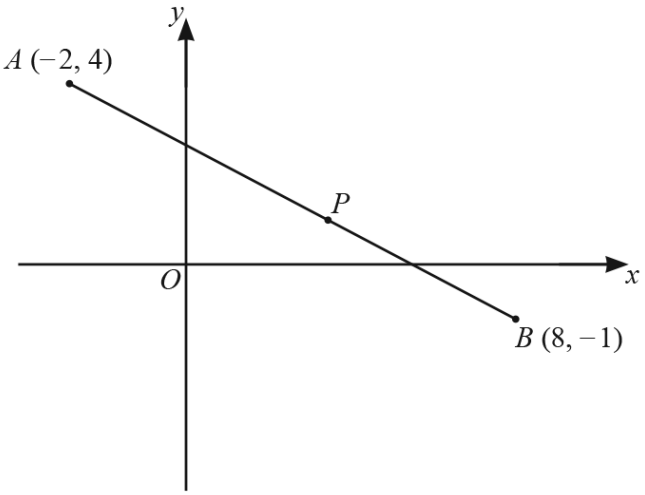
(a) Change 72 km/h into m/s.

Answer(a) ..... m/s [1]

(b) Find the time it will take for the car to pass completely through the tunnel.
Give your answer in seconds.

Answer(b) ..... s [2]

19. 0607_s21_qp_42 Q: 11



NOT TO SCALE

A is the point $(-2, 4)$ and B is the point $(8, -1)$.
P divides AB in the ratio 3 : 2.

(a) Show that the coordinates of P are (4, 1).

(..... , ...) [2]

(b) The line L is perpendicular to AB and passes through P.

Find the equation of line L.

..... [4]

(c) The point C has coordinates (6, 5).

Show that point C lies on line L.

[1]

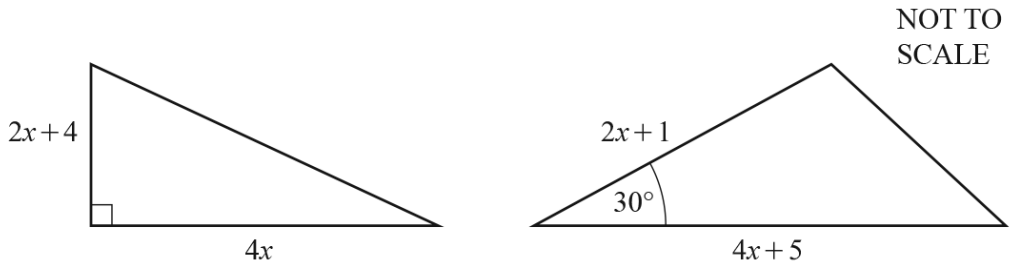
(d) **(i)** Find the distance AB.
Give your answer in surd form.

..... [2]

(ii) Calculate the area of triangle ABC.

..... [3]

20. 0607_s20_qp_43 Q: 10
In this question, all lengths are in centimetres.



The areas of the two triangles are equal.

(a) Show that $8x^2 + 18x - 5 = 0$.

[5]

(b) Solve $8x^2 + 18x - 5 = 0$.
You must show all your working.

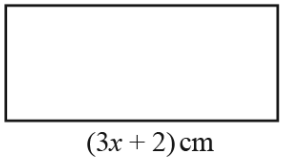
$x =$ ..... or $x =$ ..... [3]

(c) Find the area of each of the triangles.

..... cm^2 [2]

21. 0607_w18_qp_43 Q: 12

(a)



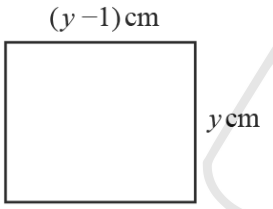
NOT TO SCALE

The perimeter of the rectangle is 44 cm.

Find the value of x.

$x =$ ..... [3]

(b)



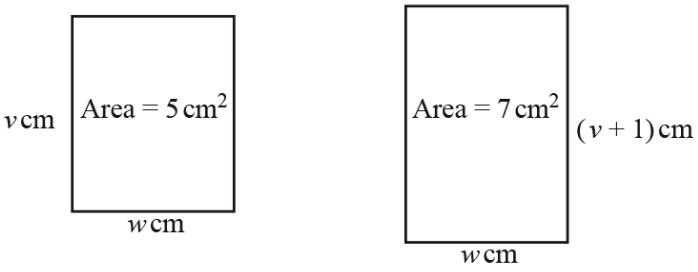
NOT TO SCALE

The area of the rectangle is 272 cm^2.

Find the value of y.

$y =$ ..... [3]

(c)

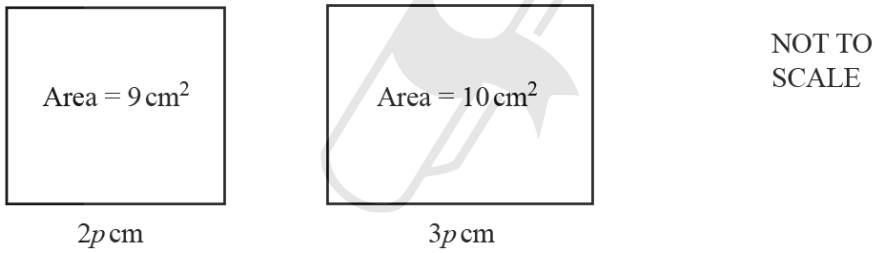


The two rectangles have the same length, w cm.

Find the value of v.

$v =$ ..... [3]

(d)

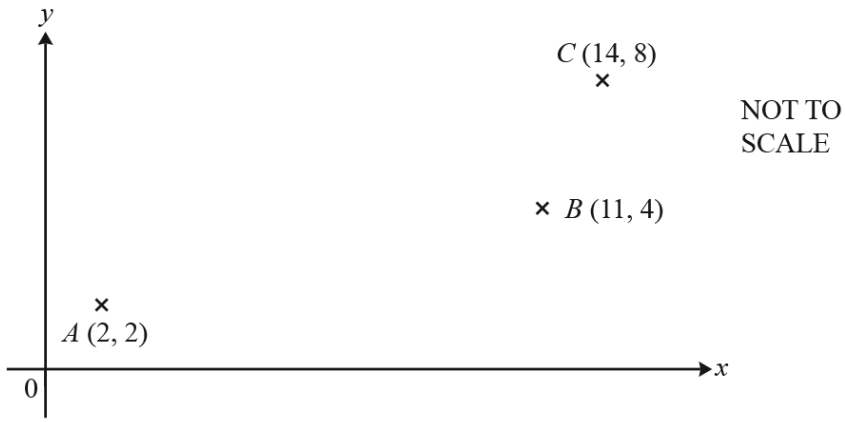


The perimeter of the larger rectangle is 2 cm **more** than the perimeter of the smaller rectangle.

Find the value of p.

$p =$ ..... [4]

22. 0607_s17_qp_42 Q: 10



A is the point (2, 2), B is the point (11, 4) and C is the point (14, 8).

(a) Find the equation, in the form $y = mx + c$, of

(i) the line AC,

$y =$ ..... [3]

(ii) the line through B that is perpendicular to AC.

$y =$ ..... [3]

(b) Show that the point (10, 6) is on both the lines you found in **part (a)**.

[2]

(c) AC is the perpendicular bisector of BD.

Find the co-ordinates of D.

(..... , ...) [1]

(d) Find the **exact** area of the quadrilateral $ABCD$.

..... [4]

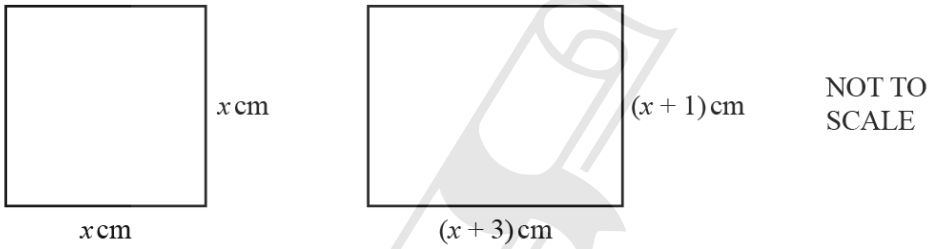
23. 0607_s16_qp_42 Q: 4

(a) The cost of a drink of water is w cents.
The cost of a drink of juice is $(w + 30)$ cents.
The total cost of 6 drinks of water and 5 drinks of juice is \$4.14 .

Find the value of w.

$w =$ ..... [3]

(b)



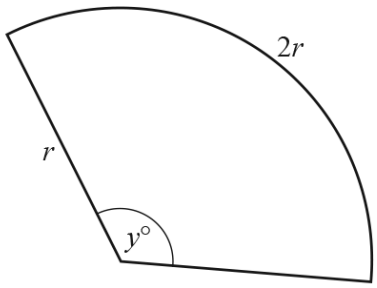
The total area of the square and the rectangle is $10\,cm^2$.

Find the perimeter of the square.
Give your answer correct to 2 decimal places.

..... cm [5]

24. 0607_m22_qp_42 Q: 11

(a)



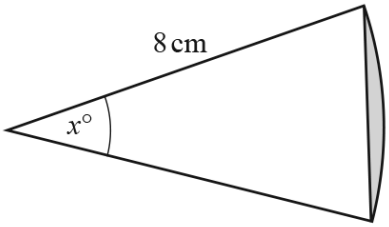
NOT TO SCALE

The diagram shows a sector of a circle with radius r and angle $y°$.
The length of the arc of the sector is $2r$.

Calculate the value of y.

y = ... [3]

(b)



NOT TO SCALE

The diagram shows a sector of a circle with radius 8 cm and angle $x°$.
The area of the shaded segment is $A\,\text{cm}^2$.

(i) Show that $A = \frac{8x}{45}\pi - 32\sin x$.

[2]

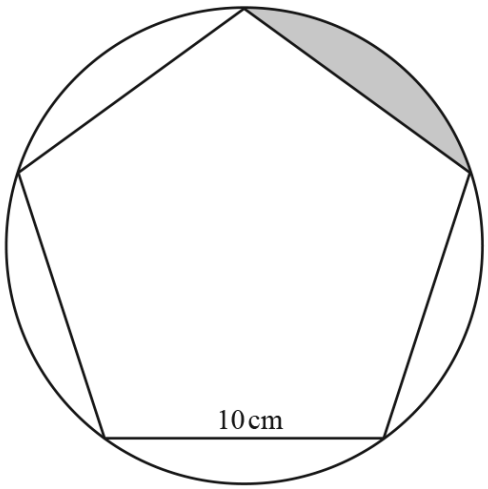
(ii) Find the value of A when $x = 90$.

..... [1]

(iii) By sketching the graph of $A = \frac{8x}{45}\pi - 32\sin x$, find the value of x when $A = 5.5$.

$x =$ ..... [3]

25. 0607_w18_qp_42 Q: 6



NOT TO SCALE

The diagram shows a regular pentagon, of side 10 cm, with its vertices lying on a circle.

(a) Show that the radius of the circle is 8.51 cm, correct to 3 significant figures.

[4]

(b) Calculate

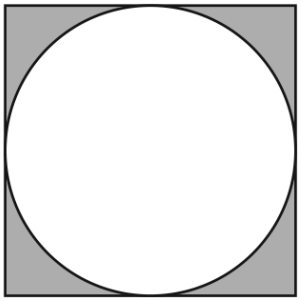
(i) the perimeter of the shaded segment,

..... cm [3]

(ii) the area of the shaded segment.

..... cm^2 [3]

26. 0607_s16_qp_43 Q: 4



A circle of radius r cm is inside a square, so that the circle touches the sides of the square.

(a) (i) Find an expression for the area of the shaded region in terms of π and r.

..... [2]

(ii) Calculate the area of the shaded region when $r = 6$.

..... cm^2 [1]

(b) Find an expression for the perimeter of the shaded region in terms of π and r.

..... [3]

27. 0607_s16_qp_43 Q: 13

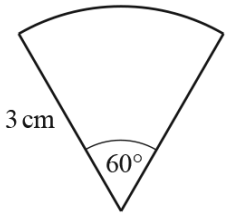


Diagram 1

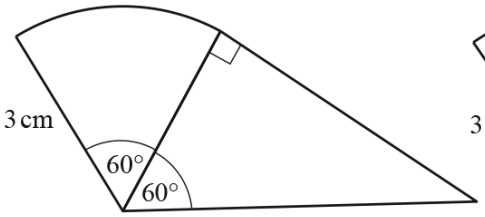


Diagram 2

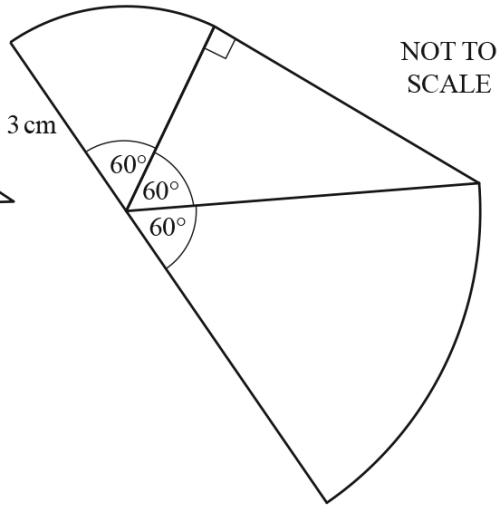


Diagram 3

Diagram 1 is a sector of a circle, radius 3 cm and sector angle 60°.
Diagram 2 has a right-angled triangle, with an angle of 60°, drawn on a radius of this sector.
Diagram 3 has a sector of a circle, with a sector angle 60°, drawn on the hypotenuse of the right-angled triangle.

(a) Calculate the area of

(i) Diagram 1,

..... cm^2 [2]

(ii) Diagram 2,

..... cm^2 [3]

(iii) Diagram 3.

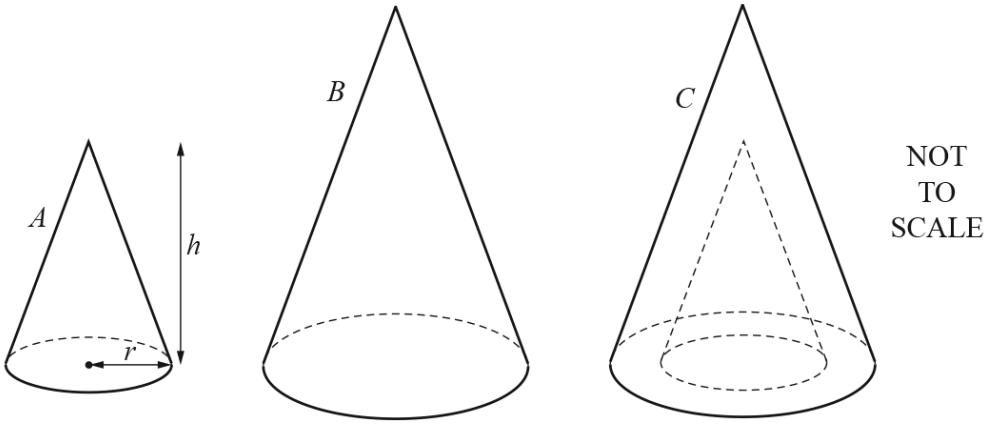
..... cm^2 [3]

(b) Diagram 1, Diagram 2 and Diagram 3 are the first three diagrams in a pattern.
There are 6 diagrams in the pattern.
Diagram 4 has a right-angled triangle added to Diagram 3 in the same way as Diagram 2.
Diagram 5 has a sector added to Diagram 4 in the same way as Diagram 3.
Diagram 6 has a right-angled triangle added to Diagram 5 in the same way as Diagram 2.

