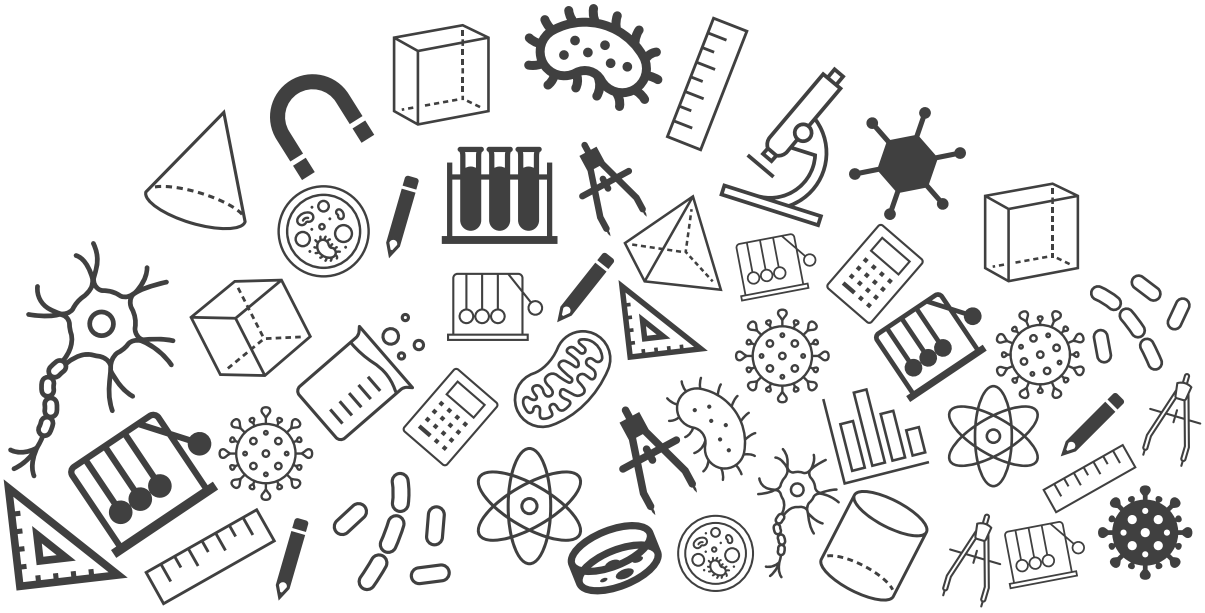
Grade 09: Maths
Exam Important Questions



Topic : Exam Important Questions

1. The surface areas of two spheres are in the ratio 1 : 4. Find the ratio of their volumes.
[2 Marks]

Sol:
Given that surface areas of two spheres are in the ratio 1:4.

$\frac{4}{3}\pi r^2 : \frac{4}{3}\pi R^2$ = 1 : 4

r : R = 1 : 2.
(1 Mark)

Now ratio of volumes of two spheres = $\frac{4}{3}\pi r^3 : \frac{4}{3}\pi R^3$

$r^3 : R^3 = 1^3 : 2^3$ = 1:8
(1 Mark)

2. Find the surface area of a hemisphere whose radius is 4 cm?
(2 marks)

Given:

Radius, r = 4 cm

The curved surface area = $2\pi r^2$ square units.

The total surface area = $3\pi r^2$ square units

Substitute the value of r in the formula.

(i) CSA of the hemisphere= 2 × 3.14 × 4 × 4

CSA = 3.14 × 32

CSA = 100.48 cm^2

(1 Mark)

(ii) TSA of the hemisphere = 3 × 3.14 × 4 × 4
TSA = 3.14 × 48
TSA = 150.72 cm^2
(1 Mark)

3. Find the length of cloth used in making a conical pandal of height 100 m and base radius 240 m, if the cloth is 100πm wide.
[3 marks]

