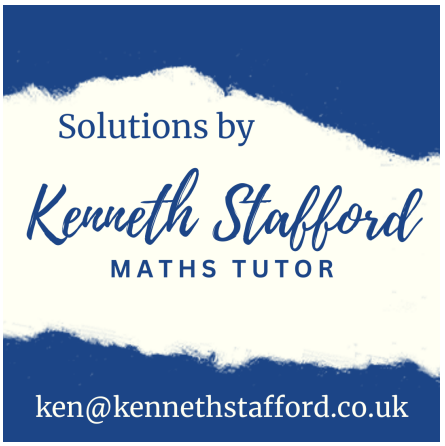
Name: SOLUTIONS

GCSE (1 - 9)

Buy me a coffee

Spheres, Cones and Cylinders

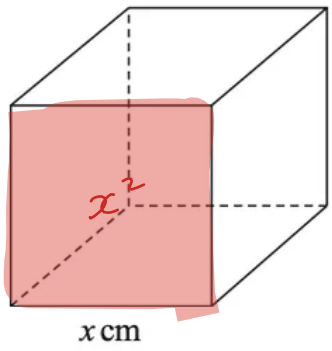


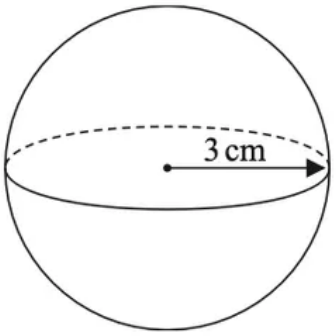
These questions are compiled from *released* Pearson Edexcel GCSE maths exam papers
They contain exam questions from up until the ***November 2021*** exam series
More recent exam papers do exist but are withheld for mock exams
As new exam papers are released these worksheets will gradually be updated
The ***most current*** version of these worksheets will always be available at: kennethstafford.co.uk
These worksheets were made using examq.co.uk

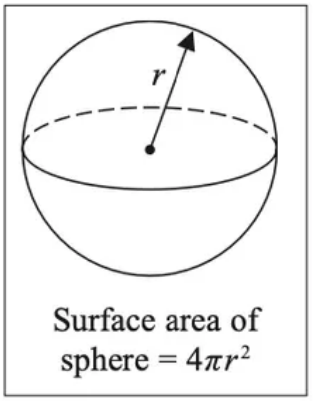
Question	Where the question appeared
1	Edexcel, GCSE, Autumn 2021, Paper 1H, Q7
2	Edexcel, GCSE, Autumn 2020, Paper 2H, Q18
3	Edexcel, GCSE, Autumn 2019, Paper 3H, Q13
4	Edexcel, GCSE, Autumn 2019, Paper 3H, Q23
5	Edexcel, GCSE, Summer 2019, Paper 1H, Q15
6	Edexcel, GCSE, Summer 2019, Paper 3H, Q6
7	Edexcel, GCSE, Autumn 2018, Paper 2H, Q20
8	Edexcel, GCSE, Summer 2018, Paper 2H, Q19
9	Edexcel, GCSE, Summer 2017, Paper 1H, Q15

1

The diagram shows a cube with edges of length x cm and a sphere of radius 3 cm.







The surface area of the cube is equal to the surface area of the sphere.

Show that $x = \sqrt{k\pi}$ where k is an integer.

Surface area of cube $= x^2 \times 6 = 6x^2$

Surface area of sphere $= 4 \times \pi \times 3^2 = 4 \times \pi \times 9 = 36\pi$

$6x^2 = 36\pi$

$x^2 = 6\pi$

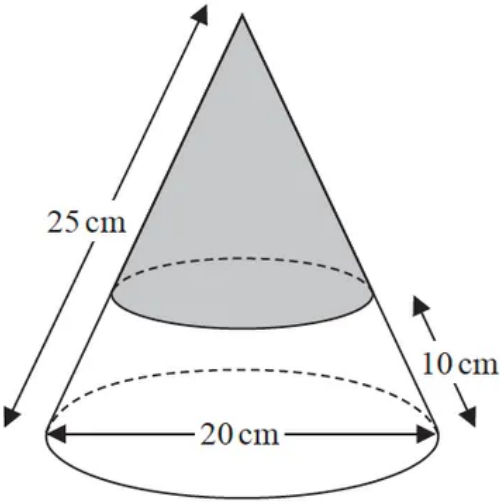
$x = \sqrt{6\pi}$

(Total for Question 7 is 4 marks)

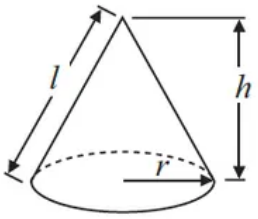
[Edexcel, GCSE, Autumn 2021, Paper 1H, Q7]

2

The diagram represents a solid cone.