Find the area of Diagram 6.

..... cm^2 [4]

28. 0607_m21_qp_42 Q: 10



Cone A has radius r and perpendicular height h.
Cone B is mathematically similar to cone A.
Solid C is formed by removing cone A from cone B.

The ratio height of cone A : height of cone B = 2 : 3.

(a) Find the ratio volume of cone A : volume of solid C.

..... : ..... [3]

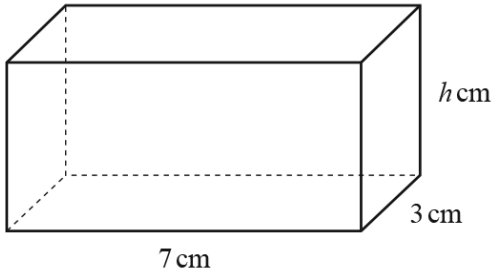
(b) Cone A has radius 4 cm and height 10 cm.

Calculate the **total** surface area of solid C.

..... cm^2 [8]

29. 0607_s19_qp_43 Q: 1

(a)



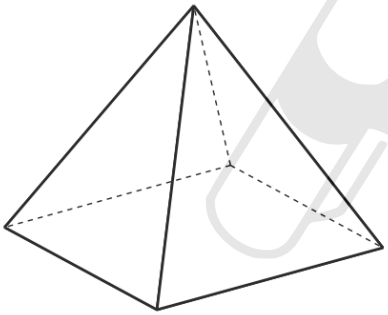
NOT TO SCALE

The diagram shows a cuboid.
The volume of this cuboid is $52.5\,cm^3$.

Find the value of h.

$h =$ ..... [2]

(b)



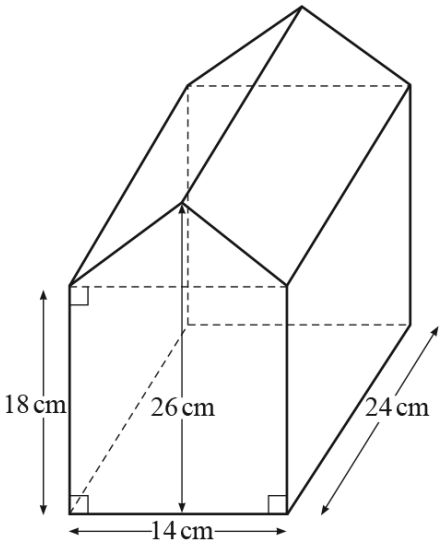
NOT TO SCALE

The diagram shows a pyramid.
The area of the base is $500\,m^2$.
The height of the pyramid is 27 m.

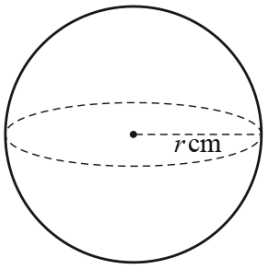
Find the volume of this pyramid.

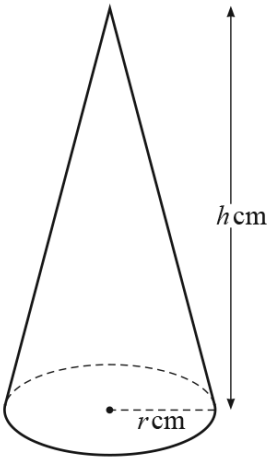
..... m^3 [2]

30. 0607_w19_qp_42 Q: 9



NOT TO SCALE





The diagram shows three solids, a prism, a sphere and a cone.
The radius of the sphere is equal to the base radius of the cone.
The volume of each solid is the same.

(a) Show that the volume of the prism is $7392\,\text{cm}^3$.

[3]

(b) A similar prism has a volume of 924 cm^3.
The length of the original prism is 24 cm.

Find the length of this similar prism.

..... cm [3]

(c) Find the value of r.

$r =$ ..... [2]

(d) Find the value of h.

$h =$ ..... [2]

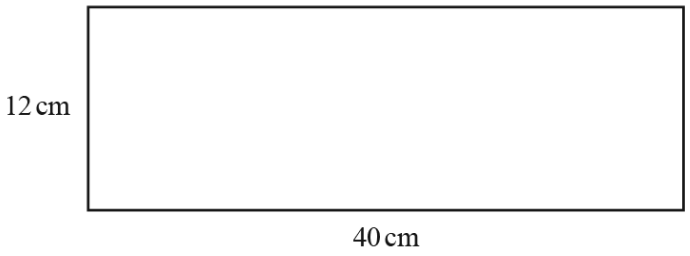
(e) When exact values of h and r are used, $h = 4r$.

Find, in terms of r, an exact expression for the curved surface area of the cone.
Give your answer in its simplest form.

..... [3]

31. 0607_s18_qp_41 Q: 6

(a)



NOT TO SCALE

(i) The rectangle can be made into a hollow cylinder with height 40 cm.

(a) Show that the radius of this cylinder is 1.910 cm, correct to 3 decimal places.

[2]

(b) Calculate the volume of this cylinder.

..... cm^3 [2]

(ii) The rectangle can also be made into a hollow cylinder with height 12 cm.

Calculate the difference between the volumes of this cylinder and the cylinder in **part (i)**.
Give your answer correct to the nearest 10 cm^3.

..... cm^3 [4]

(b) A model of a car is mathematically similar to the actual car.
The volume of the model is 75 **cubic centimetres** and the volume of the actual car is 4.8 **cubic metres**.
The scale is model : actual = 1 : n .

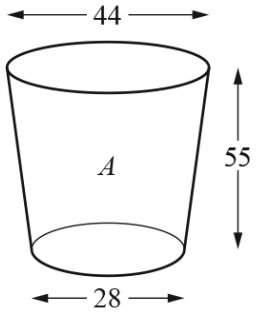
Find the value of n.

n = ... [4]

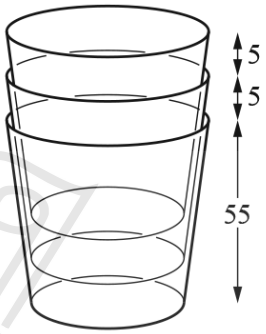
32. 0607_s18_qp_42 Q: 7

In this question, all lengths are measured in millimetres.

A small plastic cup, A, is shown in this diagram.



These plastic cups are stacked as shown in the diagram.



(a) Find the height of a stack of 8 of these cups.

..... mm [2]

(b) Find the number of these cups in a stack that has a total height of 105 mm.

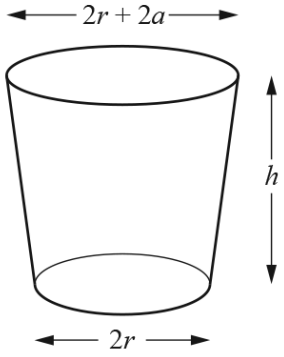
..... [2]

(c) A similar cup, B, has base diameter 42 mm.

Find the height of this cup.

..... mm [2]

(d)



The formula for the volume of a similar cup is $V = \frac{\pi h(3r^2 + 3ar + a^2)}{3}$.

(i) For cup A, show that $a = 8$ mm.

[2]

(ii) Find the volume of cup A.

..... mm^3 [2]

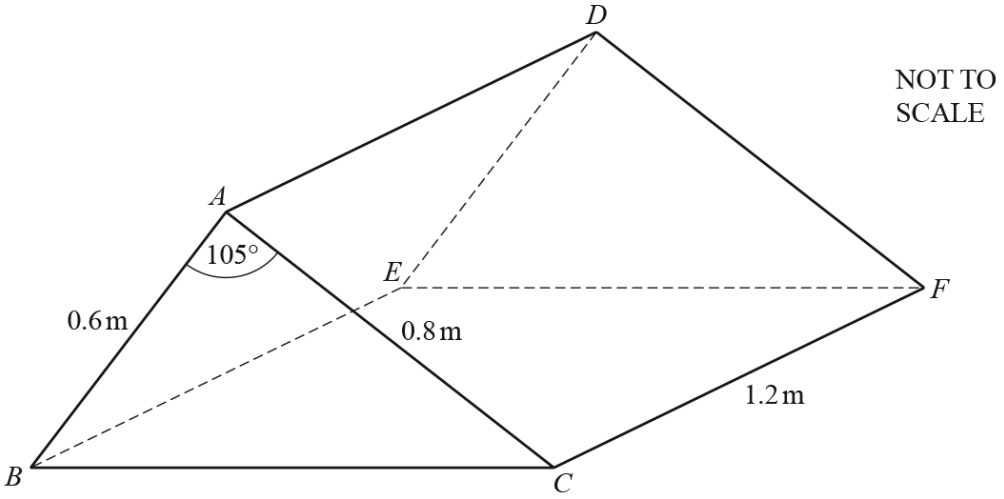
(iii) Find the volume of cup B.

..... mm^3 [3]

(iv) Rearrange $V = \frac{\pi h(3r^2 + 3ar + a^2)}{3}$ to make h the subject.

$h =$ ..... [2]

33. 0607_s18_qp_43 Q: 7



ABCDEF is a solid triangular prism.

(a) Calculate the volume of the prism.

.....m^3 [3]

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

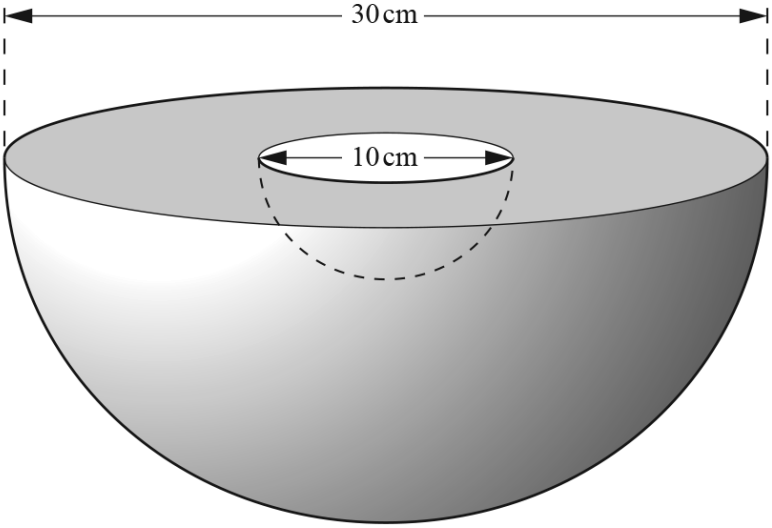
.....m^2 [5]

(c) *ABCDEF* is made of metal and has a mass of 2170 kg.
It is melted down and made into prisms similar to *ABCDEF*.
Each of these prisms has a mass of 2.17 kg.

Calculate the total surface area of each of these smaller prisms.

.....m^2 [3]

34. 0607_w17_qp_43 Q: 7



The diagram shows a hollow metal hemisphere.
The outside diameter of the hemisphere is 30 cm and the inside diameter is 10 cm.

(a) Find the volume of metal used to make the hemisphere.

..... cm^3 [3]

(b) Find the total surface area of the hemisphere.

..... cm^2 [5]

35. 0607_w16_qp_42 Q: 12

A solid hemisphere has radius 6 cm.

(a) Find, in terms of π,

(i) the volume of the hemisphere,

..... cm^3 [2]

(ii) the **total** surface area of the hemisphere.

..... cm^2 [2]

(b) Sixteen of these hemispheres, all with radius 6 cm, are made into one solid **sphere**.

(i) Find the radius of the sphere.

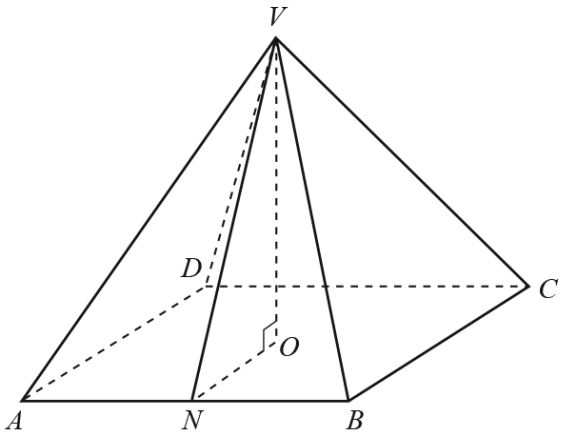
..... cm [3]

(ii) Find the ratio surface area of the sphere : total surface area of the 16 hemispheres.

Give your answer in its simplest form.

..... : .....[3]

36. 0607_w16_qp_43 Q: 4



NOT TO SCALE

The diagram shows a solid, square-based pyramid $VABCD$.
O is the centre of the base $ABCD$ and VO is perpendicular to the base.
N is the midpoint of AB.
$AB = 6$ cm and $VO = 8$ cm.

(a) Calculate

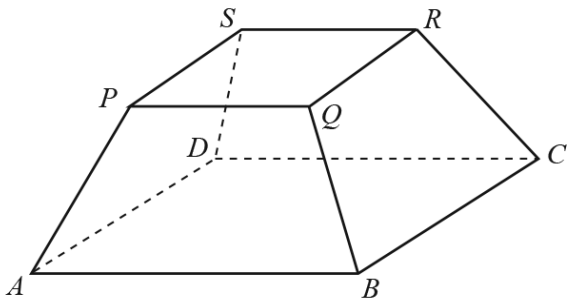
(i) the volume of the pyramid,

..... cm^3 [2]

(ii) the length of VN.

..... cm [2]

(b) The similar pyramid *VPQRS* is removed from the original pyramid to leave the solid below.



NOT TO SCALE

The height of this solid is half the height of the pyramid *VABCD*.

(i) Find the volume of this solid.

..... cm^3 [3]

(ii) Find the total surface area of this solid.

..... cm^2 [5]

37. 0607_s15_qp_41 Q: 7

Squash balls have radius 1.5 cm.
They are sold in boxes. Each box is a cuboid.
Each box has length 15 cm, width 12 cm and height 3 cm.

(a) Show that the maximum number of balls in a box is 20.

[1]

(b) Calculate the volume of **one** ball.

Answer(b) ..... cm^3 [2]

(c) Calculate the total volume of 20 balls.

Answer(c) ..... cm^3 [1]

(d) Write your answer to **part (c)** in standard form.

Answer(d) ..... cm^3 [1]

(e) Calculate the percentage of the volume of the box that the 20 balls fill.