Height of conical pandal (h)=100 m

Base radius (r)=240 m

$\therefore$ $Slant\ height\ (l) = \sqrt{r^2 + h^2}$
$= \sqrt{(240)^2 + (100)^2} = \sqrt{57600 + 10000}$
$= \sqrt{67600} = 260\ m$
$(1\ mark)$
$Now\ area\ of\ curved\ surface = \pi rl$
$= \pi \times 240 \times 260\ m^2 = 62400\ \pi\ m^2$
$(1\ mark)$
$Width\ of\ canvas\ cloth = 100\ \pi\ m$
$\therefore$ $Length\ of\ cloth = \frac{Area}{Width} = \frac{62400\ \pi}{100\ \pi}$
$= 624\ m$
$(1\ mark)$

4. Find the weight of a solid cone whose base is of diameter 14 cm and vertical height 51 cm,supposing the material of which it is made weighs 10 grams per cubic cm. (3 marks)

Diameter of the base of solid cone=14 cm

and vertical height (h)=51 cm

$\therefore$ $Radius\ (r) = \frac{14}{2} = 7\ cm (0.5\ \ marks)$ (1 mark)
$Volume = \frac{1}{3}\pi r^2 h$
$= \frac{1}{3} \times \frac{22}{7} \times 7 \times 7 \times 51\ cm^2 = 2618\ cm^3 (1\ \ mark)$
$Weight\ of\ 1\ cm^3 = 10\ grams (0.5\ \ mark)$
$Then\ total\ weight = 2618 \times 10\ gm$
$= \frac{26180}{1000} kg = 26.18\ kg$

5. The outer diameter of a spherical shell is 12 cm and its inner diameter is 8 cm,Find the volume of metal contained in the shell. Also find its outer surface area. [3 marks]

Solution:

Outer diameter of the spherical shell = 12 cm

Hence, radius = 6 cm

Inner diameter of spherical shell = 8 cm

Hence, radius = 4 cm

Now, Volume of the outer shell = $\frac{4}{3}\pi r^3$ = $\frac{4}{3}\times\frac{22}{7}\times 6\times 6\times 6$ = 905.15 cm^3 [1 mark]

And, Volume of the inner shell = $\frac{4}{3}\pi r^3$ = $\frac{4}{3}\times\frac{22}{7}\times 4\times 4\times 4$ = 268.20 cm^3 [1 mark]

Volume of metal contained in the shell = (Volume of outer) – (Volume of inner) = (905.15) -(268.20) cm^3 = 636.95 cm^3

∴ Outer Surface area = $4\pi r^2$ = $4\times\frac{22}{7}\times 6\times 6$ = 452.57 cm^3
[1 mark]

6. A cylindrical tub of radius 12 cm contains water to a depth of 20 cm. A spherical iron ball is dropped into the tub and thus the level fo water is raised by 6.75 cm.What is the radius of the ball ?
(2 marks)

Given the radius of the cylinder, r = 12 cm
It is also given that a spherical iron ball is dropped into the cylinder and the water level is raised by 6.75 cm

Hence volume of water displaced = volume of the iron ball
Height of the raised water level, h = 6.75 m

Volume of water displaced = πr^2h
= π $\times$ 12 $\times$ 12 $\times$ 6.75 cm^3
⇒ Volume of iron ball = π $\times$ 12$\times$ 12 $\times$6.75 cm^3 → (1)

But, volume of iron ball = $\frac{4}{3}\pi r^3$ ---(2)
(1 mark)

From (1) and (2) we get

$\frac{4}{3}\pi r^3$ = $\pi \times 12 \times 12 \times 6.75$

$r^3 = \pi \times 12 \times 12 \times 6.75 \times \frac{3}{4}$

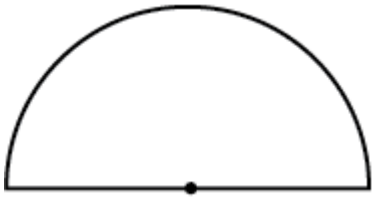
r^3 = 729

$r^3 = 3^3$

r = 9

Thus the radius of the iron ball is 9 cm
(1 mark)

