IGCSE EXTENDED MATHEMATICS (0580)

TOPICAL PAST PAPER QUESTIONS - 2016/2017

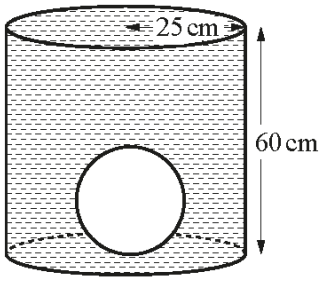
MENSURATION (Paper 4)

1. (0580-S 2016-Paper 4/1-Q4)

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

[2]

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

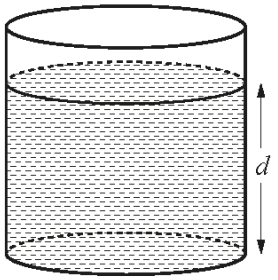


NOT TO SCALE

Calculate the volume of water required to fill the tank.

..... cm^3 [3]

(ii) The sphere is removed from the tank.



NOT TO SCALE

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

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

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

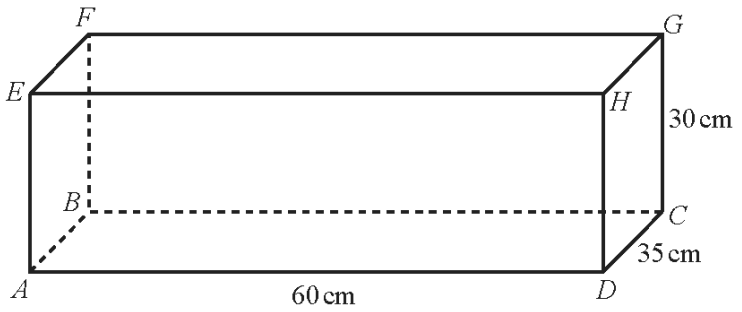
..... cm [3]

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

..... cm^2 [4]

2. (0580-S 2016-Paper 4/2-Q6)

The diagram shows a cuboid.



NOT TO SCALE

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

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

..... [1]

(b) **(i)** Work out the surface area of the cuboid.

..... cm^2 [3]

(ii) Write your answer to **part (b)(i)** in square metres.

..... m^2 [1]

(c) Calculate

(i) the length AG,

$AG =$ ..... cm [4]

(ii) the angle between AG and the base $ABCD$.

..... [3]

(d) **(i)** Show that the volume of the cuboid is $63\,000\,\text{cm}^3$.

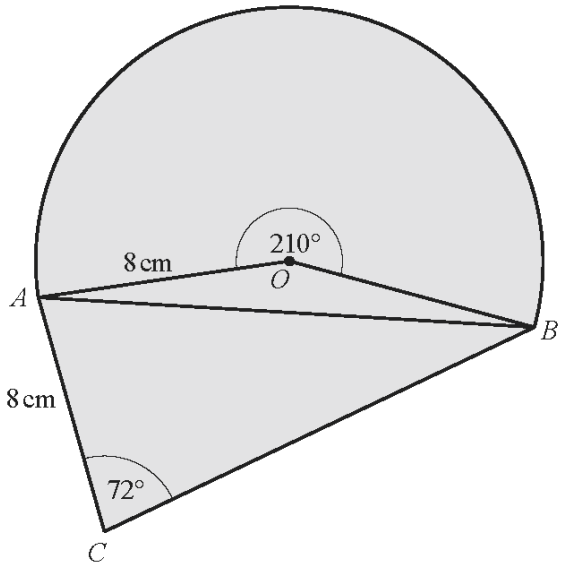
[1]

(ii) A cylinder of height 40 cm has the same volume as the cuboid.

Calculate the radius of the cylinder.

..... cm [3]

3. (0580-S 2016-Paper 4/2-Q7)



NOT TO SCALE

The diagram shows a design for a logo made from a sector and two triangles.
The sector, centre O, has radius 8 cm and sector angle 210°.
AC = 8 cm and angle ACB = 72°.

(a) Show that angle OAB = 15°.

[2]

(b) Calculate the length of the straight line AB.

AB = ... cm [4]

(c) Calculate angle ABC.

Angle ABC = ... [3]

(d) Calculate the total area of the logo design.