Answer(e) ..... % [2]

38. 0607_w15_qp_41 Q: 7

(a) A solid metal cuboid measures 20 cm by 8 cm by 2 cm.
$1\,cm^3$ of the metal has a mass of 7.85 g.

(i) Calculate the mass of the cuboid.

Answer(a)(i) ..... g [2]

(ii) The surface of the cuboid is painted at a cost of 8 cents per cm^2.

Calculate the cost of painting the cuboid.
Give your answer in dollars.

Answer(a)(ii) $ ..... [3]

(b) Another cuboid measures 16 cm by 6 cm by 4 cm.
It is cut into cubes, each of side 2 cm.

Calculate the number of cubes.

Answer(b) ..... [2]

(c) Another solid metal cuboid measures 20 cm by 12 cm by 4 cm.
It is melted down and made into spheres of radius 1.5 cm.

Calculate

(i) the largest number of spheres of radius 1.5 cm that can be made,

Answer(c)(i) ..... [3]

(ii) the volume of metal remaining after the spheres have been made,

Answer(c)(ii) ..... cm^3 [2]

(iii) the radius of the sphere that can be made using all the remaining metal.

Answer(c)(iii) ..... cm [2]

(d) A plastic cone has radius r cm and perpendicular height $3r$ cm.
$1\,cm^3$ of the plastic has a mass of 0.9 g.

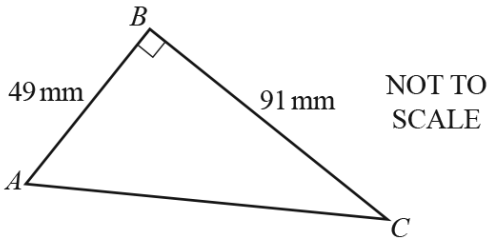
A wooden hemisphere has a radius of $2r$ cm.
$1\,cm^3$ of the wood has a mass of 0.45 g.

Find the mass of the cone as a fraction of the mass of the hemisphere.
Give your answer in its lowest terms.

Answer(d) ..... [4]

39. 0607_m21_qp_42 Q: 5

(a)

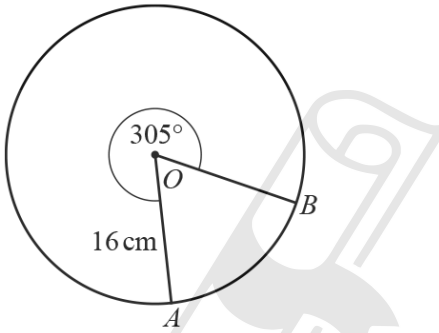


NOT TO SCALE

Calculate the length of AC.

$AC =$ ..... mm [2]

(b)



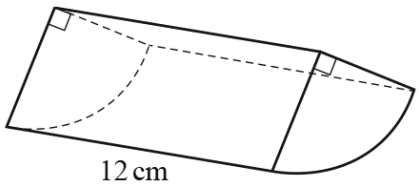
NOT TO SCALE

The diagram shows a circle with centre O and radius 16 cm.

Calculate the length of the major arc AB.

..... cm [2]

(c)



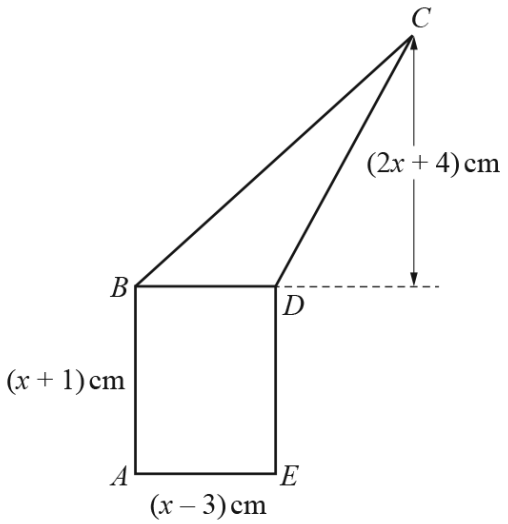
NOT TO SCALE

The diagram shows a prism with length 12 cm.
The cross-section of the prism is a quarter of a circle.
The radius of the circle is 6 cm.

Calculate the volume of the prism.

..... cm^3 [2]

(d)



NOT TO SCALE

Shape *ABCDE* is made by joining rectangle *ABDE* and triangle *BCD*.
The perpendicular height of triangle *BCD* is $(2x + 4)$ cm.
The total area of *ABCDE* is 11 cm^2.

(i) Show that $2x^2 - 3x - 20 = 0$.

[3]

(ii) Factorise $2x^2 - 3x - 20$.

..... [2]

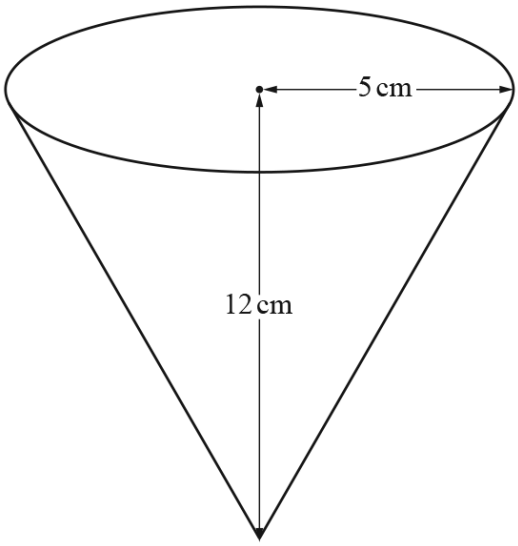
(iii) Use your answer to **part (ii)** to solve the equation $2x^2 - 3x - 20 = 0$.

$x =$ ..... or $x =$ ..... [1]

(iv) Find the perpendicular height of triangle *BCD*.

..... cm [1]

40. 0607_s21_qp_42 Q: 9



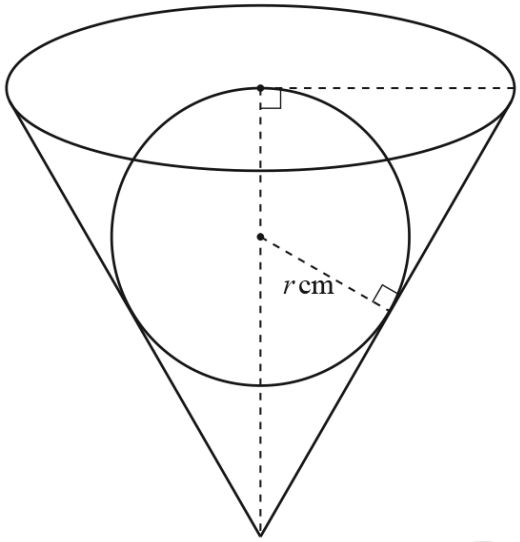
NOT TO SCALE

The diagram shows a cup in the shape of a cone.

(a) Calculate the curved surface area of the cup.

..... cm^2 [3]

(b) The cup is filled with water.
A metal sphere of radius r cm is lowered into the cup.
The top of the sphere is level with the surface of the water.



NOT TO SCALE

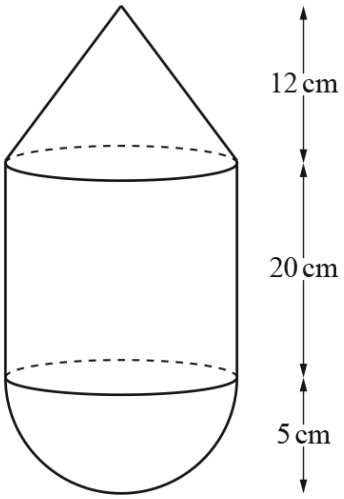
(i) Use similar triangles to show that $r = 3.33$ cm correct to 3 significant figures.

[3]

(ii) Calculate the volume of the water in the cup.

..... cm^3 [3]

41. 0607_s21_qp_43 Q: 4



NOT TO SCALE

The diagram shows a solid made by joining a cone and a hemisphere to a cylinder.
The radius of each of the three shapes is 5 cm.
The height of the cylinder is 20 cm and the height of the cone is 12 cm.

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

..... cm^2 [5]

(b) The total volume of the solid is $\frac{2050\pi}{3}$ cm^3.

It is melted down and made into spheres of radius 1.2 cm.

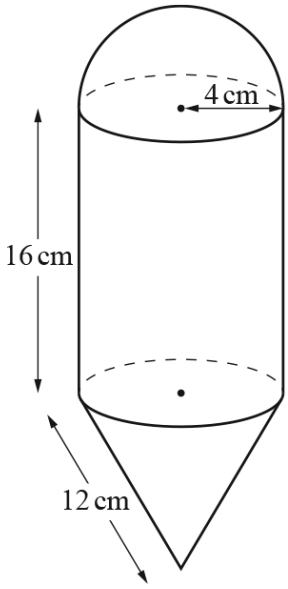
(i) Find the greatest number of spheres that can be made.

..... [3]

(ii) Work out the percentage of the $\frac{2050\pi}{3}$ cm^3 that remains after the spheres have been made.

..... % [3]

42. 0607_w21_qp_43 Q: 10



NOT TO SCALE

The diagram shows a solid made from a cylinder, a hemisphere and a cone, each with radius 4 cm.
The cylinder has length 16 cm.
The slant height of the cone is 12 cm.

(a) Find the volume of the solid.

..... cm^3 [5]

(b) Show that the total surface area of the solid is $208\pi\,\text{cm}^2$.

[4]

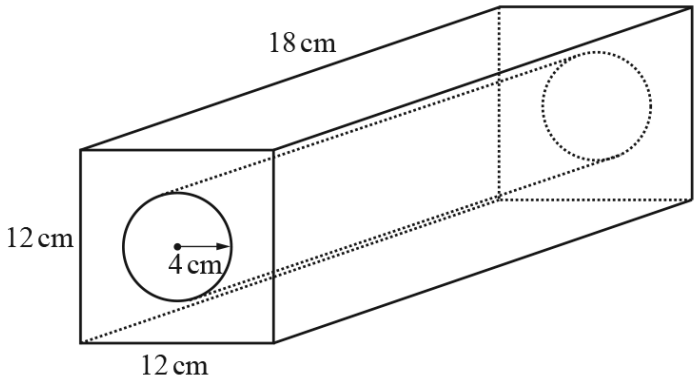
(c) A mathematically similar solid has a total surface area of $468\pi\,\text{cm}^2$.

Find the radius of the cylinder in this solid.

..... cm [3]

43. 0607_s20_qp_42 Q: 4

A piece of metal is in the shape of a cuboid.
The cuboid has length 18 cm, width 12 cm and height 12 cm.
A cylinder is removed from the cuboid.
The cylinder has length 18 cm and radius 4 cm.



NOT TO SCALE

(a) (i) Find the volume of the metal remaining after the cylinder has been removed.

..... cm^3 [3]

(ii) Write your answer to **part (i)** in standard form.

..... cm^3 [1]

(b) Find the total surface area of the metal remaining after the cylinder has been removed.

..... cm^2 [4]

(c) The **cylinder removed** is melted and formed into 16 identical spheres.

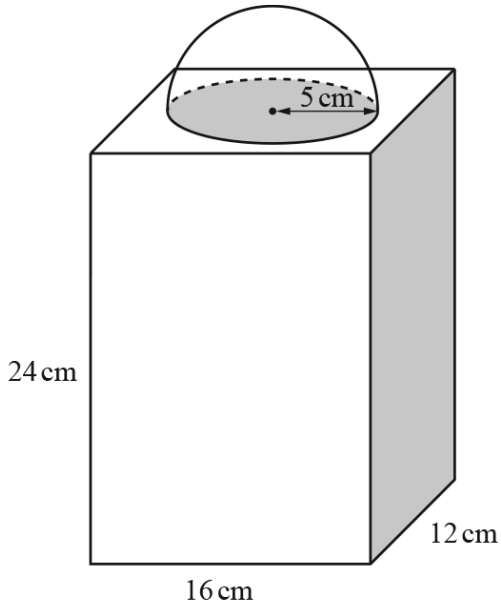
(i) Calculate the volume of **one** sphere.

..... cm^3 [1]

(ii) Calculate the radius of one sphere.

..... cm [2]

44. 0607_w20_qp_41 Q: 9



NOT TO SCALE

The diagram shows a solid made from a cuboid and a solid hemisphere.
The cuboid measures 12 cm by 16 cm by 24 cm.
The hemisphere has radius 5 cm.

(a) Find

(i) the volume of the solid,

..... cm^3 [3]

(ii) the volume of a similar solid where the radius of the hemisphere is 3 cm.

..... cm^3 [2]

(b) Find

(i) the total surface area of the original solid,

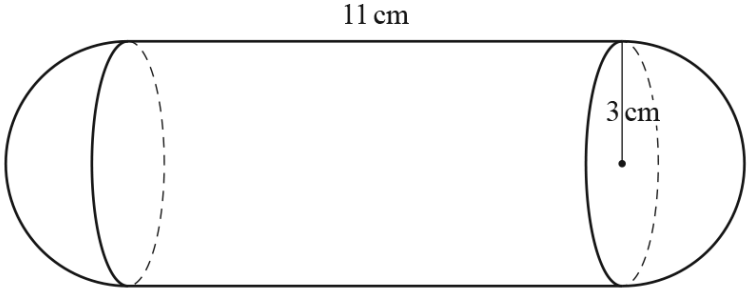
..... cm^2 [3]

(ii) the total surface area of a similar solid where the radius of the hemisphere is 6 cm.

..... cm^2 [2]

---

45. 0607_w20_qp_43 Q: 6



NOT TO SCALE

The diagram shows a solid made from a cylinder and two hemispheres.
The cylinder has radius 3 cm and length 11 cm.
Each hemisphere has radius 3 cm.

(a) Find the volume of the solid.
Give your answer in terms of π.

..... cm^3 [3]

(b) The solid is melted down and all the metal is used to make a cylinder of length 15 cm.

(i) Use your answer to **part (a)** to find the radius of this cylinder.

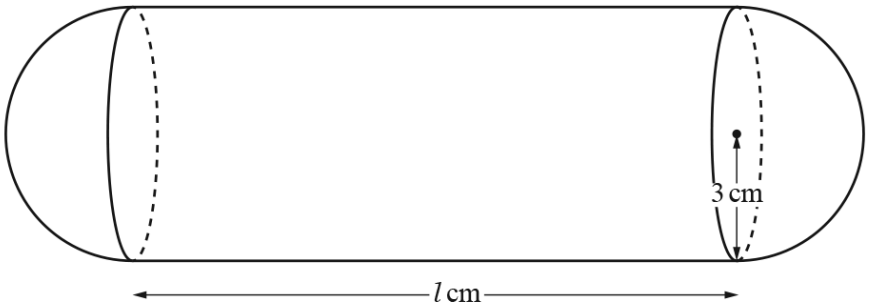
..... cm [2]

(ii) A rectangular tank contains water.
The base of the tank measures 20 cm by 10 cm.
The cylinder is placed in the tank so that it is completely covered by water.
No water overflows the tank.

Calculate the increase in the depth of the water in the tank.

