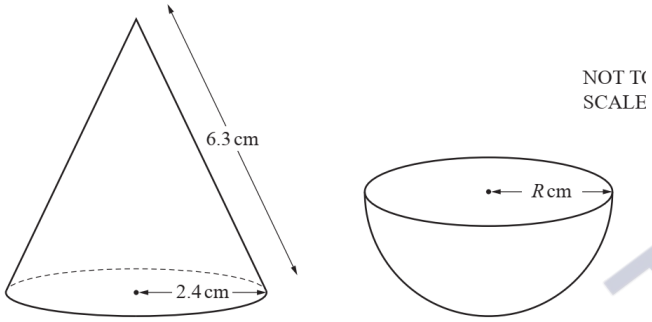
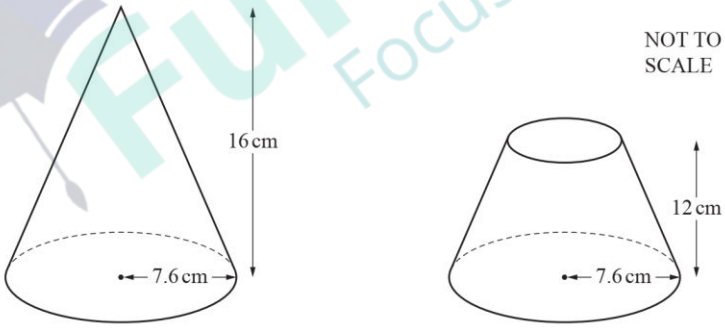
1. (a) The diagram shows a solid cone and a solid hemisphere.
The cone has radius 2.4cm and slant height 6.3 cm.
The hemisphere has radius R cm.
The total surface area of the cone is equal to the total surface area of the hemisphere.
Calculate the value of R [4]



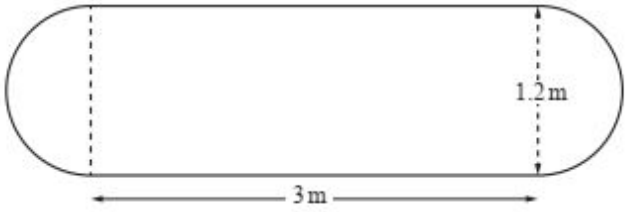
(b) The diagram shows a solid cone with radius 7.6 cm and height 16cm. A cut is made parallel to the base of the cone and the top section is removed.
The remaining solid has height 12cm, as shown in the diagram.
Calculate the volume of the remaining solid.



0580/41/M/J/21 Q3)

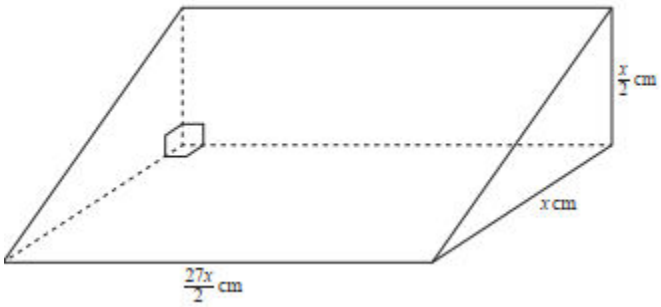
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2. The diagram shows the surface of a garden pond, made from a rectangle and two semicircles.
The rectangle measures 3m by 1.2m.



(a) Calculate the area of this surface [3]
(b) The pond is a prism and the water in the pond has a depth of 20cm. Calculate the number of litres of water in the pond. [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. [3]
0580/41/M/J/19 Q5)

3. The volume of each of the following solids is 1000cm^3.
Calculate the value of x for each solid.
(a) A cube with side length x cm. [1]
(b) A sphere with radius x cm [3]
(c) A cone with radius x cm and slant height $x\sqrt{5}$ cm. [4]
(d) A prism with a right-angled triangle as its cross-section [4]



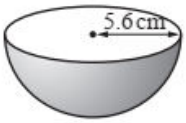
0580/41/M/J/19 Q10)

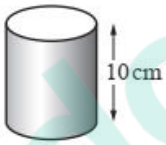
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4. (a) The volume of a solid metal sphere is 24430cm^3.
   (i) Calculate the radius of the sphere. [3]
   (ii) The metal sphere is placed in an empty tank. The tank is a cylinder with radius 50cm, standing on its circular base. Water is poured into the tank to a depth of 60cm.
   Calculate the number of litres of water needed. [3]
   (b) A different tank is a cuboid measuring 1.8m by 1.5m by 1.2m. 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. [4]