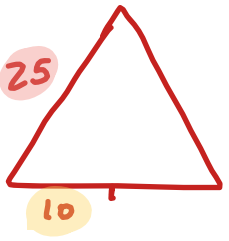
Curved surface area of cone = πrl



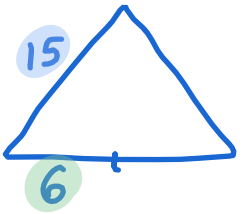
The cone has a base diameter of 20 cm and a slant height of 25 cm.

A circle is drawn around the surface of the cone at a slant height of 10 cm above the base.
The curved surface of the cone above the circle is painted grey.

Work out the area of the curved surface of the cone that is **not** painted grey.
Give your answer as a multiple of π
You must show all your working.



Curved surface area = $\pi \times 10 \times 25 = 250\pi$



Radius of smaller cone = $10 \times \frac{15}{25} = 6$

Curved surface area of smaller cone = $\pi \times 15 \times 6 = 90\pi$

$250\pi - 90\pi = 160\pi$

..... cm^2

(Total for Question 18 is 4 marks)

[Edexcel, GCSE, Autumn 2020, Paper 2H, Q18]

3

Liquid A and liquid B are mixed together in the ratio 2 : 13 by volume to make liquid C.

Liquid A has density 1.21 g/cm³
Liquid B has density 1.02 g/cm³

$2+13=15$

A cylindrical container is filled completely with liquid C.
The cylinder has radius 3 cm and height 25 cm.

Work out the mass of the liquid in the container.
Give your answer correct to 3 significant figures.
You must show all your working.

Vol. of cylinder $= \pi r^2 h = \pi \times 3^2 \times 25 = 225\pi$

$225\pi \div 15 = 15\pi$

Liquid A $= 15\pi \times 2 \times 1.21 = 114.04\text{g}$

Liquid B $= 15\pi \times 13 \times 1.02 = 624.86\text{g}$

accepted:
[738.5 – 739]

Mass of liquid $= 114.04 + 624.86 = 739$

..... g

(Total for Question 13 is 4 marks)

[Edexcel, GCSE, Autumn 2019, Paper 3H, Q13]

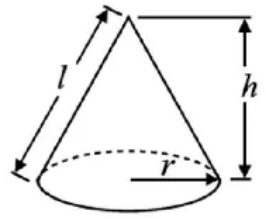
4

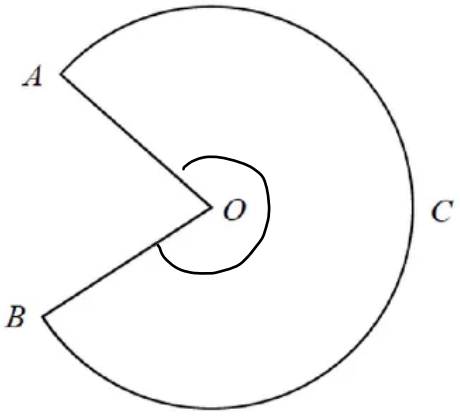
The diagram shows a sector $OACB$ of a circle with centre O.
The point C is the midpoint of the arc AB.

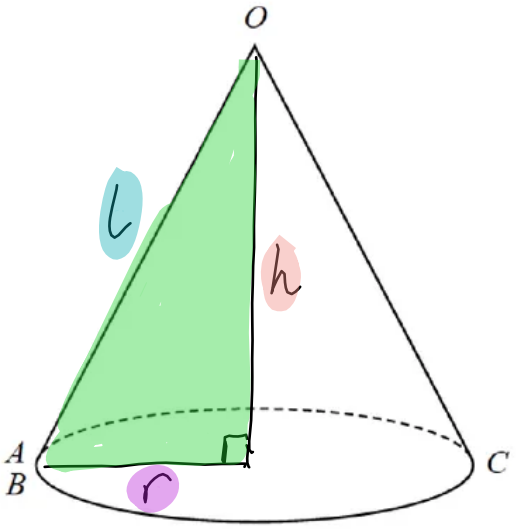
The diagram also shows a hollow cone with vertex O.
The cone is formed by joining OA and OB.

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

Curved surface area of cone $= \pi r l$







The cone has volume 56.8 cm³ and height 3.6 cm.

Calculate the size of angle AOB of sector $OACB$.
Give your answer correct to 3 significant figures.
You must show all your working.