..... cm [2]

46. 0607_s19_qp_42 Q: 4



NOT TO SCALE

The diagram shows a solid made from a cylinder and two hemispheres.
The radius of the cylinder and each hemisphere is 3 cm.
The total volume of the solid is 144π cm^3.

(a) The length of the cylinder is l cm.

Find the value of l.

$l =$ ..... [3]

(b) The solid is made of steel.
1 cm^3 of steel has a mass of 7.8 g.

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

..... kg [2]

(c) The solid is melted down and made into 20 cubes each of side length 2.8 cm.

Calculate the volume of steel **not** used for the cubes as a percentage of the $144\pi\,\text{cm}^3$.

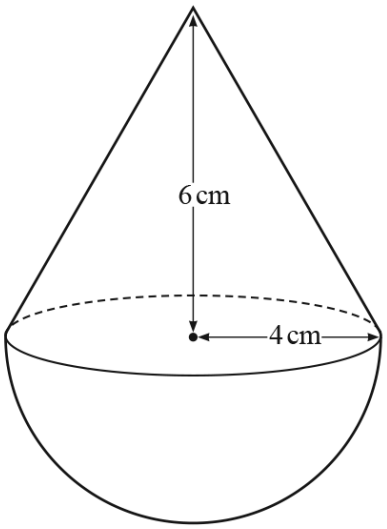
.....% [3]

(d) A solid that is mathematically similar to the original solid has a volume of $18\pi\,\text{cm}^3$.

Find the radius of the new cylinder.

..... cm [3]

47. 0607_w19_qp_43 Q: 7



NOT TO SCALE

The diagram shows a child's toy made of a cone joined to a hemisphere.
The cone and the hemisphere each have a radius of 4 cm.
The perpendicular height of the cone is 6 cm.

(a) (i) Find the volume of the hemisphere.

.....cm^3 [2]

(ii) Find the volume of the cone.

.....cm^3 [2]

(iii) Each cubic centimetre of the hemisphere has a mass of 7.85 g.
Each cubic centimetre of the cone has a mass of 0.65 g.

Find the total mass of the toy.

..... g [2]

(b) Find the total surface area of the toy.

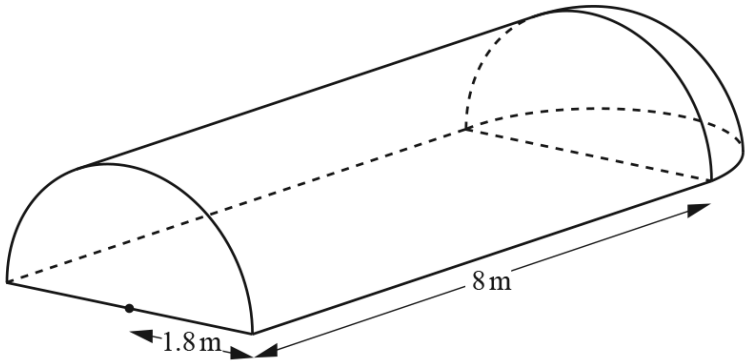
.....cm^2 [5]

(c) The height of the cone on a similar toy is 9 cm.

Find the total surface area of this toy.

.....cm^2 [2]

48. 0607_w18_qp_42 Q: 11



NOT TO SCALE

The diagram shows a polythene structure in which a farmer grows vegetables.
The structure consists of a prism with a quarter of a sphere at **one** end.
The cross-section of the prism is a semicircle.

The semicircle has a radius of 1.8 m and the length of the prism is 8 m.

(a) Calculate the volume of the structure.

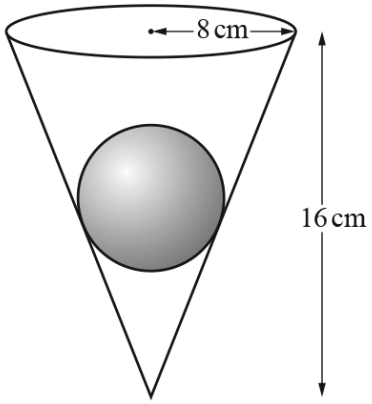
.....m^3 [3]

(b) The curved surface of the prism and the two ends of the structure are made of polythene.

Calculate the area of the polythene.

.....m^2 [4]

49. 0607_s17_qp_43 Q: 5



NOT TO SCALE

The diagram shows a solid sphere of radius 4 cm inside a hollow cone of radius 8 cm and height 16 cm. The sphere touches the interior of the cone.

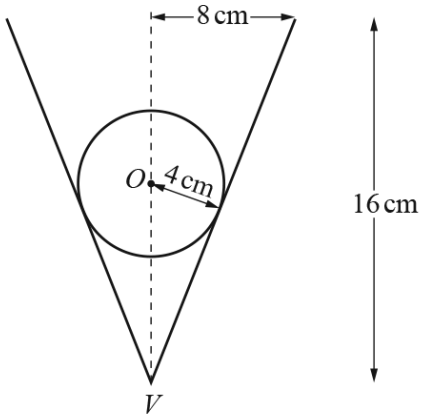
(a) Calculate the volume of the cone that is **not** occupied by the sphere.

..... cm^3 [3]

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

..... cm^2 [3]

(c)



NOT TO SCALE

The centre, O, of the sphere is directly above the vertex, V, of the cone.

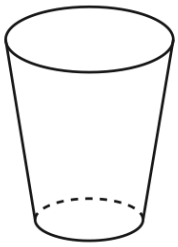
Calculate the length OV.

$OV =$ ..... cm [4]

---

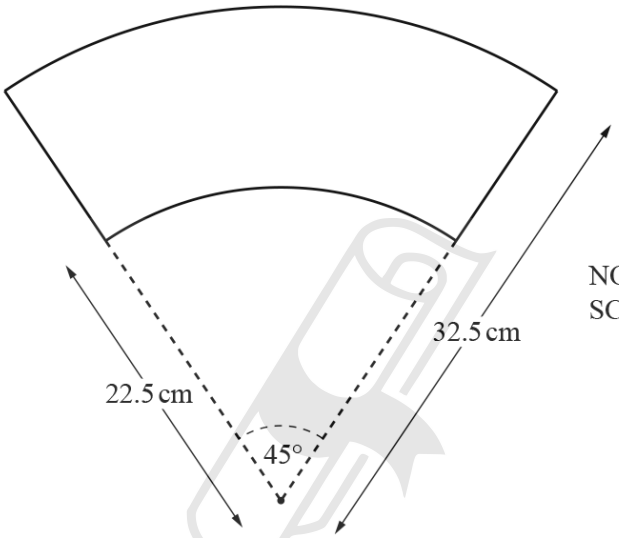
50. 0607_w17_qp_41 Q: 5

The diagram shows a paper cup.



NOT TO SCALE

The curved surface of the cup is made from a sector of a circle with a smaller sector cut from it, as shown below.



NOT TO SCALE

The small sector has radius 22.5 cm and the large sector has radius 32.5 cm.
The sectors have the same centre and both have sector angle 45°.

(a) Show that the radius of the base of the cup is 2.81 cm, correct to 2 decimal places.

[3]

(b) Find the total area of the paper that makes the cup, including the circular base.

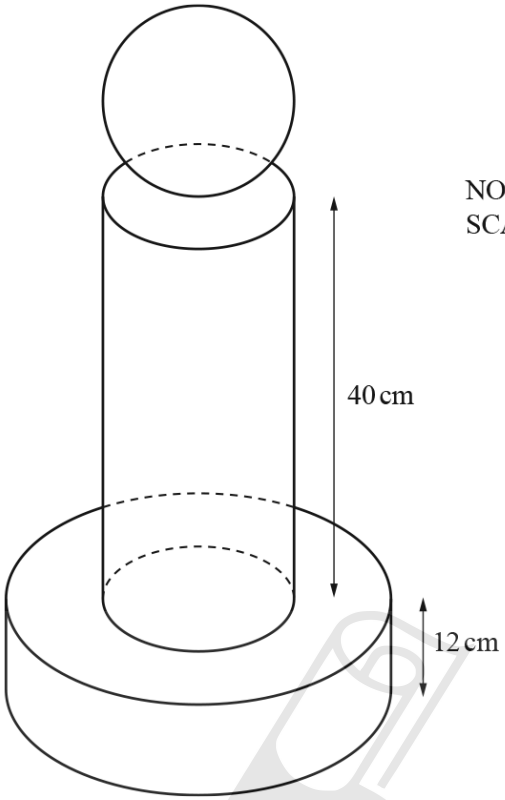
..... cm^2 [5]

(c) A mathematically similar cup holds 8 times as much liquid as this cup.

Find the total area of the paper that makes the larger cup.

..... cm^2 [2]

51. 0607_s16_qp_41 Q: 4



The diagram shows a solid trophy for a football tournament.
The sphere on the top has a radius of 15 cm.
The sphere rests on a cylinder with the same radius as the sphere and height 40 cm.
The base is a cylinder with radius 25 cm and height 12 cm.

(a) Calculate the volume of the trophy.

.....cm^3 [4]

(b) The mass of the trophy is 15 kg.
Each member of the winning team receives a model of the trophy made from the same material.
The model is similar to the real trophy and one-fifth of the height.

(i) Calculate the total height of each model trophy.

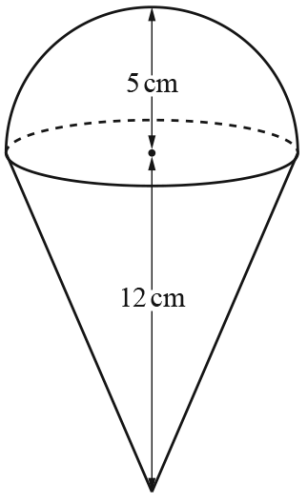
..... cm [1]

(ii) Calculate the mass, in grams, of each model trophy.

..... g [3]

52. 0607_s16_qp_42 Q: 7

(a)



NOT TO SCALE

The diagram shows a plastic solid made by joining a hemisphere to a cone.
The radius of the hemisphere is 5 cm and the height of the cone is 12 cm.

(i) Calculate the volume of the solid.

..... cm^3 [3]

(ii) One cubic centimetre of the plastic has a mass of 0.95 g.

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

..... kg [2]

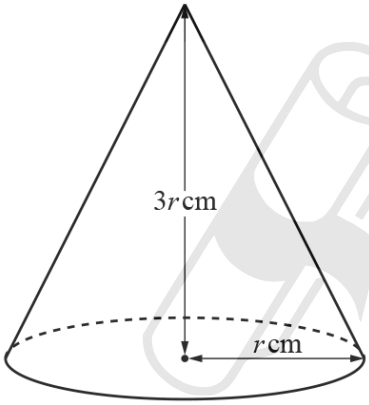
(iii) Find the number of these solids that can be made from 1 tonne of plastic.

..... [2]

(iv) Calculate the total surface area of the solid.

..... cm^2 [4]

(b)



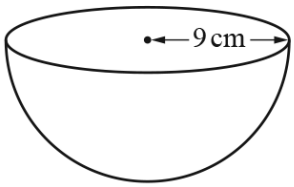
NOT TO SCALE

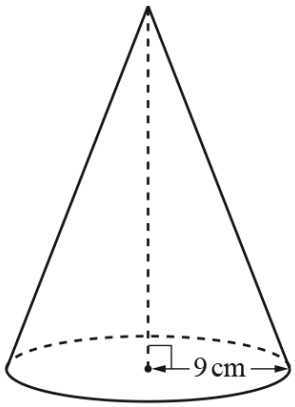
A solid cone has radius r cm and height $3r$ cm.
The **total** surface area of the cone is 377 cm^2.

Find the value of r.

r = ... [5]

53. 0607_w16_qp_41 Q: 4





NOT TO SCALE

The diagrams show a solid hemisphere and a solid cone.
Both the hemisphere and the base of the cone have radius 9 cm.
The volumes of the two shapes are equal.

(a) Show that the perpendicular height of the cone is 18 cm.

[2]

(b) **(i)** Calculate the **total** surface area of the hemisphere.

..... cm^2 [2]

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

..... cm^2 [3]

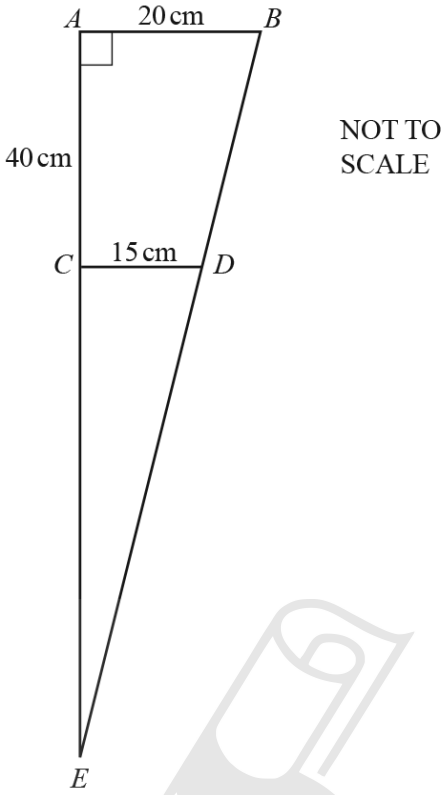
(c) The hemisphere is made from metal.
The metal is melted down and made into **spheres** of radius 2 cm.

Calculate the number of spheres that are made.

..... [3]

54. 0607_s15_qp_43 Q: 9

(a)



The diagram shows two similar triangles EAB and ECD.
$AB = 20$ cm, $CD = 15$ cm, $AC = 40$ cm and angle $CAB = 90°$.

(i) Show that $EC = 120$ cm.

[2]

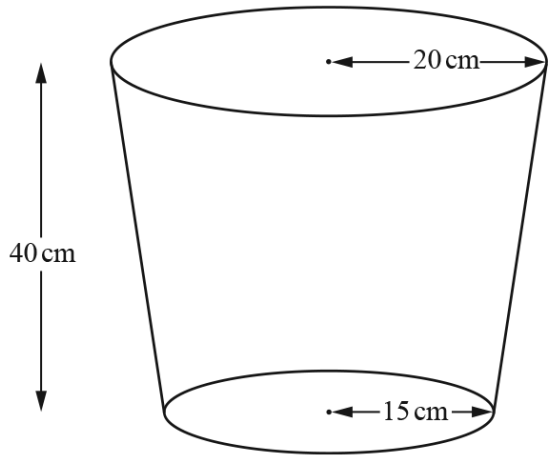
(ii) Find ED.

Answer(a)(ii) ..... cm [2]

(iii) Find DB.

Answer(a)(iii) ..... cm [2]

(b)



NOT TO SCALE

The diagram shows an open waste paper bin made from metal.

The radius of the circular top is 20 cm.
The radius of the circular base is 15 cm.
The perpendicular height of the bin is 40 cm.

Using answers from **part (a)**, calculate

(i) the volume of the waste paper bin,

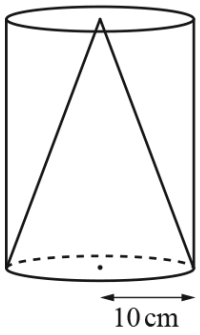
Answer(b)(i) ..... cm^3 [3]

(ii) the area of metal needed to make the bin.