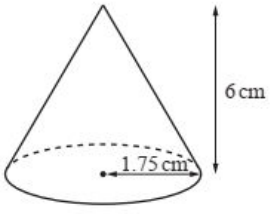
0580/42/M/J/19 Q10)

5. (a) The diagram shows a hemispherical bowl of





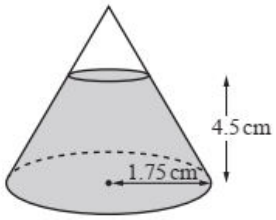
radius 5.6cm and a cylindrical tin of height 10cm
(i) Show that the volume of the bowl is 368cm^3, correct to the nearest cm^3. [2]
(ii) The tin is completely full of soup.
When all the soup is poured into the empty bowl, 80% of the volume of the bowl is filled. Calculate



the radius of the tin. [4]
(b) The diagram shows a cone with radius 1.75cm and height 6 cm
(i) Calculate the total surface area of the cone. [5]

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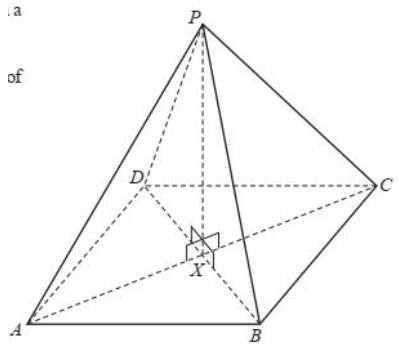
(ii) The cone contains salt to a depth of 4.5cm. The top layer of the salt forms a circle that is parallel to the base of the cone.



(a) Show that the volume of the salt inside the cone is 18.9cm^3, correct to 1 decimal place.[4]
(b) The salt is removed from the cone at a constant rate of 200mm^3 per second. Calculate the time taken for the cone to be completely emptied. Give your answer in seconds, correct to the nearest second. [3]
0580/43/M/J/19 Q4)

6. (a) (i) Calculate the **external curved** surface area of a cylinder with radius 8m and height 19m.[2]
(ii) This surface is painted at a cost of $0.85 per square metre. Calculate the cost of painting this surface. [2]
(ii) This surface is painted at a cost of $0.85 per square metre.Calculate the cost of painting this surface.
(b) A solid metal sphere with radius 6cm is melted down and all of the metal is used to make a solid cone with radius 8 cm and height hcm.
(i) Show that h = 13.5 . [2]
(ii) Calculate the slant height of the cone. [2]
(iii) Calculate the curved surface area of the cone. [1]
(d) The diagram shows a pyramid with a square base ABCD.

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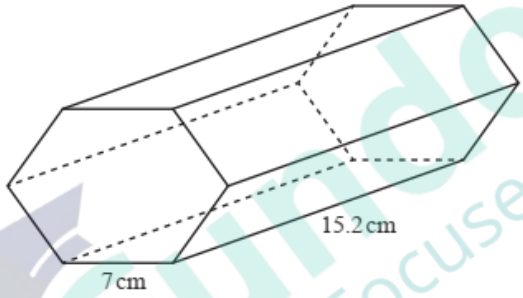


DB = 8 cm. P is vertically above the centre, X, of the base and PX = 5cm.

Calculate the angle between PB and the base ABCD [3]

0580/41/O/N/19 Q4)

7. (a)The diagram shows a solid prism with length 15.2cm.



The cross-section of this prism is a **regular** hexagon with side 7cm.

(i) Calculate the volume of the prism. [5]

(ii) Calculate the total surface area of the prism. [3]

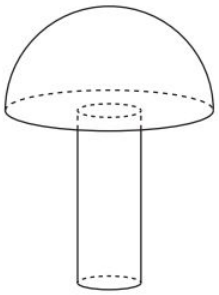
(b) Another solid metal prism with volume $500cm^3$ is melted and made into 6 identical spheres.