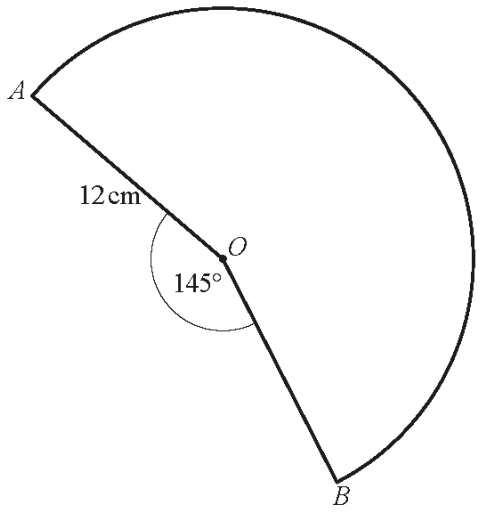
.....cm^2 [6]

(e) The logo design is an enlargement with scale factor 4 of the actual logo.

Calculate the area of the actual logo.

.....cm^2 [2]

4. (0580-S 2016-Paper 4/3-Q9)



NOT TO SCALE

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

(a) Calculate the area of the sector.

..... cm^2 [3]

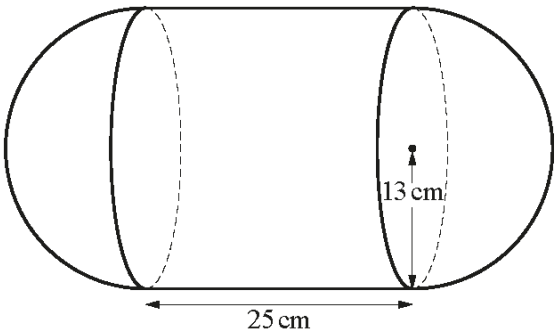
(b) The sector is made into a cone by joining OA to OB.

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

..... cm^3 [6]

5. (0580-W 2016-Paper 4/1-Q3)

(a)



NOT TO SCALE

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

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

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

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

..... kg [4]

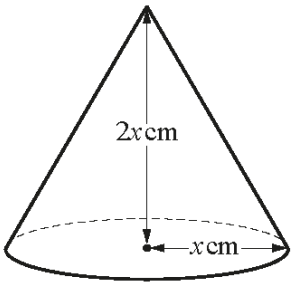
(ii) The surface of the solid is painted at a cost of \$4.70 per square metre.

Calculate the cost of painting the solid.

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

\$..... [4]

(b)



NOT TO SCALE

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

Find the value of x.

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

x = ... [3]

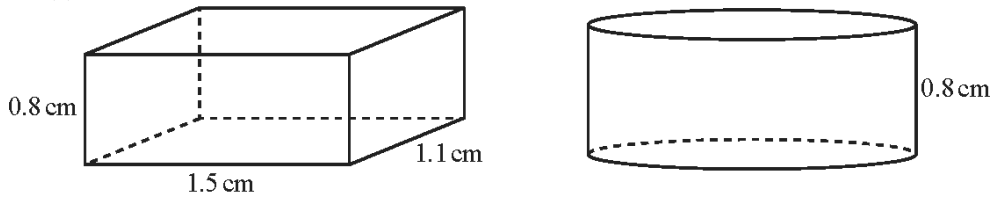
(c) Two mathematically similar solids have volumes of 180 cm^3 and 360 cm^3.
The surface area of the smaller solid is 180 cm^2.

Calculate the surface area of the larger solid.

..... cm^2 [3]

6. (0580-W 2016-Paper 4/2-Q6)

(a)



NOT TO SCALE

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

(i) Calculate the volume of the cuboid.

.....cm^3 [2]

(ii) Calculate the radius of the cylinder.

..... cm [2]

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

.....cm^2 [5]

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

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

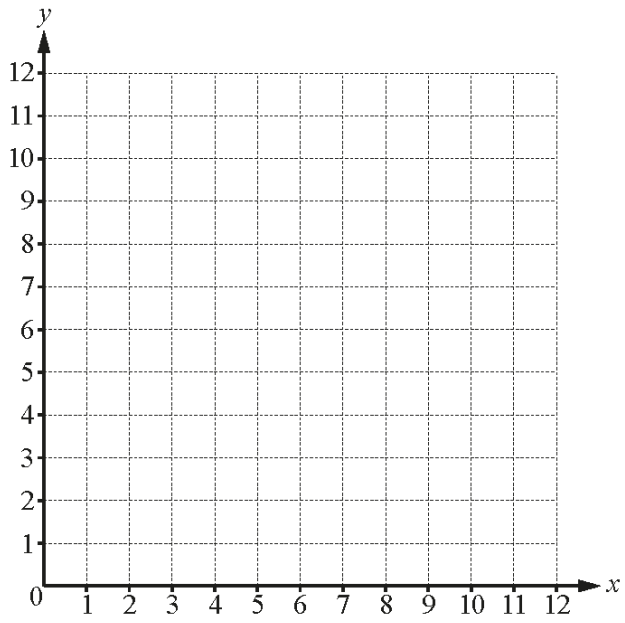
(i) One of the inequalities that shows this information is $2x + 3y < 24$.