Answer(b)(ii) ..... cm^2 [4]

55. 0607_w15_qp_43 Q: 6

The diagram shows a solid cone inside a cylinder.
The base radius of the cone and the radius of the cylinder are both 10 cm.
The height of both the cone and the cylinder is 30 cm.

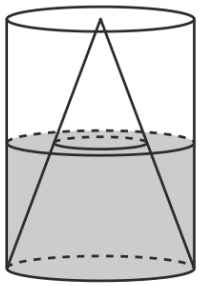


NOT TO SCALE

(a) Find the volume of the cylinder **not** occupied by the cone.

Answer(a) ..... cm^3 [3]

(b) Water is poured into the cylinder until it reaches a depth of 15 cm.



NOT TO SCALE

(i) Calculate the volume of the part of the cone that is below the water level and show that it rounds to 2749 cm^3, correct to the nearest cubic centimetre.

[4]

(ii) Calculate the amount of water that has been poured into the cylinder.
Give your answer in litres.

Answer(b)(ii) ..... litres [3]

01. 0607_m24_ms_42 Q: 9

Question	Answer	Marks	Partial Marks
(a)	(2, 4)	**2**	**B1** for each coordinate
(b)	$y = -\frac{1}{3}x + 4\frac{2}{3}$ oe cao final answer	**3**	**M1** for $\frac{2-6}{8-(-4)}$ **M1** for substituting (2, 8) or (–4, 6) into $y = their\left(-\frac{1}{3}\right)x + c$ oe

Question	Answer	Marks	Partial Marks
(c)	Gradient = for $-1 \div \left(their - \frac{1}{3}\right)$ oe	**M1**	
	substituting *their* (2, 4) into $y = their3x + c$ oe	**M1**	
	Completion to $y = 3x - 2$ with no errors or omissions	**A1**	Dep on M1, M1
(d)	$3 \times 3 - 2 = 7$	**1**	
(e)	20	**4**	**M1** for $[AB =] \sqrt{(8+4)^2 + (2-6)^2}$ **M1** for $[h =]$ $\sqrt{(7 - their4)^2 + (3 - their2)^2}$ **M1** for $\frac{1}{2} \times their\sqrt{160} \times their\sqrt{10}$

02. 0607_s24_ms_41 Q: 9

Question	Answer	Marks	Partial Marks
(a)	74 900 or 74 929 to 74 941.1	3	**M2** for $\frac{1}{3}\times\pi\times40^2\times\sqrt{60^2-40^2}$ oe or **M1** for 60^2-40^2 [=2000] oe
(b)	$\pi\times40^2+\pi\times40\times60$ $=4000\pi$ with no errors	M2	**M1** for $\pi\times40^2$ or $\pi\times40\times60$

Question	Answer	Marks	Partial Marks
(c)	Ratio areas = $4000\pi : 1000\pi$ implies Ratio sides = 2 : 1 oe	M1	
	[r=] 40 × 0.5 = 20 oe	A1	
	ALTERNATIVE $40\times\sqrt{\frac{1000\pi}{4000\pi}}$ oe = 20 with no errors	(M2)	**M1** for $\sqrt{\frac{1000\pi}{4000\pi}}$ or $\sqrt{\frac{4000\pi}{1000\pi}}$ oe or $\left(\frac{40}{x}\right)^2=\frac{4000\pi}{1000\pi}$ oe
(d)	11 900 or 11 930 to 11 940 or 3800π	3	**M2** for $\pi\times40^2+\pi\times20^2+\pi\times60\times40-\pi\times30\times20$ or **M1** for $\pi\times60\times40-\pi\times30\times20$ If 0 scored, **SC1** for 3400π or 10 700 or 10 680 to 10 681.4…

03. 0607_s24_ms_42 Q: 1

Question	Answer	Marks	Partial Marks
(a)	17	3	**M1** for $\frac{1}{2}\times 8\times 7$ **M1** for 476 ÷ *their* area of triangle
(b)(i)	62.88	1	
(b)(ii)	2400	3	**M2** for $6\times\left(\sqrt[3]{8000}\right)^2$ oe or **M1** for $\sqrt[3]{8000}$ oe
(b)(iii)	44 cao	3	**M2** for $8000\div\left(\frac{4}{3}\pi 3.5^3\right)$ or **M1** for $\frac{4}{3}\pi 3.5^3$

04. 0607_s24_ms_42 Q: 5

Question	Answer	Marks	Partial Marks
(a)	62.4 or 62.35...	2	**M1** for $\frac{1}{2}\times 12\times 12\times\sin 60$ oe
(b)	286 or 286.4 to 286.5	3	**M2** for $\pi\times$ (*their* radius)^2 or **M1** for $2\pi r = 60$ or better
(c)	277 or 276.9 to 277.0	4	**M3** for [10 ×] $\frac{1}{2}\times 6\times$ *their* height oe or [10×]$\frac{1}{2}\times\left(\frac{3}{\sin 18}\right)^2\times\sin 36$ or **M2** for 3 tan72 or $\frac{3}{\sin 18}$ oe or **M1** for angles 72 or 36 or 18 or 144 seen

05. 0607_s24_ms_43 Q: 7

Question	Answer	Marks	Partial Marks
(a)	$\pi d = 37 - 12 - 12$ oe	M1	
	4.137 to 4.138...	A1	

Question	Answer	Marks	Partial Marks
(b)	40.3 or 40.4 or 40.33 to 40.36…	3	**M2** for $2 \times \sin^{-1}\frac{4.14}{12}$ oe or $\cos ACB = \frac{12^2+12^2-(2\times 4.14)^2}{2\times 12\times 12}$ or **M1** for sin(...) = $\frac{4.14}{12}$ or $(2\times 4.14)^2 = 12^2+12^2-2\times 12\times 12\times \cos ACB$
(c)	60[.0] or 60.1 or 60.01 to 60.13	3	**M1** for $\frac{1}{2}\times 12\times 12\times \sin(their\ b)$ oe **M1** for $2\times\frac{1}{2}\times\pi\left(\frac{4.14}{2}\right)^2$ oe
(d)	28.2 or 28.3 or 28.23 to 28.26	3	**M2** for $37\times\sqrt{\frac{35}{their\ c}}$ oe or **M1** for $\sqrt{\frac{35}{their\ c}}$ or $\sqrt{\frac{their\ c}{35}}$ or $\frac{35}{their\ c}=\left(\frac{p}{37}\right)^2$

06. 0607_s24_ms_43 Q: 8

Question	Answer	Marks	Partial Marks
(a)	$h^2 = 0.8^2 - 0.35^2 - 0.35^2$ oe	M3	**M2** for $0.8^2 = 0.35^2 + 0.35^2 + h^2$ oe or **M1** for $0.35^2 + 0.35^2$ or $0.7^2 + 0.7^2$ oe
	0.6284 to 0.6285	A1	
(b)	165 or 165.0 to 165.2	5	**B4** for 262 or 262.1 to 262.2… OR **M1** for $6 \times 4.9 \times 4.9$ **M1** for $\pi \times 1.2^2 \times 25$ **M1** for $\frac{1}{3}\times 0.7\times 0.7\times 0.628$ [× 49] **M1** for at least 1 of *their* volumes × 0.63

Question	Answer	Marks	Partial Marks
(a)(i)	Fully correct method for area	**M3**	e.g. [Area] $= \frac{1}{2} \times \left(2 \times \frac{\sqrt{3}r}{2}\right)^2 \sin 60$ or Area of $BOC = \frac{1}{2}r^2 \times \sin 120$ $= \frac{1}{2}r^2 \times \frac{\sqrt{3}}{2}$ Area of $ABC = 3 \times \frac{1}{2}r^2 \times \frac{\sqrt{3}}{2}$ or Side by cosine rule = $r\sqrt{3}$ Then $0.5 \times a^2 \times \sin 60$ or $\frac{\sqrt{3}}{4}(side)^2 = \frac{\sqrt{3}}{4}(r\sqrt{3})^2$ $= \frac{3\sqrt{3}}{4}r^2$ or **M2** for correct method length of side or **M1 for** $\cos 30 = \frac{\sqrt{3}}{2}$ oe
	Completion to answer with no errors	**A1**	
(a)(ii)	$\pi r^2 - \frac{3\sqrt{3}}{4}r^2$ oe	**1**	
(b)	[Area =] $3\sqrt{3}r^2 - \pi r^2$ oe	**3**	**M2** for $0.5 \times \left(\frac{2r}{\tan 30}\right)^2 \times \sin 60$ oe or **M1** for $EF = \frac{2r}{\tan 30}$ oe
(c)	1 : 2	**2**	**B1** for unsimplified

08. 0607_s23_ms_41 Q: 2

Question	Answer	Marks	Partial Marks
(a)(i)	75	2	**M1** for $5^2[\times 3]$
(a)(ii)	268 or 268.0 to 268.1...	2	**M1** for $\frac{4}{3} \times \pi \times 4^3$
(b)	2.52 or 2.522 to 2.523...	2	**M1** for $\pi \times r^2 \times 6 = 120$ or better
(c)	7.42 or 7.422 to 7.423	3	**M1** for $\frac{1}{3} \times \pi \times r^2 \times 6 = 120$ oe or better **M1** for $6^2 + (their\ r)^2$ or better

09. 0607_s23_ms_41 Q: 7

Question	Answer	Marks	Partial Marks
(a)(i)	26.6 or 26.56 to 26.57	2	**M1** for $\tan = \frac{6}{12}$ oe
(a)(ii)	13.4 or 13.41 to 13.42	2	**M1** for $6^2 + 12^2$ oe
(a)(iii)	56.4 to 56.5	3	**M2** for $2 \times 10 + 2 \times 12 + \frac{2 \times their CMN}{360} \times 2 \times \pi \times their\ MC$ or **M1** for $\frac{2 \times their CMN}{360} \times 2 \times \pi \times their\ MC$ oe
(a)(iv)	203 to 205	5	**M1** for $\frac{2 \times their CMN}{360} \times \pi \times (their\ MC)^2$ **M2** for $\frac{1}{2} \times 12 \times \sqrt{10^2 - 6^2}$ oe or **M1** for $10^2 - 6^2$ **B1** for 144 or 72 or 36

Question	Answer	Marks	Partial Marks
(b)	248	3	**M2** for $558 \times \left(\sqrt[3]{\frac{240}{810}}\right)^2$ oe or **M1** for $\left(\sqrt[3]{\frac{240}{810}}\right)^2$ or $\left(\sqrt[3]{\frac{810}{240}}\right)^2$ or for $\left(\frac{810}{240}\right)^2 = \left(\frac{558}{area}\right)^3$ oe

10. 0607_s23_ms_42 Q: 5

Question	Answer	Marks	Partial Marks
(a)(i)	72	1	
(a)(ii)	$\frac{5}{\sin\left(\frac{1}{2}their72\right)}$ oe	M2	**M1** for $\sin\left(\frac{1}{2}their72\right)=\frac{5}{OD}$ oe
	8.506 to 8.507	A1	
(a)(iii)	172 or 172.0 to 172.2	2	**M1** for $\frac{1}{2}\times 8.51^2\times\sin(their\ 72)$ oe or $\frac{1}{2}\times 8.51\times(10\text{ or }5)\sin 54$ oe or $\frac{1}{2}\times(10\text{ or }5)\times 5\tan 54$ oe
(b)(i)	15.9 or 15.86...	3	**M2** for $18^2-8.51^2$ or **M1** for $VO^2+8.51^2=18^2$
(b)(ii)	909 to 913	2	**M1** for $\frac{1}{3}\times(their172)\times(their15.9)$
(b)(iii)	11.8 or 11.79 to 11.82	3	**M2** for $10\times\sqrt[3]{\frac{1500}{their\textbf{(b)(ii)}}}$ oe or **M1** for $\sqrt[3]{\frac{1500}{their\textbf{(b)(ii)}}}$ or $\sqrt[3]{\frac{their\textbf{(b)(ii)}}{1500}}$ or $\frac{their\textbf{(b)(ii)}}{1500}=\left(\frac{10}{x}\right)^3$ oe

11. 0607_s23_ms_42 Q: 7

Question	Answer	Marks	Partial Marks
(a)	$y=\frac{1}{2}x+6$ oe final answer	3	**B2** for $\frac{1}{2}x+6$ OR **M1** for $\frac{10-2}{8-(-8)}$ oe **M1** for substituting (–8, 2) or (8, 10) into $y = (their\ m)x + c$ oe
(b)	$\frac{1}{2}\times 4+6=8$ oe	1	

Question	Answer	Marks	Partial Marks
(c)	$y = -2x + 16$ oe final answer	3	**B2** for $-2x + 16$ OR **M1** for grad $= -\frac{1}{their\ \frac{1}{2}}$ **M1** for substituting (4, 8) into $y = (their\ m)x + c$ oe, $their\ m \neq their\ \frac{1}{2}$
(d)(i)	(6, 4)	2	**B1** for each coordinate
(d)(ii)	Kite	1	
(d)(iii)	17.9 or 17.88 to 17.89 or $8\sqrt{5}$ oe	2	**M1** for $(8 - (-8))^2 + (10 - 2)^2$
(d)(iv)	80 or 79.5 to 80.5	3	**M2** for $\frac{1}{2}$ × *their* **(d)(iii)** × *their BD* or $2 \times \frac{1}{2}$ × *their* **(d)(iii)** × *their BN* oe i.e. a correct method for the area of *ABCD*. or **B1**for [*BN* =] 4.47 or 4.472... or $2\sqrt{5}$ oe or [*BD* =] 8.94 or 8.944... or $4\sqrt{5}$ oe or **M1** for a correct method for the area of one of the triangles in *ABCD*.