Calculate the radius of each sphere. [3]

0580/42/F/M/18 Q5)

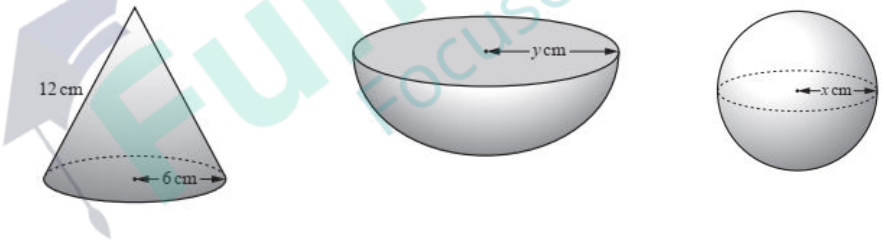
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8. A solid hemisphere has volume 230cm^3.
(a) Calculate the radius of the hemisphere. [3]



(b) A solid cylinder with radius 1.6cm is attached to the hemisphere to make a toy.
The total volume of the toy is 300cm^3.
Calculate the height of the cylinder. [3]
0580/41/M/J/18 Q6)

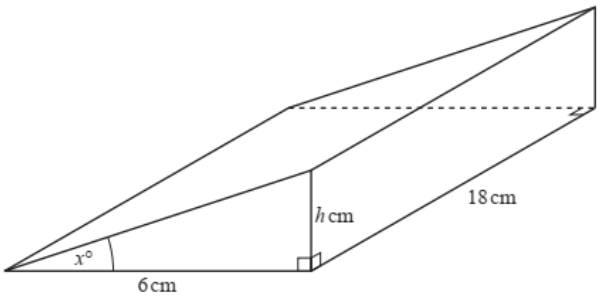
9. (a) Water flows through a cylindrical pipe at a speed of 8cm/s.
The radius of the circular cross-section is 1.5cm and the pipe is always completely full of water.
Calculate the amount of water that flows through the pipe in 1 hour. Give your answer in litres. [4]
(b) The diagram shows three solids.



The base radius of the cone is 6cm and the slant height is 12cm.
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 108πcm^2. [2]
(ii) Find the value of x and the value of y. [4]
0580/43/M/J/18 Q7)

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10. The diagram shows a prism with length 18cm and volume 253.8cm^3.



The cross-section of the prism is a right-angled triangle with base 6cm and height hcm.

(a) (i) Show that the value of h is 4.7 [3]

(ii) Calculate the value of x [2]

(b) Calculate the total surface area of the prism. [6]

0580/41/O/N/18 Q5)

11. (a) The lake behind a dam has an area of 55 hectares.

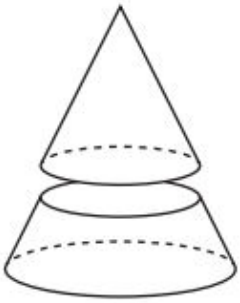
When the gates in the dam are open, water flows out at a rate of 75 000 litres per second.

(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.

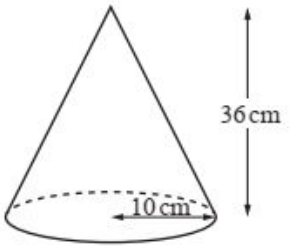
Give your answer in centimetres.

[1 hectare = 10^4 m^2, 1000 litres = 1m^3] [3]



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

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(i) Calculate the volume of this cone. [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.

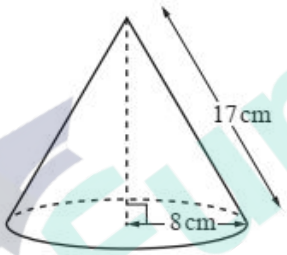
The smaller cone is melted down to make two different spheres.

The ratio of the radii of these two spheres is 1 : 2.

Calculate the radius of the smaller sphere. [4]

0580/42/O/N/18 Q10)

12. (a) The diagram shows a solid cone.



The radius is 8 cm and the slant height is 17cm.

(i) Calculate the curved surface area of the cone. [2]

(ii) Calculate the volume of the cone. [4]

(iii) The cone is made of wood and $1cm^3$ of the wood has a mass of 0.8 g.

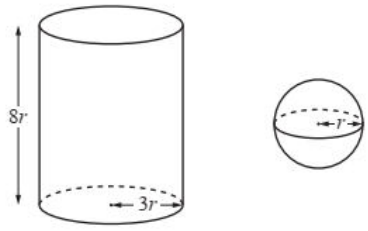
Calculate the mass of the cone. [1]

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

Calculate the mass of the box. Give your answer in grams. [1]

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(b) The diagram shows a solid cylinder and a solid sphere.