Volume of cone $= \frac{1}{3}\pi r^2 h = 56.8$

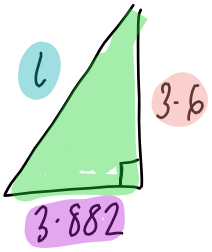
$\frac{1}{3} \times \pi \times r^2 \times 3.6 = 56.8$

$1.2\pi r^2 = 56.8$

$r^2 = \frac{56.8}{1.2\pi}$

$r = \sqrt{\frac{56.8}{1.2\pi}}$

$r = 3.882$



$l^2 = 3.6^2 + 3.882^2$

$l^2 = 28.03$

$l = 5.29$

Curved surface area $= \pi \times 3.882 \times 5.29$

$= 64.5678$

Area of circle $= \pi \times 3.882^2 = 47.34$

$\frac{47.34}{64.5678} \times 360° = 263.96$

264 °

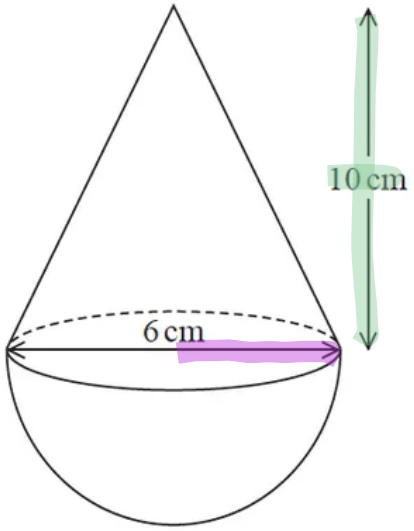
[263.9 to 264.1]

(Total for Question 23 is 5 marks)

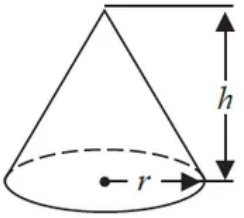
[Edexcel, GCSE, Autumn 2019, Paper 3H, Q23]

5

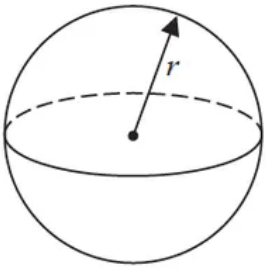
The diagram shows a solid shape.
The shape is a cone on top of a hemisphere.



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



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



The height of the cone is 10 cm.
The base of the cone has a diameter of 6 cm.
The hemisphere has a diameter of 6 cm.

The total volume of the shape is $k\pi$ cm^3, where k is an integer.

Work out the value of k.

Volume of cone $= \frac{1}{3} \times \pi \times 3^2 \times 10 = 30\pi$

Volume of sphere $= \frac{4}{3} \times \pi \times 3^3 = 36\pi$

Volume of hemisphere $= 36\pi \div 2 = 18\pi$

$30\pi + 18\pi = 48\pi$

$k =$ 48

(Total for Question 15 is 4 marks)

[Edexcel, GCSE, Summer 2019, Paper 1H, Q15]

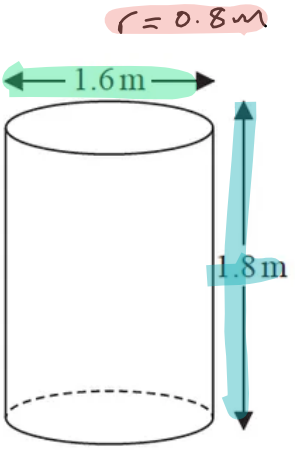
6

Jeremy has to cover 3 tanks completely with paint.

Each tank is in the shape of a cylinder with a top and a bottom.
The tank has a diameter of 1.6 m and a height of 1.8 m.

Jeremy has 7 tins of paint.
Each tin of paint covers $5\,m^2$

Has Jeremy got enough paint to cover completely the 3 tanks?
You must show how you get your answer.



Surface area of tank = 9.047 + 2.01 + 2.01
= 13.07 m^2

area of circle = $\pi \times 0.8^2 = 2.01$

circumference = $\pi \times 1.6 = 5.02$

Curved surface area = 1.8×5.02
= 9.047

area of 3 tanks = $13.07 \times 3 = 39.2\,m^2$

Paint = $7 \times 5 = 35\,m^2$

No he doesn't

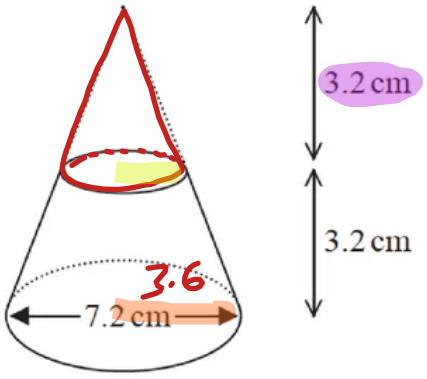
$35\,m^2 < 39.2\,m^2$

(Total for Question 6 is 5 marks)