12. 0607_s23_ms_43 Q: 11

Question	Answer	Marks	Partial Marks
(a)	5440	2	**M1** for $20 \times 34 \times 8$ or $20 \times 34 \times 16$
(b)	8.39 or 8.394…	4	**B3** for 0.394 or 0.394… OR **M3** for $q = \frac{\frac{4}{3}\pi(4)^3\ [+their(\boldsymbol{a})]}{680}$ or **M2** for $(20 \times 34)q = \frac{4}{3}\pi(4)^3\ [their(\boldsymbol{a})]$ or **M1** for $\frac{4}{3}\pi(4)^3$
(c)(i)	6.67 or 6.666 to 6.667	3	**M2** for $\frac{20}{3}$ and $\frac{34}{5}$ or **M1** for $\frac{20}{3}$ or $\frac{34}{5}$ or recognition of 3 by 5

Question	Answer	Marks	Partial Marks
(c)(ii)	14.5 or 14.53 to 14.55	3	**B2** for 6.53 to 6.55 OR **M2** for $p = \frac{15 \times (their\textbf{(c)(i)})^3 [+their\textbf{(a)}]}{20 \times 34}$ or **M1** for $20 \times 34p = 15 \times (their\textbf{(c)(i)})^3 [+their\textbf{(a)}]$

13. 0607_w23_ms_41 Q: 8

Question	Answer	Marks	Partial Marks
(a)	22[.0] or 21.99...	2	**M1** for $\frac{140}{360} \times 2 \times \pi \times 9$ oe
(b)	99[.0] or 98.96 to 98.97...	2	**M1** for $\frac{140}{360} \times \pi \times 9^2$ oe
(c)	998 or 997.7 to 998.0	4	**M1** for *their* **(a)** × 20 **M1** for *their* **(b)** × 2 **M1** for [2 ×] 9 × 20
(d)	1230 or 1231 to 1232...nfww	2	**FT** *their* **(c)** $\times \left(\frac{10}{9}\right)^2$ **M1** for $\left(\frac{10}{9}\right)^2$ or $\left(\frac{9}{10}\right)^2$

14. 0607_w23_ms_41 Q: 11

Question	Answer	Marks	Partial Marks
(a)	29.3 or 29.25...	2	**M1** for $\frac{1}{2} \times 8 \times 10 \sin 47$
(b)	5.85 to 5.86	3	**M2** for $\sin 47 = \frac{\text{distance}}{8}$ oe or for $\frac{2 \times their\textbf{(a)}}{10}$ oe or **M1** for recognition of shortest distance
(c)	$\sqrt{8^2 + 10^2 - 2 \times 8 \times 10 \cos 47}$	M2	**M1** for $8^2 + 10^2 - 2 \times 8 \times 10 \cos 47$ oe **A1** for 54.9 or 54.88...
	7.408...	A1	

Question	Answer	Marks	Partial Marks
(d)	5.06 or 5.07 or 5.064 to 5.066	4	**M3** for $\frac{\frac{1}{2}\times 7.41}{\sin 47}$ oe or **M2** for $\sin 47 = \frac{\frac{1}{2}\times 7.41}{\text{radius}}$ oe or **M1** for angle $BOC = 94$ soi

15. 0607_w23_ms_42 Q: 8

Question	Answer	Marks	Partial Marks
(a)(i)	26	2	**M1** for $10^2 + 24^2$ or better
(a)(ii)	15.2 or 15.19 to 15.20	3	**M2** for $\sqrt{20^2 - \left(\frac{\text{their } 26}{2}\right)^2}$ **M1** for $20^2 - \left(\frac{\text{their } 26}{2}\right)^2$
(a)(iii)	71.8 or 71.78 to 71.80…	3	**M2** for $\tan EFM = \frac{\sqrt{231}}{5}$ or using *their* height oe **ALT** **M1** for $EF^2 = 20^2 - 12^2$ **M1** for $\cos EFM = \frac{5}{\text{their } EF}$ or **B1** for identifying correct angle or stating EFM
(b)(i)	10.5	3	**M2** for $\sqrt[3]{\frac{222.75}{66}} \times 7$ oe or **M1** for $\sqrt[3]{\frac{222.75}{66}}$ oe or $\left(\frac{7}{l}\right)^3 = \frac{66}{222.75}$
(b)(ii)	2.51 or 2.506 to 2.507…	2	**M1** for $\sqrt[3]{\frac{66\times 3}{4\pi}}$

16. 0607_w23_ms_43 Q: 6

Question	Answer	Marks	Partial Marks
(a)(i)	400	2	**M1** for $\frac{1}{3} \times 10^2 \times 12$
(a)(ii)	$\sqrt{\left(\frac{10}{2}\right)^2 + 12^{12}}$ leading to 13	M2	**M1** for $[VM^2 =] \left(\frac{10}{2}\right)^2 + 12^2$

Question	Answer	Marks	Partial Marks
(b)(i)	195.2 or 195	4	**B3** for 204.8 OR **B2** for 9.6 or awrt 9.6 or **M1** for [height of small pyramid] = $12 \times \frac{8}{10}$ oe **M1** for $\frac{1}{3} \times 8^2 \times$ (*their* 9.6) OR **M3** for *their* $400 \times \left(1 - \left(\frac{8}{10}\right)^3\right)$ oe or **M2** for *their* $400 \times \left(\frac{8}{10}\right)^3$ oe or **M1** for $\left(\frac{8}{10}\right)^3$ oe
(b)(ii)	257.6 or 258	4	**B1** for $13 \times \frac{2}{10}$ or $13 \times \frac{8}{10}$ **M1** for $8 \times$ (*their* 2.6) $+ 2 \times \frac{1}{2} \times 1 \times$ (*their* 2.6) oe **M1** for 8^2 and 10^2 soi

17. 0607_w20_ms_41 Q: 2

Question	Answer	Marks	Partial Marks
(a)(i)	25.0 cao	**1**	
(a)(ii)	25.0 cao	**1**	
(a)(iii)	30	**1**	
(a)(iv)	25.047	**1**	
(a)(v)	$2.50467\times10^{[1]}$	**1**	
(b)(i)	0.2[0] oe	**1**	
(b)(ii)	200 000	**1**	
(b)(iii)	5	**2**	**M1** for $\times1000\div3600$

18. 0607_s15_ms_41 Q: 3

Qu.	Answer	Mark	Part Marks
(a)	20	**1**	
(b)	13.225	**2**	or **M1** for (264.5 or 260 or 269) ÷ *their* **(a)** oe

19. 0607_s21_ms_42 Q: 11

Question	Answer	Marks	Partial Marks
(a)	8 – –2 = 10, 3 : 2 = 6 : 4, $x = -2 + 6 = 4$ oe 4 to –1 = 5, $y = 4 - 3 = 1$ oe	**M2**	**M1** for each coordinate
(b)	$y = 2x - 7$ oe final answer	**4**	**B3** for $2x - 7$ as final answer OR **M1** for gradient of $AB = \frac{-1-4}{8-(-2)}$ **M1** for $m = \frac{-1}{their\left(-\frac{1}{2}\right)}$ **M1** for $1 = (their2) \times 4 + c$ or $y - 1 = their2(x - 4)$)
(c)	$2 \times 6 - 7 = 5$ oe	**1**	
(d)(i)	$5\sqrt{5}$ or $\sqrt{125}$ final answer	**2**	**M1** for $(8 - (-2))^2 + ((-1) - 4)^2$ oe
(d)(ii)	25 [.0] cao nfww	**3**	**M1** for $(6 - 4)^2 + (5 - 1)^2$ **M1 dep on first M1** for $\frac{1}{2} \times their(d)(i) \times their\sqrt{20}$

20. 0607_s20_ms_43 Q: 10

Question	Answer	Marks	Partial Marks
(a)	$\frac{1}{2}\times 4x(2x+4) =$ $\frac{1}{2}(2x+1)(4x+5)\sin 30$	**M2**	**M1** for either area
	$\sin 30 = \frac{1}{2}$ and eliminating fractions	**M1**	
	Expanding brackets	**M1**	**FT**
	Completion to $8x^2 + 18x - 5 = 0$ with no errors	**A1**	
(b)	$(4x-1)(2x+5) = 0$	**M1**	or $x = \frac{-18 \pm \sqrt{18^2 - 4\times 8\times(-5)}}{2\times 8}$ or sketch of parabola (U shaped) with one +ve and one –ve zero.
	$\frac{1}{4}, -2\frac{1}{2}$ oe	**A2**	**A1** for each. If 0 scored, **SC1** for $\frac{1}{4}, -2\frac{1}{2}$
(c)	2.25	**2**	**M1** for substituting *their* positive solution in either area formula.

21. 0607_w18_ms_43 Q: 12

Question	Answer	Marks	Partial Marks
(a)	4.75	**3**	**B2** for $8x = 38$ oe or **M1** for $2\{(3x + 2) + (x + 1)\} = 44$ or $(3x + 2) + (x + 1) = 22$
(b)	17 cao	**3**	**B2** for 16 and 17 seen or sketch showing 17 or $(y+16)(y-17)$ seen or $\frac{-(-1) \pm \sqrt{(-1)^2 - 4(1)(-272)}}{2(1)}$ oe or **B1** for 17 seen or **M1** for $y(y - 1) = 272$ or better or appropriate sketch but not indicating 17
(c)	2.5 oe	**3**	**M2** for $vw = 5$ and $(v + 1)w = 7$ oe or **M1** for one of these equations oe
(d)	1.69 or 1.690… only cao	**4**	**M3** for $6p^2 - 6p - 7[=0]$ oe or **M2** for $2\left(2p + \frac{9}{2p}\right) + 2 = 2\left(3p + \frac{10}{3p}\right)$ oe or **M1** for $\frac{9}{2p}$ or $\frac{10}{3p}$ soi

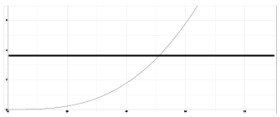
22. 0607_s17_ms_42 Q: 10

Question	Answer	Marks	Partial Marks
(a)(i)	$[y =] \frac{1}{2}x + 1$	3	**M1** for gradient = $\frac{8-2}{14-2}$ oe **M1** for correct substitution of (2, 2) or (14, 8) into $y = (their\ m)x + c$ oe soi
(a)(ii)	$[y =] -2x + 26$	3	**M1** for gradient = $\frac{-1}{their\ \frac{1}{2}}$ **M1**for substituting (11, 4) into $y = (their - 2)x + c$ oe soi
(b)	Correct substitution and completion of (10, 6) for both lines oe	2	**B1** for either OR **M1** for correct elimination of x or y from equations **A1** for completion to solution (10, 6)
(c)	(9, 8)	1	
(d)	30 cao	4	**M3** for $\left[\frac{1}{2}\right] \times \sqrt{12^2 + 6^2} \times \sqrt{2^2 + 4^2}$ oe or **B2** for two of $\sqrt{12^2 + 6^2}$ oe (AC), $\sqrt{2^2 + 4^2}$ oe (BD or MC), $\sqrt{8^2 + 4^2}$ oe (AM), $\sqrt{2^2 + 1^2}$ oe (MD or MB) or **B1** for one of these. (M is the intersection of AC and BD) OR **M3** for full area e.g. $[0.5 \times 12 \times 6 - 0.5 \times 6 \times 7] \times 2$ or **B2** for 2 correct areas evaluated or **B1** for 1 correct area evaluated

23. 0607_s16_ms_42 Q: 4

Question	Answer	Mark	Part Marks
(a)	24	**3**	**M2** for $6w + 5(w + 30) = 414$ oe or better or **B1** for $6w$ and $5(w + 30)$ oe
(b)	$2x^2 + 4x - 7\ [= 0]$ oe	**B2**	i.e. a correct simplified quadratic equation **M1** for $x^2 + (x + 1)(x + 3)\ [= 10]$ oe
	Sketch of appropriate graph or correct use of formula or completing square	**M1 dep**	Dep on a quadratic from addition of two areas. Must see some valid method
	4.48 or 4.49	**B2**	**B1** for 4.484 to 4.485… or $6\sqrt{2} - 4$ or 1.12 or 1.121… or $1.5\sqrt{2} - 1$

24. 0607_m22_ms_42 Q: 11

Question	Answer	Marks	Partial Marks
(a)	114.6 or 114.5 to 114.6	**3**	**M2** for $\frac{y}{360}\times 2\pi r = 2r$ oe or **M1** for $\frac{y}{360}\times 2\pi r$ oe
(b)(i)	$\frac{x}{360}\times\pi\times 8^2 - \frac{1}{2}\times 8^2\times\sin x = A$	**M2**	**M1** for $\frac{x}{360}\times\pi\times 8^2$ or $\frac{1}{2}\times 8^2\times\sin x$
(b)(ii)	18.3 or 18.26 to 18.27...	**1**	
(b)(iii)	Correct sketch of curve and line 	**B2**	**B1** for correct shape of curve
	58.9 or 58.90 to 58.92	**1**	

25. 0607_w18_ms_42 Q: 6

Question	Answer	Marks	Partial Marks
(a)	36 or 54 or 72 or 108 or 540 seen	**B1**	
	5 ÷ cos 54 oe	**M2**	or **M1** for $\cos 54 = \frac{5}{r}$ oe Starting with 8.51 is **M0**
	8.506 to 8.507	**A1**	
(b)(i)	20.7 or 20.68 to 20.70	**3**	**M2** for $\frac{72}{360}\times 2\times\pi\times 8.51 + 10$ oe or **M1** for $\frac{72}{360}$ oe soi by ÷ 5
(b)(ii)	11.0 or 11.1 or 11.02 to 11.10...	**3**	**M1** for $\frac{72}{360}\times\pi\times 8.51^2$ oe **M1** for $0.5\times 8.51^2\times\sin 72$ oe

26. 0607_s16_ms_43 Q: 4

Question	Answer	Mark	Part Marks
(a) (i)	$A = 4r^2 - \pi r^2$ oe final answer	**2**	**M1** for $ar^2 - b\pi r^2$
(ii)	30.9 or 30.88 to 30.90[…]	**1**	
(b)	$8r + 2\pi r$ oe final answer	**3**	**B1** for $8r$ oe **B1** for $2\pi r$ oe If **B0** scored then **M1** for $r + r + \frac{1}{4}\times 2\pi r$ oe

27. 0607_s16_ms_43 Q: 13

Question	Answer	Mark	Part Marks
(a) (i)	4.71 or 1.5π or 4.712 to 4.713	2	**M1** for $\frac{60}{360}\times\pi\times3^2$
(ii)	12.5 or $1.5\pi+4.5\sqrt{3}$ oe or 12.50 to 12.51	3	**M2** for $0.5\times3\times\frac{3}{\cos60}\times\sin60+their(a)$ oe or **M1** for $\frac{3}{\cos60}$
(iii)	31.4 or $7.5\pi+4.5\sqrt{3}$ oe or 31.35 to 31.36	3	**B1** for hyp = 6 **M1** for $\frac{60}{360}\times\pi\times(their6)^2$
(b)	263 or $31.5\pi+94.5\sqrt{3}$ oe or 262.6 to 262.7	4	**M3** for $1.5\pi+6\pi+24\pi+4.5\times\sqrt{3}+18\times\sqrt{3}+72\times\sqrt{3}$ or **M1** for $1.5\pi+6\pi+24\pi$ **and M1** for $4.5\times\sqrt{3}+18\times\sqrt{3}+72\times\sqrt{3}$ or **M1** for correct new triangle in diagram 4 or **M1** for correct new sector in diagram 5 or **M1** for correct new triangle in diagram 6

28. 0607_m21_ms_42 Q: 10

Question	Answer	Marks	Partial Marks
(a)	8 : 19 oe	3	**M1** for [Vol A : Vol B =] $2^3:3^3$ oe **M1** for [Vol C =] $27k-8k$ k any variable OR **M1** for $\frac{1}{3}\pi\left(\frac{3r}{2}\right)^2\times\frac{3h}{2}$ **M1** for [V_A : V_C =] $\frac{1}{3}\pi r^2h:\frac{1}{3}\left(\frac{19}{8}\right)\pi r^2h$