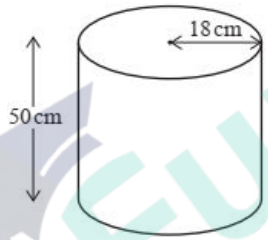
The cylinder has radius 3r and height 8r. The sphere has radius r.

(i) Find the volume of the sphere as a fraction of the volume of the cylinder.
Give your answer in its lowest terms. [4]

(ii) The surface area of the sphere is 81π cm^2. Find the **curved** surface area of the cylinder. Give your answer in terms of π. [4]

0580/43/O/N/18 Q3)

13. (a) The diagram shows a cylindrical container used

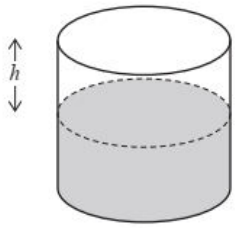


to serve coffee in a hotel.
The container has a height of 50cm and a radius of 18cm.

(i) Calculate the volume of the cylinder and show that it rounds to 50900cm^3, correct to 3 significant figures. [2]

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

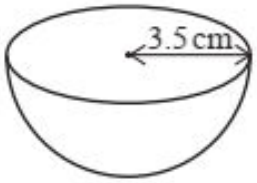
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Work out the height, h, of the empty space in the container [3]

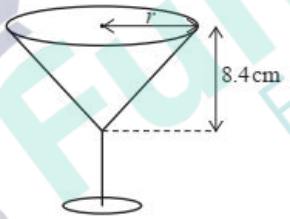
(iii) Cups in the shape of a hemisphere are filled with coffee from the container. The radius of a cup is 3.5cm.

Work out the maximum number of these cups



that can be completely filled from the 30 litres of coffee in the container. [4]

(b) The hotel also uses glasses in the shape of a cone. The capacity of each glass is $95cm^3$.



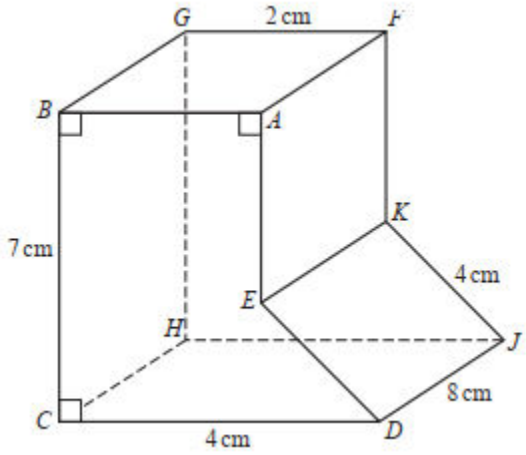
(i) Calculate the radius, r, and show that it rounds to 3.3 cm, correct to 1 decimal place. [3]

(ii) Calculate the curved surface area of the cone. [4]

0580/41/M/J/17 Q5)

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



(i) Calculate the area of the cross section ABCDE. [6]

(ii) The prism is of length 8cm. Calculate the volume of the prism. [1]

(b) A cylinder of length 13cm has volume 280cm^3.

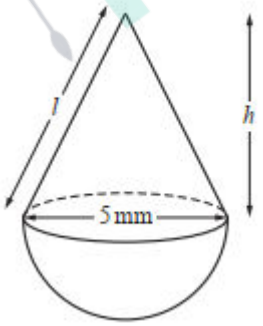
(i) Calculate the radius of the cylinder. [3]

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

Calculate the percentage of the volume of the box that is occupied by the cylinder. [3]

0580/43/M/J/17 Q4)

15. The diagram shows a solid made from a



hemisphere and a cone.

The base diameter of the cone and the diameter of

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the hemisphere are each 5mm.

(a) The total surface area of the solid is $\frac{115\pi}{4}$mm^2.

Show that the slant height, l, is 6.5 mm. [4]

(b) Calculate the height, h, of the cone. [3]

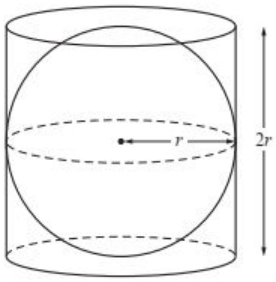
(c) Calculate the volume of the solid. [4]

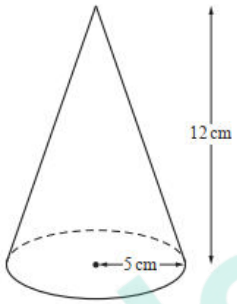
(d) The solid is made from gold. **1 cubic centimetre** of gold has a mass of 19.3grams.