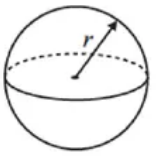
[Edexcel, GCSE, Summer 2019, Paper 3H, Q6]

7 Here is a frustum of a cone.

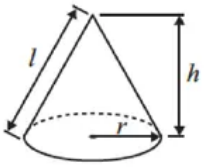
7.2 ÷ 2 = 3.6
3.6 ÷ 2 = 1.8



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

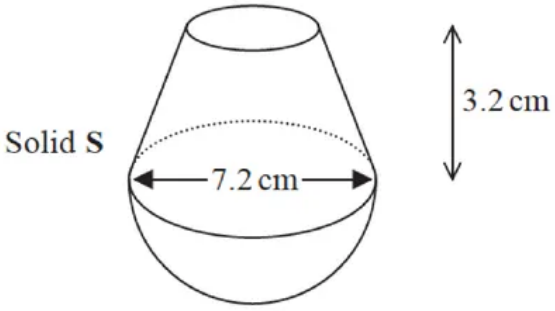


Volume of cone $= \frac{1}{3}\pi r^2 h$



The diagram shows that the frustum is made by removing a cone with height 3.2 cm from a solid cone with height 6.4 cm and base diameter 7.2 cm.

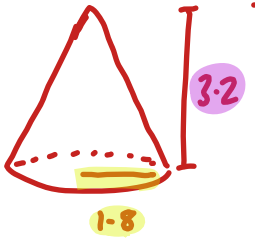
The frustum is joined to a solid hemisphere of diameter 7.2 cm to form the solid **S** shown below.



The density of the frustum is 2.4 g/cm³
The density of the hemisphere is 4.8 g/cm³

Calculate the average density of solid **S**.

Small Cone $= \frac{1}{3} \times \pi \times 1.8^2 \times 3.2$
$= 10.857$



Large cone $= \frac{1}{3} \times \pi \times 7.2 \times 3.6$
$= 86.858$

Volume of frustum $= 86.858 - 10.857 = 76.001$

mass $= 76.01 \times 2.4 = 182.404$ g

Volume of hemisphere $= \frac{\frac{4}{3} \times \pi \times 3.6^3}{2}$
$= 97.716$

mass $= 97.716 \times 4.8 = 469.037$

TOTAL MASS $= 469.037 + 182.404 = 651.44$

TOTAL VOLUME $= 97.716 + 76.001 = 173.72$

density $= \frac{651.44}{173.72}$

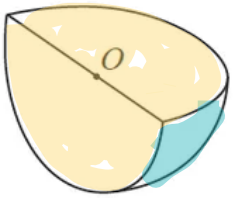
$= 3.75$ g/cm³

(Total for Question 20 is 5 marks)

[Edexcel, GCSE, Autumn 2018, Paper 2H, Q20]

8

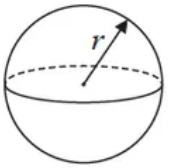
Shape **S** is one quarter of a solid sphere, centre O.



Shape **S**

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

Surface area of sphere $= 4\pi r^2$



The volume of **S** is 576π cm^3

Find the surface area of **S**.
Give your answer correct to 3 significant figures.
You must show your working.

$\frac{1}{4} \times \frac{4}{3} \times \pi \times r^3 = 576\pi$

$\frac{1}{3}\pi r^3 = 576\pi$

$\frac{1}{3} r^3 = 576$

$r^3 = 1728$

$r = 12$

Surface area =

$\frac{4\pi r^2}{4} = \pi r^2 = 144\pi$

Surface area =

$\pi r^2 = 144\pi$

$144\pi + 144\pi = 288\pi = 905$

..... cm^2

(Total for Question 19 is 5 marks)

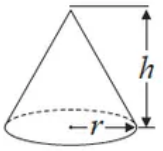
[Edexcel, GCSE, Summer 2018, Paper 2H, Q19]

9

A cone has a volume of 98 cm³.
The radius of the cone is 5.13 cm.

(a) Work out an estimate for the height of the cone.

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



$\frac{1}{3}\pi r^2 h$ = volume

$\frac{1}{3} \times 3 \times 5^2 \times h = 100$

$25h = 100$

$h = \frac{100}{25}$

$h = 4$

4

[3·5 to 4·5] cm (3)

John uses a calculator to work out the height of the cone to 2 decimal places.

(b) Will your estimate be more than John's answer or less than John's answer?
Give reasons for your answer.

More as we rounded the volume up and the radius and pi down.

(1)

(Total for Question 15 is 4 marks)

[Edexcel, GCSE, Summer 2017, Paper 1H, Q15]