Question	Answer	Marks	Partial Marks
(b)	503 or 502.6 to 502.8	**8**	**M1** for $\frac{3}{2}\times 4$ oe or $\frac{3}{2}\times 10$ or $\frac{3}{2}\times$ *their l* oe if *their l* is from Pythagoras or $\frac{3^2}{2^2}$ **M2** for $\sqrt{4^2+10^2}$ or $\sqrt{(\text{their } R)^2+(\text{their } H)^2}$ or **M1** for 4^2+10^2 or $(\text{their } R)^2+(\text{their } H)^2$ **M1** for $\pi\times 4\times\sqrt{116}$ **M1** for $\pi\times 6\times\frac{3}{2}\sqrt{116}$ or $\frac{3^2}{2^2}\times\pi\times 4\sqrt{116}$ **M2** for CSAa + CSAb + $\pi\times(\text{their } R)^2-\pi\times 4^2$ oe or **M1** for for CSAa + CSAb or $\pi\times(\text{their } R)^2-\pi\times 4^2$ oe

29. 0607_s19_ms_43 Q: 1

Question	Answer	Marks	Partial Marks
(a)	2.5	**2**	**M1** for $7\times 3\times h=52.5$ or better
(b)	4500	**2**	**M1** for $\frac{1}{3}\times 500\times 27$ oe

30. 0607_w19_ms_42 Q: 9

Question	Answer	Marks	Partial Marks
(a)	$[(14\times18)+0.5\times14\times8]\times24$ oe or $18\times14\times24+0.5\times14\times8\times24$ oe leading to 7392	**M3**	i.e. area × length volume + volume **M2** for $14\times18+0.5\times14\times8$ or **M1** for 14×18 or $0.5\times14\times8$ or $0.5\times(18+26)\times7$
(b)	12 cao	**3**	**M2** for $24\div\sqrt[3]{\frac{7392}{924}}$ oe or **M1** for $\sqrt[3]{\frac{7392}{924}}$ soi
(c)	12.1 or 2.08…	**2**	**M1** for $r^3=\frac{3}{4}\times\frac{7392}{\pi}$ oe
(d)	48.2 or 48.3 or 48.4 or 48.20 to 48.37…	**2**	**M1** for $h=\frac{3\times7392}{\pi\times(their12.1)^2}$
(e)	$\pi r^2\sqrt{17}$ final answer	**3**	**M2** for $\pi r\sqrt{r^2+(4r)^2}$ or **M1** for $l^2=r^2+(4r)^2$ If 0 scored , **SC1** for $\pi r^2\sqrt{5}$

31. 0607_s18_ms_41 Q: 6

Question	Answer	Marks	Partial Marks
(a)(i)(a)	$2\pi r$ = 12 oe	**M1**	
	1.9096 to 1.9099	**A1**	
(a)(i)(b)	458 or 457.9 to 458.5	**2**	**M1** for $\pi\times1.91[0]^2\times40$
(a)(ii)	1070	**4**	**B3** for volume of other cylinder 1530 or 1527 to 1529. … or **M2** for $\pi\times\left(\frac{40}{2\pi}\right)^2\times12$ or **M1** for $40\div(2\pi)$ oe
(b)	40	**4**	**M3** for $\sqrt[3]{\frac{4.8\times100^3}{75}}$ oe or **M1** for $\sqrt[3]{\frac{\text{figs } 48}{\text{figs } 75}}$ oe or $\sqrt[3]{\frac{\text{figs } 75}{\text{figs } 48}}$ oe **and M1** for 4.8×100^3 or $75\div100^3$ oe

32. 0607_s18_ms_42 Q: 7

Question	Answer	Marks	Partial Marks
(a)	90	**2**	**M1** for $55 + 5k$, $k = 7$ or 8
(b)	11	**2**	**M1** for $55 + 5(n - 1) = 105$ or better or $\frac{105 - 55\,[+5]}{5}$ soi by 10
(c)	82.5	**2**	**M1** for $\frac{42}{28} = \frac{[\ ]}{55}$ oe
(d)(i)	$28 + 2a = 44$ oe or $44 - 28$ oe seen	**M1**	
	$2a = 16$ or $\frac{44 - 28}{2}$ oe[= 8]	**A1**	
(d)(ii)	56 900 or 56 900 to 56 920	**2**	**M1** for $\frac{\pi}{3} \times (3 \times 14^2 + 3 \times 14 \times 8 + 8^2)$ [× 55]
(d)(iii)	192 000 or 192 000 to 192 200	**3**	**M2** for *their* **(d)(ii)** $\times \left(\frac{42}{28}\right)^3$ or **M1** for $\left(\frac{42}{28}\right)^3$ or $\left(\frac{28}{42}\right)^3$ OR **M2** for $\frac{\pi}{3} \times$ *their* **(c)** $\times \left(3 \times 21^2 + 3 \times (8 \times 1.5) \times 21 + (8 \times 1.5)^2\right)$ or **B1** for $a = 12$
(d)(iv)	$[h =] \frac{3V}{\pi(3r^2 + 3ar + a^2)}$	**2**	**M1** for $3V = \pi h\left(3r^2 + 3ar + a^2\right)$ or $\frac{V}{\pi\left(3r^2 + 3ar + a^2\right)} = \frac{h}{3}$ or $\pi h = \frac{3V}{3r^2 + 3ar + a^2}$

33. 0607_s18_ms_43 Q: 7

Question	Answer	Marks	Partial Marks
(a)	0.278 or 0.2781 to 0.2782	**3**	**M2** for $0.5 \times 0.6 \times 0.8 \times \sin 105 \times 1.2$ oe or **M1** for $0.5 \times 0.6 \times 0.8 \times \sin 105$
(b)	3.48 to 3.49	**5**	**M2** for $\sqrt{0.6^2 + 0.8^2 - 2 \times 0.6 \times 0.8 \times \cos 105}$ or **M1** for $0.6^2 + 0.8^2 - 2 \times 0.6 \times 0.8 \times \cos 105$ **A1** for 1.12 or 1.117... **M1** for *their* $1.117 \times 1.2 + 2 \times$ *their* area of $ABC + 0.6 \times 0.12 + 0.8 \times 1.2$
(c)	0.0348 to 0.0349	**3**	**FT** *their* **(b)** $\div 100$ **M2** for *their* **(b)** $\div \sqrt[3]{\frac{2170}{2.17}} \times \left(\sqrt[3]{\frac{2170}{2.17}}\right)^2$ oe or **M1** for $\frac{2170}{2.17}$ or $\frac{2.17}{2170}$ or $\left(\sqrt[3]{k}\right)^2$ implied by *their* **(b)** $\div 1000$

34. 0607_w17_ms_43 Q: 7

Question	Answer	Marks	Partial Marks
(a)	6810 or 6806 to 6808	**3**	**M2** for $\frac{1}{2} \times \frac{4}{3}\pi(15^3 - 5^3)$ or **M1** for either $[\frac{1}{2}\times]\frac{4}{3}\pi \times 15^3$ or $[\frac{1}{2}\times]\frac{4}{3}\pi \times 5^3$
(b)	2200 or 2199…	**5**	**M4** for $2 \times \pi \times 5^2 + 2 \times \pi \times 15^2 + \pi \times (15^2 - 5^2)$ or **M1** for each term

35. 0607_w16_ms_42 Q: 12

Question	Answer	Mark	Part Marks
(a) (i)	144π	2	**M1** for $\frac{2}{3} \times \pi \times 6^3$
(ii)	108π	2	**M1** for $2\pi \times 6^2 + \pi \times 6^2$ If 0 scored **SC1** for 72π
(b) (i)	12 or 11.99 to 12.01 nfww	3	**M2** for $\frac{\textit{their}(a)(i) \times 16}{\frac{4}{3}\pi}$ oe or **M1** for $\frac{4}{3} \times \pi \times r^3 = \textit{their}$(a)(i) $\times$ 16
(ii)	1 : 3 or $\frac{1}{3}$:1 cao nfww	3	**M2** for $4 \times \pi \times (\textit{their}$(b)(i)$)^2 : 16 \times \textit{their}$(a)(ii) oe or **M1** for $4 \times \pi \times (\textit{their}$(b)(i)$)^2$ or $16 \times \textit{their}$(a)(ii)

36. 0607_w16_ms_43 Q: 4

Question	Answer	Mark	Part Marks
(a) (i)	96	2	**M1** for $\frac{1}{3} \times 6 \times 6 \times 8$
(ii)	8.54 or 8.544...	2	**M1** for $8^2 + 3^2$
(b) (i)	84	3FT	**M2** for $\frac{7}{8} \times \textit{their}$ (a)(i) oe or **M1** for $96 \times (\frac{1}{2})^3$ or $\frac{1}{3} \times 3 \times 3 \times 4$ soi by 12
(ii)	122 or 121.8 to121.9	5	**M3** for $4 \times \frac{3}{4} \times \frac{1}{2} \times 6 \times \textit{their}$ (a)(ii) oe or $4 \times \frac{1}{2} \times (6 + 3) \times \frac{1}{2} \textit{their}$ (a)(ii) oe or **M2** for $\frac{3}{4} \times \frac{1}{2} \times 6 \times \textit{their}$ (a)(ii) oe or $\frac{1}{2} \times (6 + 3) \times \frac{1}{2} \textit{their}$ (a)(ii) oe or **M1** for $\frac{1}{2} \times 6 \times \textit{their}$ (a)(ii) or $\frac{1}{2} \times 3 \times \frac{1}{2} \textit{their}$ (a)(ii) and **M1** for $36 + 9 + 4 \times \textit{their}$ trapezium area oe

37. 0607_s15_ms_41 Q: 7

Qu.	Answer	Mark	Part Marks
(a)	$\frac{15}{3}\times\frac{12}{3}\times\frac{3}{3}$	1	
(b)	14.1 or 14.13 to 14.14	2	**M1** for $\frac{4}{3}\pi 1.5^3$
(c)	282 or 283 or 282.6 to 282.8	1FT	**FT** *their* **(b)** × 20
(d)	2.82×10^2 or 2.83×10^2 or $(2.826 \text{ to } 2.828) \times 10^2$	1FT	**FT** *their* **(c)** in standard form
(e)	52.20 to 52.41	2FT	**FT** answer only if less than 100 **M1** for $\frac{\textit{their (c)}}{15\times12\times3}\times100$

38. 0607_w15_ms_41 Q: 7

Question	Answer	Mark	Part Marks
(a) (i)	2512 final answer	2	**M1** for $20 \times 8 \times 2 \times 7.85$
(ii)	34.56 cao	3	**M2** for $2(20 \times 8 + 20 \times 2 + 8 \times 2) \times 0.08$ oe or **M1** for $2(20 \times 8 + 20 \times 2 + 8 \times 2)$ oe or for area × 0.08
(b)	48	2	**M1** for $8 \times 3 \times 2$ oe
(c) (i)	67	3	**M2** for $(20 \times 12 \times 4) \div \left(\frac{4}{3}\pi \times 1.5^3\right)$ or **M1** for $\left(\frac{4}{3}\pi \times 1.5^3\right)$
(ii)	12.6 or 12.7 or 12.8 or 12.62 to 12.82...	2	**M1** for $(20 \times 12 \times 4) - \textit{their}\ 67 \times \textit{their}\left(\frac{4}{3}\pi \times 1.5^3\right)$ oe must be positive
(iii)	1.44 or 1.45 or 1.444 to 1.452 cao	2	**M1** for $\frac{4}{3}\pi r^3 = \textit{their}(\textbf{ii})$ oe or better
(d)	$\frac{3}{8}$	4	**B3** for equivalent fraction or 0.375 **SC2** for answer $\frac{3}{16}$ or **M1** for $\frac{1}{3}\pi r^2 \times 3r \times 0.9$ and **M1** for $\left[\frac{1}{2}\right]\times\frac{4}{3}\pi(2r)^3 \times 0.45$

39. 0607_m21_ms_42 Q: 5

Question	Answer	Marks	Partial Marks
(a)	103 or 103.3 to 103.4	**2**	**M1** for $49^2 + 91^2$ oe
(b)	85.2 or 85.17 to 85.18	**2**	**M1** for $\frac{305}{360}\times\pi\times2\times16$
(c)	339 or 339.2 to 339.3…	**2**	**M1** for $\frac{1}{4}\times\pi\times6^2\times12$

Question	Answer	Marks	Partial Marks
(d)(i)	$(x-3)(x+1)+\frac{1}{2}(x-3)(2x+4)$ [=11]	**M1**	
	$x^2-3x+x-3$ or $\left[\frac{1}{2}\right](2x^2-6x+4x-12)$ or $x^2-3x+2x-6$	**B1**	one correct expansion seen
	At least one more line of working leading to $2x^2-3x-20=0$	**A1**	no errors or omissions
(d)(ii)	$(2x+5)(x-4)$	**2**	**M1** for $(2x+a)(x+b)$ where $ab=-20$ or $a+2b=-3$ or $2x(x-4)+5(x-4)$ or $x(2x+5)-4(2x+5)$
(d)(iii)	4 , –2.5	**1**	Strict **FT** *their* factors Dep on factors in part (ii)
(d)(iv)	12	**1**	**FT** 2 × (*their* positive root (d)(iii)) + 4

40. 0607_s21_ms_42 Q: 9

Question	Answer	Marks	Partial Marks
(a)	204 or 204.2...	**3**	**M2** for $\pi\times5\times\sqrt{(5^2+12^2)}$ or **M1** for $5^2 + 12^2$ (implied by 13)
(b)(i)	$\frac{r}{12-r}=\frac{5}{their13}$ oe	**M1**	$\frac{r}{13-5}=\frac{5}{12}$
	r(*their* 13) = 5(12 – r)	**M1**	**M1 dep on first M1 for** $12r = 5(13 - 5)$
	Completion to $r = 3.\dot{3}$ or $3\frac{1}{3}$ or $\frac{10}{3}$ or 3.333... with no errors	**A1**	
(b)(ii)	159 or 159.0 to 159.5	**3**	**M1** for $\frac{1}{3}\times\pi\times5^2\times12$ **M1** for $\frac{4}{3}\times\pi\times3.33^3$

41. 0607_s21_ms_43 Q: 4

Question	Answer	Marks	Partial Marks
(a)	990 or 989.6 to 989.7...	**5**	**M2** for $\pi\times5\times\sqrt{5^2+12^2}$ or **M1** for $\sqrt{5^2+12^2}$ implied by 13 **M1** for $2\pi\times5\times20$ **M1** for $\frac{1}{2}\times4\pi\times5^2$
(b)(i)	296	**3**	**M2** for $\frac{2050\pi}{3}\div\left(\frac{4}{3}\pi\times1.2^3\right)$ implied by final answer 296.5 to 296.6 or **M1** for $\frac{4}{3}\pi\times1.2^3$ implied by 7.24 or 7.238 to 7.239...
(b)(ii)	0.197 or 0.1972 to 0.1975	**3**	**M2** for $\left(\frac{2050\pi}{3}-their\,296\times\frac{4}{3}\times\pi\times1.2^3\right)\div\frac{2050\pi}{3}$ oe or for $\left(their\,296\times\frac{4}{3}\times\pi\times1.2^3\right)\div\frac{2050\pi}{3}\times100$ oe or **M1** for $\frac{2050\pi}{3}-their\,296\times\frac{4}{3}\times\pi\times1.2^3$ or for $\left(their\,296\times\frac{4}{3}\times\pi\times1.2^3\right)\div\frac{2050\pi}{3}$