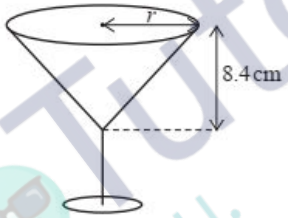
The value of 1gram of gold is $38.62 . Calculate the value of the gold used to make the solid. [3]

0580/41/O/N/17 Q8)

16. (a) A sphere of radius r is inside a closed cylinder of







radius r and height 2r.

(i) When r = 8cm, calculate the volume inside the cylinder which is **not** occupied by the sphere. [3]

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

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

(i) The total surface area is painted at a cost of $0.015 per cm^2.

Calculate the cost of painting the cone. [4]

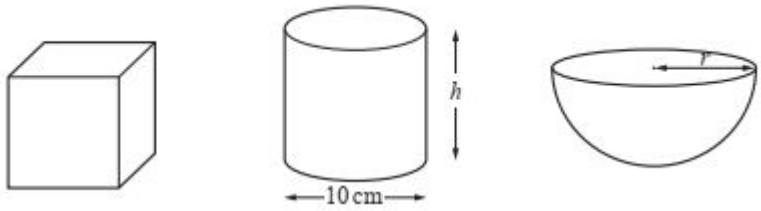
(ii) The cone is made of metal and is melted down and made into smaller solid cones with radius 1.25cm and perpendicular height 3cm.

Calculate the number of smaller cones that can be made. [3]

0580/42/O/N/17 Q2

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17. (a) The diagrams show a cube, a cylinder and a hemisphere.



The volume of each of these solids is 2000cm^3.

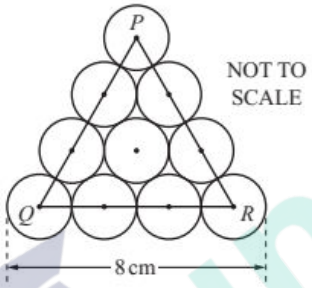
(i) Work out the height, h, of the cylinder [2]

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

(iii) Work out the surface area of the cube. [3]

0580/43/O/N/17 Q6

18. (a) The ten circles in the diagram each have radius 1cm.

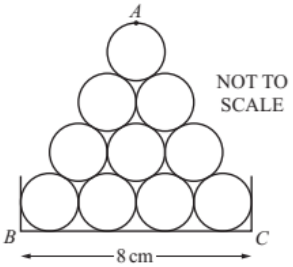


The centre of each circle is marked with a dot.

Calculate the height of triangle PQR [3]

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

(i) The diagram shows 10 pens stacked in a tray.

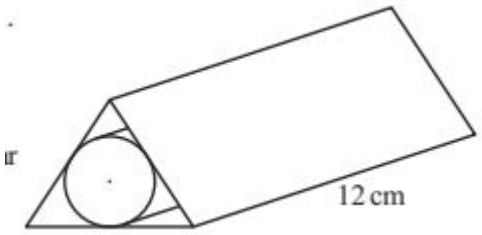


The tray is 8cm wide. The point A is the highest point in the stack.

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Find the height of A above the base, BC, of the tray.
[1]

(ii) The diagram shows a box that holds one pen.

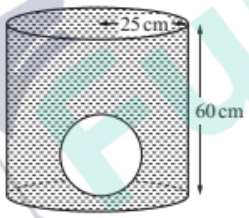


The box is a prism of length 12cm.
The cross section of the prism is an equilateral triangle.
The pen touches each of the three rectangular faces of the box. Calculate the volume of this box.
[5]

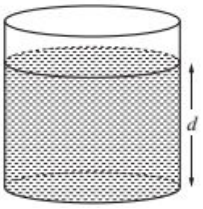
0580/42/F/M/16 Q10)

19. (a) Calculate the volume of a metal sphere of radius 15 cm and show that it rounds to 14140 cm^3, correct to 4 significant figures. [2]

(b) (i) The sphere is placed inside an empty



cylindrical tank of radius 25cm and height 60cm.



The tank is filled with water. Calculate the volume of water required to fill the tank [3]

(ii) The sphere is removed from the tank

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Calculate the depth, d, of water in the tank. [2]

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

(i) Calculate the radius of the cone. [3]

(ii) Calculate the **total** surface area of the cone. [4]

0580/41/M/J/16 Q4)

20. The diagram shows a cuboid



AD = 60cm, CD = 35cm and CG = 30cm.