Write down the other two inequalities.

.....

..... [2]

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



[4]

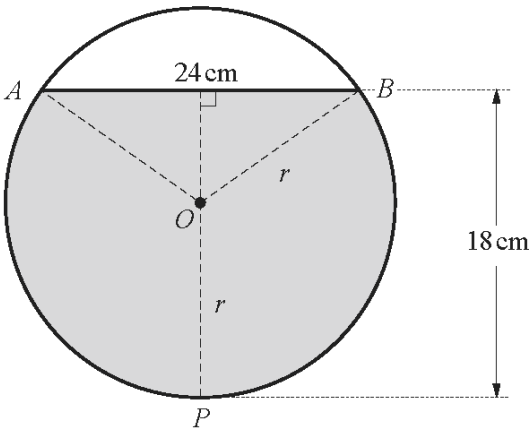
(iii) Find the lowest cost of a bag of sweets.
Write down the value of x and the value of y that give this cost.

Lowest cost = ... cents

x = ...

y = ... [3]

7. (0580-W 2016-Paper 4/3-Q8)



NOT TO SCALE

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

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

[4]

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

[2]

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

.....cm^2 [3]

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

.....cm^2 [3]

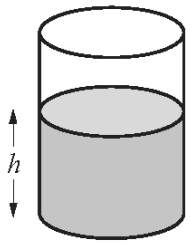
(iii) The length of the cylinder is 40 cm.

Calculate the volume of water in the cylinder.

.....cm^3 [1]

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

Find h.

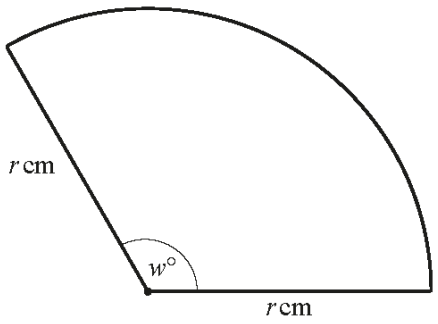


NOT TO SCALE

h = ... cm [2]

8. (0580-W 2016-Paper 4/1-Q10)

(a)



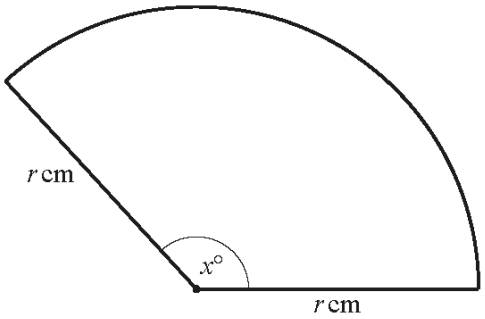
NOT TO SCALE

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

Find the value of w.

w = ... [3]

(b)



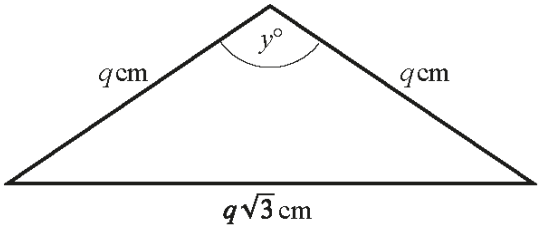
NOT TO SCALE

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

Find the value of x.

x = ... [3]

(c)



NOT TO SCALE

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

Find the value of y.

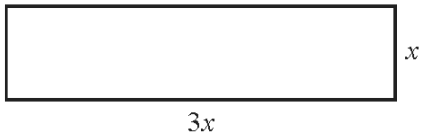
y = ... [4]

9. (0580-W 2016-Paper 4/2-Q10)

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

Find x in each part.

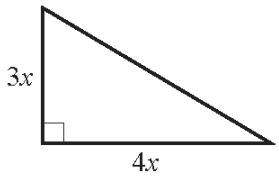
(a) Rectangle



NOT TO SCALE

x = ... cm [2]

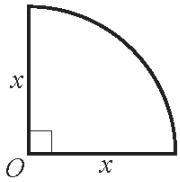
(b) Triangle



NOT TO SCALE

x = ... cm [3]