42. 0607_w21_ms_43 Q: 10

Question	Answer	Marks	Partial Marks
(a)	1130 or 1127 to 1128	**5**	**M1** for $\pi\times16\times4^2$ **M1** for $\frac{1}{2}\times\frac{4}{3}\times\pi\times4^3$ **M1** for 12^2-4^2 or better **M1** for $\frac{1}{3}\times\pi\times4^2\times$*their h*
(b)	$2\times\pi\times16\times4$	**M1**	
	$\frac{1}{2}\times4\times\pi\times4^2$ oe	**M1**	
	$\pi\times12\times4$	**M1**	
	$32\pi+128\pi+48\pi$ [$=208\pi$]	**B1**	
(c)	6	**3**	**M2** for $\sqrt{\frac{468}{208}}\times4$ oe or **M1** for $\sqrt{\frac{468}{208}}$ or $\sqrt{\frac{208}{468}}$ or $\left(\frac{4}{r}\right)^2=\frac{208\pi}{468\pi}$ oe

43. 0607_s20_ms_42 Q: 4

Question	Answer	Marks	Partial Marks
(a)(i)	1690 or 1687 or 1687.1 to 1687.3	**3**	**M2** for $18\times12^2-18\times\pi\times4^2$ or **M1** for either term correct
(a)(ii)	$1.69[0]\times10^3$	**1**	**FT** *their* (i)

Question	Answer	Marks	Partial Marks
(b)	1500 or 1503 to 1504	**4**	**M1** for $[4\times]18\times12$ **M1** for $[2\times](12^2-\pi\times4^2)$ **M1** for $\pi\times2\times4\times18$
(c)(i)	56.5 or 56.6 or 56.54 to 56.56	**1**	
(c)(ii)	2.38 or 2.380 to 2.382	**2**	**M1** for $\frac{3\times\textit{their}(c)}{4\times\pi}$

44. 0607_w20_ms_41 Q: 9

Question	Answer	Marks	Partial Marks
(a)(i)	4870 or 4869 to 4870	3	**M1** for $24\times16\times12$ **M1** for $\frac{1}{2}\times\frac{4}{3}\times\pi\times5^3$
(a)(ii)	1050 or 1051 to 1052 nfww	2	**M1** for $\left(\frac{3}{5}\right)^3$ oe or $\frac{1}{2}\times\frac{4}{3}\times\pi\times3^3 + 14.4\times9.6\times7.2$
(b)(i)	1810 or 1806 to 1807	3	**M1** for $24\times16\times2 + 24\times12\times2 + 16\times12\times2$ $[-\pi\times5^2]$ **M1** for $0.5\times4\times\pi\times5^2$
(b)(ii)	2600 or 2610 or 2600 to 2606. ... nfww	2	**M1** for $\left(\frac{6}{5}\right)^2$ oe soi or $0.5\times4\times\pi\times6^2 + 28.8\times19.2\times2$ $+ 28.8\times14.4\times2$ $+ 19.2\times14.4\times2 - \pi\times6^2$

45. 0607_w20_ms_43 Q: 6

Question	Answer	Marks	Partial Marks
(a)	135π	3	**M1** for $\pi\times3^2\times11$ **M1** for $\frac{4}{3}\pi\times3^3$
(b)(i)	3	2	**M1** for $\pi\times r^2\times15 =$ *their* **(a)**
(b)(ii)	2.12 or 2.120 to 2.121	2	**M1** for $20\times10\times h =$ *their* **(a)**

46. 0607_s19_ms_42 Q: 4

Question	Answer	Marks	Partial Marks
(a)	12 cao final answer	3	**B2** for 11.98 to 12.02 or **M1** for $\pi\times3^2\times l + 2\times\frac{2}{3}\times\pi\times3^3$ $[=144\pi]$ oe
(b)	3.53 or 3.528 to 3.529...	2	**M1** for $144\pi\times7.8$ soi by figs 353 or 3528 to 3529

Question	Answer	Marks	Partial Marks
(c)	2.95 or 2.96 or 2.950 to 2.963...	**3**	**M2** for $\frac{144\pi - 20\times 2.8^3}{144\pi}$[×100] or $\frac{20\times 2.8^3}{144\pi}\times 100$ oe or **M1** for $144\pi - 20\times 2.8^3$ or $\frac{20\times 2.8^3}{144\pi}$ oe
(d)	1.5 oe cao final answer	**3**	**B2** for 1.498 to 1.502 or **M2** for $3\times\sqrt[3]{\frac{18\pi}{144\pi}}$ oe or **M1** for $\sqrt[3]{\frac{18\pi}{144\pi}}$ or $\sqrt[3]{\frac{144\pi}{18\pi}}$ oe or better or for $\left(\frac{3}{x}\right)^3 = \frac{144\pi}{18\pi}$ oe

47. 0607_w19_ms_43 Q: 7

Question	Answer	Marks	Partial Marks
(a)(i)	134 or 134.0 to 134.1	**2**	**M1** for $\frac{1}{2}\times\frac{4}{3}\times\pi\times 4^3$ oe
(a)(ii)	101 or 100.5...	**2**	**M1** for $\frac{1}{3}\times\pi\times 4^2\times 6$ oe

Question	Answer	Marks	Partial Marks
(a)(iii)	1120 or 1117 to 1118	**2**	**M1** for $\frac{2}{3}\times\pi\times 4^3\times 7.85$ soi or *their* **(i)** × 7.85 or for $\frac{1}{3}\times\pi\times 4^2\times 6\times 0.65$ soi or *their* **(ii)** × 0.65
(b)	191 or 191.1 to 191.2	**5**	**M1** for $6^2 + 4^2$ **A1** for 7.21 or 7.211... or $\sqrt{52}$ **M1** for $\pi\times 4\times$ *their* 7.21 **M1** for $2\times\pi\times 4^2$
(c)	430 or 429.7 to 430.2	**2**	**FT** *their* **(b)** **M1** for *their* **(b)** × $\left(\frac{9}{6}\right)^2$ oe

48. 0607_w18_ms_42 Q: 11

Question	Answer	Marks	Partial Marks
(a)	46.8 or 46.82 to 46.83	**3**	**M1** for $\frac{1}{2} \times \pi \times 1.8^2 \times 8$ oe **M1** for $\frac{1}{4} \times \frac{4}{3} \times \pi \times 1.8^3$ oe
(b)	60.5 or 60.49 to 60.51...	**4**	**M1** for $\frac{1}{2} \times \pi \times 1.8^2$ oe **M1** for $\frac{1}{2} \times 2 \times \pi \times 1.8 \times 8$ oe **M1** for $\frac{1}{4} \times 4 \times \pi \times 1.8^2$ oe

49. 0607_s17_ms_43 Q: 5

Question	Answer	Marks	Part Marks
(a)	804 or 804.2 to 804.4	**3**	**M1** for $\frac{1}{3}\pi \times 8^2 \times 16$ **M1** for $\frac{4}{3}\pi \times 4^3$
(b)	450 or 449.5 to 449.6…	**3**	**M2** for $\pi \times 8 \times \sqrt{8^2 + 16^2}$ or **M1** for $\sqrt{8^2 + 16^2}$ or $\pi \times 8 \times$ *their l*

Question	Answer	Marks	Part Marks
(c)	8.94 or 8.944…	**4**	P is point of contact between slant edge and circle. **B2** for $PV = 8$ nfww or **M1** for $\frac{8}{4} = \frac{16}{PV}$ oe **M1** for $OV^2 = 4^2 + PV^2$ OR **B2** for $l = \sqrt{320}$ oe or **M1** for $l^2 = 8^2 + 16^2$ **M1** for $\frac{8}{4} = \frac{l}{OV}$ soi OR x is semi-vertical angle of cone **M1** for $\tan x = \frac{8}{16}$ oe **M2** for $\frac{4}{\sin x}$ or **M1** for $\frac{4}{OV} = \sin x$

50. 0607_w17_ms_41 Q: 5

Question	Answer	Marks	Partial Marks
(a)	$\frac{45}{360} \times 2\pi \times 22.5 = 2\pi r$ or $\frac{45}{360} \times \pi \times 22.5^2 = \pi \times r \times 22.5$	M2	or **M1** for $\frac{45}{360} \times 2\pi \times 22.5$ or $\frac{45}{360} \times \pi \times 22.5^2$
	2.812 to 2.813	A1	
(b)	241 or 240.7 to 241.0...	5	**M3** for $\frac{45}{360} \times \pi\,(32.5^2 - 22.5^2)$ oe or **M2** for $\frac{45}{360} \times \pi \times 32.5^2$ or $\frac{45}{360} \times \pi \times 22.5^2$ and **M1** for $\pi \times 2.81^2$
(c)	963 or 964 or 962.8 to 963.6	2	**FT** *their* (b) × 4 **B1** for length scale factor = 2, $\sqrt[3]{8}$, $\frac{1}{2}$ soi, or area factor = 2^2 oe

51. 0607_s16_ms_41 Q: 4

Question	Answer	Mark	Part Marks
(a)	66 000 or 65 970 to 65 982	4	**M1** for $\frac{4}{3} \times \pi \times 15^3$ **M1** for $\pi \times 15^2 \times 40$ **M1** for $\pi \times 25^2 \times 12$
(b) (i)	16.4	1	
(ii)	120	3	**M2** for $15000 \div 5^3$ oe or **M1** for 5^3 or $(\frac{1}{5})^3$ seen

52. 0607_s16_ms_42 Q: 7

Question	Answer	Mark	Part Marks
(a) (i)	576 or 575.8 to 576.0…	3	**M1** for $\frac{2}{3}\pi \times 5^3$ (262 or 261.7 to 261.8…) **M1** for $\frac{1}{3}\pi \times 5^2 \times 12$ (314 or 314.1 to 314.2)
(ii)	0.547 or 0.5470 to 0.5472	2FT	**FT** *their* (a)(i) **M1** for *their* (a)(i) × 0.95 ÷ 1000
(iii)	1827 or 1828	2FT	**FT** with consistent units usual accuracy and truncated **M1** for 1000 ÷ *their* (a)(ii)

Question	Answer	Mark	Part Marks
(iv)	361 or 361.2 to 361.3…	4	**M1** for $2\pi \times 5^2$ (157 or 157.0 to 157.1) **M2** for $\pi \times 5 \times \sqrt{5^2+12^2}$ (204 or 204.2…) or **M1** for $\sqrt{5^2+12^2}$ (13)
(b)	5.37 or 5.369…	5	**M4** for $\sqrt{\dfrac{377}{\pi(1+\sqrt{10})}}$ or **M3** for $\dfrac{377}{\pi(1+\sqrt{10})}$ or **M2** for $\pi r^2 + \pi r\left(\sqrt{(3r)^2+r^2}\right) = 377$ or **M1** for $r^2 + (3r)^2$ oe

53. 0607_w16_ms_41 Q: 4

Qu.	Answer	Mark	Part Marks
(a)	$\dfrac{\frac{2}{3}\pi \times 9^3}{\frac{1}{3}\pi \times 9^2}$ or equation with parts clearly cancelled leaving 2 and 9	M2	**M1** for $\frac{1}{3}\pi \times 9^2 \times h = \frac{2}{3}\pi \times 9^3$ oe
(b) (i)	763 or 764 or 763.4 to 763.5…	2	**M1** for $\pi \times 9^2 + 2\pi \times 9^2$ or **SC1** for 509 or 508.9 to 509.0… or 162π
(ii)	569 or 569.0 to 569.1	3	**M2** for $\pi \times 9 \times \sqrt{9^2+18^2}$ or **M1** for 9^2+18^2
(c)	45	3	**M2** for $\dfrac{\frac{2}{3}\pi \times 9^3}{\frac{4}{3}\pi \times 2^3}$ or equation with parts clearly cancelled (implied by 45.56 to 46) or **M1** for $\frac{4}{3}\pi \times 2^3 \times n = \frac{2}{3}\pi \times 9^3$

54. 0607_s15_ms_43 Q: 9

Qu.	Answer	Mark	Part Marks
(a) (i)	$\frac{x}{x+40}=\frac{15}{20}$ oe	1	
	$20x = 15x + 40 \times 15$ oe	1	Accept 600 for 40×15
(ii)	121 or 120.9… or $15\sqrt{65}$	2	**M1** for $\sqrt{120^2+15^2}$
(iii)	40.3 or 40.24 to 40.35 or $5\sqrt{65}$	2FT	**M1** for *their* **(a)(i)** $\times \frac{40}{120}$ oe

Qu.	Answer	Mark	Part Marks
(b) (i)	38 700 or 38 740 to 38 752	3	**M2** for $\frac{1}{3}\pi \times 20^2 \times 160 - \frac{1}{3}\pi \times 15^2 \times 120$ oe or **M1** for either $\frac{1}{3}\pi \times 20^2 \times 160$ or $\frac{1}{3}\pi \times 15^2 \times 120$
(ii)	5140 or 5139 to 5142	4	**M3FT** for $\pi \times 20 \times$ (*their* **(a)(ii)** + *their***(a)(iii)**) $- \pi \times 15 \times$ (*their***(a)(ii)**) $+ \pi \times 15^2$ or **M2FT** for $\pi \times 20 \times$ (*their* **(a)(ii)** + *their***(a)(iii)**) $- \pi \times 15 \times$ (*their***(a)(ii)**) or **M1** for for $\pi \times 20 \times$ (*their* **(a)(ii)** + *their***(a)(iii)**) or $\pi \times 15 \times$ (*their***(a)(ii)**)

55. 0607_w15_ms_43 Q: 6

Question	Answer	Mark	Part Marks
(a)	6280 or 6283 to 6284	3	**M2** for $\frac{2}{3}\times\pi\times10^2\times30$ oe or **M1** for $\left[\frac{1}{3}\right]\pi\times10^2\times30\ (1000\pi)$
(b) (i)	$\frac{1}{3}\times\pi\times10^2\times30-\frac{1}{3}\times\pi\times5^2\times15$ oe	M3	Allow use of *their* volume of cone from **(a)** or $\frac{7}{8}\times\frac{1}{3}\times\pi\times10^2\times30$ or $\frac{7}{8}$ *their* volume of cone from **(a)** **M2** for $\frac{1}{3}\times\pi\times5^2\times15$ oe or **B1** for radius of small cone = 5
	2748.8 to 2749.3	A1	**not 2749 alone**
(ii)	1.96 or 1.963 to 1.964	3	**B2** for 1960 or 1963 to 1964 or **M1** for $\pi\times10^2\times15-2749$ **M1** for correctly converting *their* volume in cc to litres.