(a) Write down the number of planes of symmetry of this cuboid. [1]

(b) (i) Work out the surface area of the cuboid. [3]

(ii) Write your answer to part (b)(i) in square metres. [1]

(c) Calculate

(i) the length AG, [4]

(ii) the angle between AG and the base ABCD. [3]

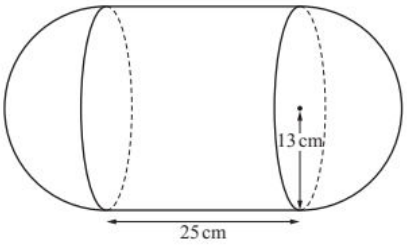
(d) (i) Show that the volume of the cuboid is $63000cm^3$. [1]

(ii) A cylinder of height 40cm has the same volume as the cuboid. Calculate the radius of the cylinder. [3]

0580/42/M/J/16 Q6)

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21. 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 25cm.

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

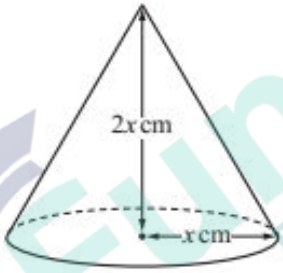
Calculate the mass of the solid.

Give your answer in kilograms. [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. [4]

(b) The cone in the diagram has radius x cm and



height $2x$cm.

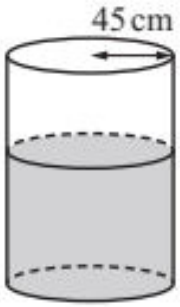
The volume of the cone is 500cm^3.

Find the value of x.

0580/41/O/N/16 Q3(a)

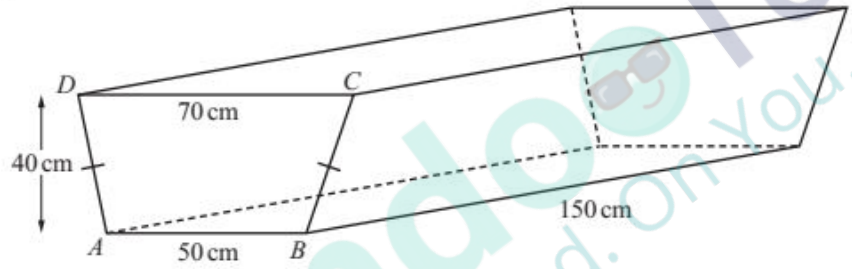
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22. (a) A cylindrical tank contains 180000cm^3 of water.



The radius of the tank is 45cm.
Calculate the height of water in the tank. [2]

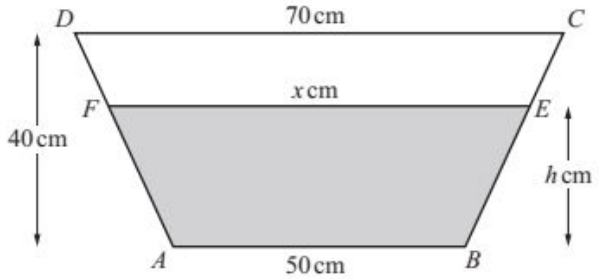
(b) The diagram shows an empty tank in the shape of a horizontal prism of length 150cm. The cross section of the prism is an isosceles trapezium ABCD. AB = 50cm, CD = 70cm and the vertical height of the trapezium is 40cm.



(i) Calculate the volume of the tank. [3]
(ii) Write your answer to **part (b)(i)** in litres. [1]

(c) The 180000cm^3 of water flows from the tank in **part (a)** into the tank in **part (b)** at a rate of 15cm^3/s. Calculate the time this takes. Give your answer in hours and minutes. [3]

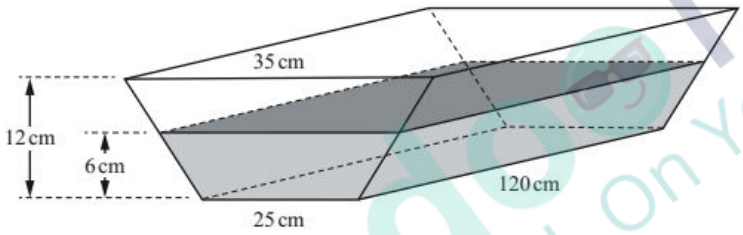
(d) The 180 000cm^3 of water reaches the level EF as shown above.