(c) Sector

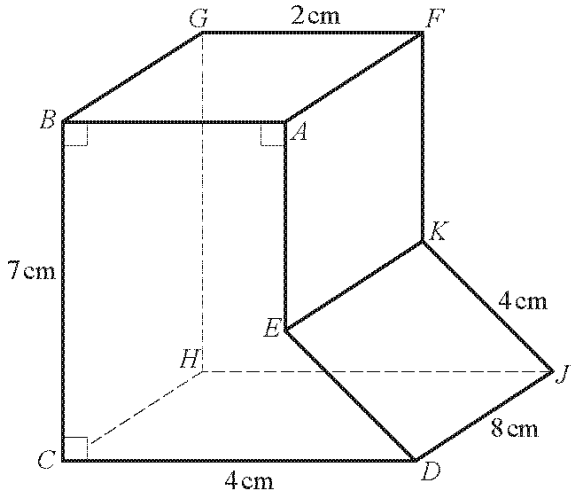


NOT TO SCALE

x = ... cm [3]

10. (0580-S 2017-Paper 4/3-Q4)

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



NOT TO SCALE

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

.....cm^2 [6]

(ii) The prism is of length 8 cm.

Calculate the volume of the prism.

.....cm^3 [1]

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

(i) Calculate the radius of the cylinder.

..... cm [3]

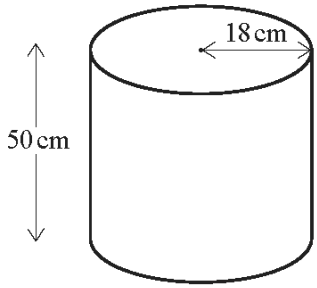
(ii) The cylinder is placed in a box that is a cube of side 14 cm.

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

.....% [3]

11. (0580-S 2017-Paper 4/1-Q5)

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



NOT TO SCALE

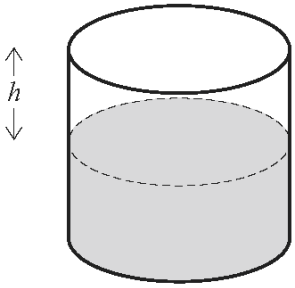
The container has a height of 50 cm and a radius of 18 cm.

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

[2]

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

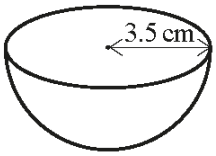
Work out the height, h, of the empty space in the container.



NOT TO SCALE

h = ... cm [3]

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



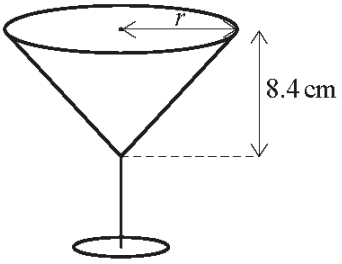
NOT TO SCALE

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

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

..... [4]

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



NOT TO SCALE

The capacity of each glass is 95 cm^3.

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

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

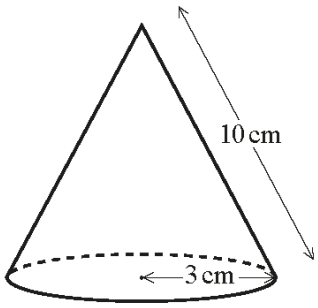
[3]

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

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

..... cm^2 [4]

12. (0580-S 2017-Paper 4/2-Q5)



NOT TO SCALE

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

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

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

..... cm^2 [2]

(ii) Calculate the perpendicular height of the cone.

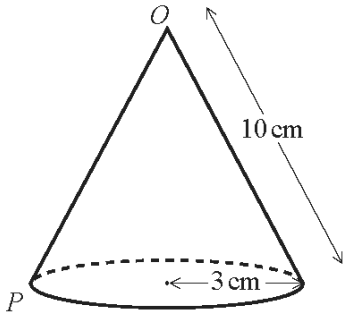
..... cm [3]

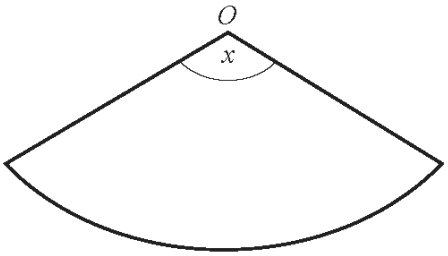
(iii) Calculate the volume of the cone.

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

..... cm^3 [2]

(b)





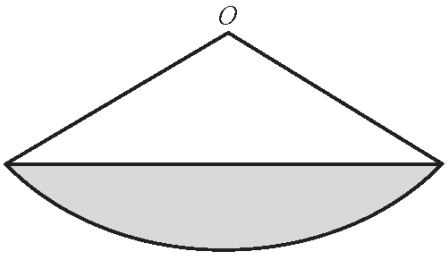
NOT TO SCALE

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

Calculate the sector angle x.

$x =$ ..... [4]

(c)



NOT TO SCALE

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

Calculate the area of the shaded segment.

..... cm^2 [4]