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EF = x cm and the height of the water is hcm.
(i) Using the properties of similar triangles, show that h = 2(x – 50). [2]
(ii) Using h = 2(x – 50), show that the shaded area, in cm^2, is x^2 – 2500. [1]
(iii) Find the value of x. [2]
(iv) Find the value of h. [1]
0580/43/M/J/15 Q8)

23. The diagram shows a horizontal water trough in the shape of a prism.



The cross section of this prism is a trapezium.
The trapezium has parallel sides of lengths 35cm and 25 cm and a perpendicular height of 12cm.
The length of the prism is 120cm.
(a) Calculate the volume of the trough.
(b) The trough contains water to a depth of 6cm.
(i) Show that the volume of water is 19800cm^3. [2]
(ii) Calculate the percentage of the trough that contains water. [1]
(c) The water is drained from the trough at a rate of 12 litres per hour. Calculate the time it takes to empty the trough. Give your answer in hours and minutes. [4]
(d) The water from the trough just fills a cylinder of radius r cm and height 3rcm. Calculate the value of

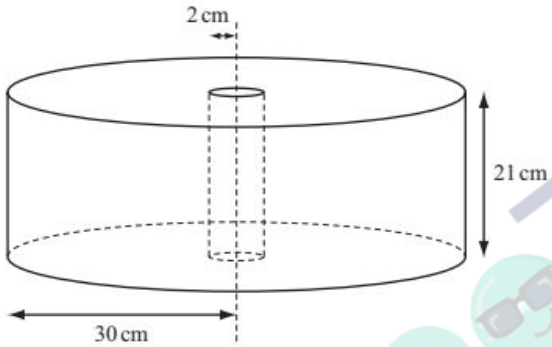
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r. [3]

(e) The cylinder has a mass of 1.2kg. $1cm^3$ of water has a mass of 1g. Calculate the total mass of the cylinder and the water. Give your answer in kilograms. [2]

0580/43/O/N/15 Q3)

24. Paper is sold in cylindrical rolls.



There is a wooden cylinder of radius 2cm and height 21cm in the centre of each roll.

The outer radius of a roll of paper is 30cm.

(i) Calculate the volume of paper in a roll [3]

(ii) The paper is cut into sheets which measure 21cm by 29.7cm. The thickness of each sheet is 0.125mm.

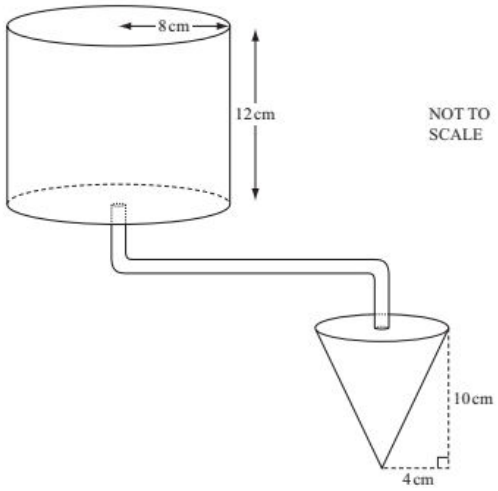
(a) Change 0.125 millimetres into centimetres. [1]

(b) Work out how many whole sheets of paper can be cut from a roll. [4]

0580/41/M/J/14 Q3)

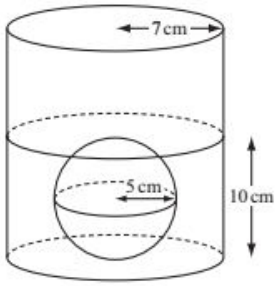
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25. The diagram shows a cylinder with radius 8cm and height 12cm which is full of water.
A pipe connects the cylinder to a cone.
The cone has radius 4cm and height 10cm.



(a) (i) Calculate the volume of water in the cylinder.
Show that it rounds to 2410cm^3 correct to 3 significant figures. [2]
(ii) Change 2410cm^3 into litres [1]
(b) Water flows from the cylinder along the pipe into the cone at a rate of 2cm^3 per second.
Calculate the time taken to fill the empty cone.
Give your answer in minutes and seconds correct to the nearest second. [4]
(c) Find the number of empty cones which can be filled completely from the full cylinder. [3]
0580/42/M/J/14 Q5)

26. A solid sphere of radius 5cm is placed inside a cylinder of radius 7cm.



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A liquid is poured into the cylinder to a depth of 10 cm, as shown in the diagram.

(a) Calculate the volume of liquid in the cylinder and show that it rounds to 1016cm^3, correct to the nearest cubic centimetre. [3]

(b) The sphere is made of metal and 1cm^3 of the metal has a mass of 7.85g

1 cm^3 of the liquid has a mass of 0.85g.

The mass of the cylinder is 1.14 **kilograms**.

Calculate the total mass of the cylinder, the sphere and the liquid.

Give your answer in kilograms. [4]

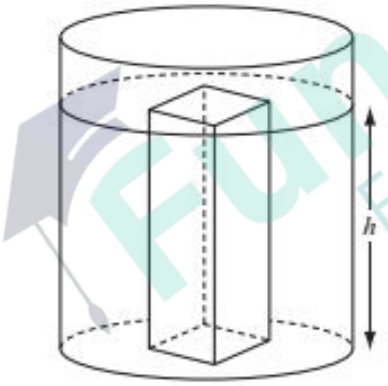
(c) The sphere is removed from the cylinder.

Calculate the new depth of the liquid in the cylinder. [3]

(d) The sphere is melted down and all the metal is used to make a cuboid with a square base of side 6.5cm.

(i) Calculate the height, h, of the cuboid. [2]

(ii) The cuboid is placed inside the cylinder.



More liquid is poured into the cylinder until the liquid just reaches the top of the cuboid.

Calculate the volume of liquid that must be added to the liquid already in the cylinder. [3]

0580/47/M/J/14 Q4)

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Answers

1) (a) 2.64 (b) 953	14) (a)(i) 17.5 (a)(ii) 140 (b)(i) 2.62 (b)(ii) 10.2
2) (a) 4.73 (b) 946 (c) 1.28	15) (b) 6 (c) 72[.0] (d) 53.7
3) (a) 10 (b) 6.20 (c) 7.82 (d)6.67	16)) (a)(i) 1070 (a)(ii) 2.58 (b)(i) 4.24 (b)(ii) 64
4) (a)(i) 18[.0] (ii) 447 (b) 4 [hours] 30 [mins]	17) (a) (i) 25.5 (ii) 9.85 (iii) 952
5) (a)(ii) 3.06 (b)(i) 44[.0] (b)(ii)(b)95	18) (a) 5.2[0] (b) (i) 7.2[0] (ii) 62.4
6) (a)(i) 955 (ii) 812 (b)(ii) 15.7(iii) 394 or 395 (d) 51.3	19) (a) 14 137 (b) (i) 104 000 (ii) 52.8 (c) (i) 15.8 (ii) 3580
7) (a) (i) 1930 or 1940 (ii) 893 (b) 2.71	20) (a)3 (b) (i) 9900 (ii) 0.99 (c) (i) 75.7 (ii) 23.4 (d) (d) (i) 30 × 35 × 60 (ii) 22.4
8) (a) 4.79 (b)8.7[0]	21) (a) (i) 51.7 (ii) 1.96 (b) 6.2[0]
9) (a)204 (b) 5.2 and 6	22) (a) 28.3 (b) (i) 360 000 (ii) 360 (c) 3 h 20 min (d) (i) $\frac{h}{40} = \frac{\frac{1}{2}(x-50)}{10}$(ii) $\frac{1}{2}(x+50)2(x-50)$(iii) 60.8 (iv) 21.7
10) (a)(ii) 38.1 (b) 358	23) (a) 43 200 (b) (i) 0.5 × (25 + 30) × 6 ×120 [= 19 800] (ii) 45.8 (c) 1 hr 39 min (d) 12.8 (e) 21[.0]
11) (a)(ii) 16.4 (iii) 28.3 (b)(i) 3770 (ii) 3.68	24) (d)(i) 59100 (ii) (a) 0.0125 (b) 7580
12) (a)(i) 427 (ii) 1010 (iii) 804 (iv) 396 (b)(i)1/54 (ii) 972π	25) (a) (i) 2412 to 2413 (ii) 2.41[0] (b) 1 min 24 s (c) 14
13) (a)(ii)20.5 (iii) 334 (b)(ii) 93.1 to 93.6	26) (a) 1015.7 to 1015.9 (b) 6.11 or 6.12 (c) 6.6[0] (d) (i) 12.4 (ii) 366 to 370

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