7. A hemi- spherical dome of a building needs to be painted. If the circumference of the base of the dome is 17.6 m, find the cost of painting it, given the cost of painting is Rs. 5 per $100cm^2$.
(2 marks)



circumference of the base of dome (r)
$= 17.6m$
$\therefore Radius = \frac{c}{2\pi} = \frac{17.6 \times 7}{2 \times 22} = 2.8m$
$\therefore Surface\ area = 2\pi r^2$
$= 2 \times \frac{22}{7} \times (2.8)^2 m^2$
$= \frac{44}{7} \times 2.8 \times 2.8m^2 = 49.28m^2$
(1 mark)

Rate of painting the surface
$= Rs.\ 5\ per\ 100\ cm^2$
$\therefore Total\ cost = \frac{49.28 \times 5 \times 10000}{100}$
$= Rs.\ 24640$
(1 mark)

8. The dimensions of a room are $(9\ \text{m} \times 8\ \text{m} \times 6.5\ \text{m})$.It has one door of dimensions ($2\ \text{m} \times 1.5\ \text{m}$) and two windows, each of dimensions $(1.5\ \text{m} \times 1\ \text{m}$). Find the cost of whitewashing the walls at Rs25 per square metre.
(3 Marks)

Length of room = 9 m
Breadth of room = 8 m
Height of room = 6.5 m

Total Surface Area of room = 2(lb + bh + hl) – lb [Floor is excluded]
= 2[9x8 + 8x6.5 + 6.5x9] – 9x8
= 293 sq m (1 Mark)

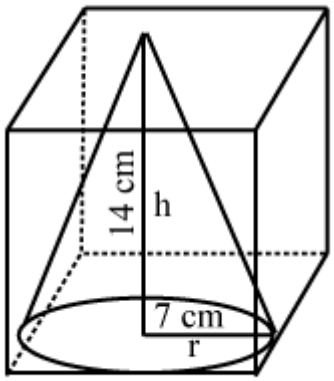
Area of one door = 2 x 1.5 = 3 sq m (0.5 Marks)
Area of 2 windows = 2 x 1.5 x 1 = 3 sq m
(0.5 Marks)
Area of walls to be white washed = 293 – 6 = 287 sq m
(0.5 Marks)
Cost of white washing the walls at Rs 25 per sq m = Rs 25 x 287
= Rs 7175 (0.5 Marks)

9. Find the volume of the largest right circular cone that can be fitted in a cube whose edge is 14 cm.
[2 marks]

Side of cube=14 cm

Radius of the largest cone that can be fitted in the cube (r)=
$\frac{Side}{2} = \frac{14}{2} cm = 7\ cm$
(0.5 mark)

Height (h)=14 cm



(0.5 mark)

$\therefore Volume = \frac{1}{3}\pi r^2 h = \frac{1}{3} \times \frac{22}{7} \times 7 \times 7 \times 14\ cm^3$
$= \frac{2156}{3} cm^3 = 718.67\ \ cm^3$
(1 mark)

10. A hollow spherical shell is made of a metal of density 4.5 g per cm^3.If its internal and external radii are 8 cm and 9 cm respectively, find the weight of the shell. [2 marks]

Solution:

Internal radius (r) = 8 cm

External radius (R) = 9 cm

Density of metal = 4.5 g per cm^3

$\therefore$ weight of the shell = $\frac{4}{3}\pi(R^3 - r^3) \times$ density

=$(\frac{4}{3}\pi(729-512) \times 4.5)$/1000 kg.

= $(\frac{4}{3}\pi \times (217) \times 4.5)$/1000 kg.

$\therefore$ weight of the shell = 4.092 kg.
[2 marks]

11. How many cubic centimetres of iron are there in an open box whose external dimensions are 36 cm, 25 cm and 16.5 cm, the iron being 1.5 cm thick throughout? If 1 cubic cm of iron weighs 15 g, find the weight of the empty box in kg.

(3 marks)

$\text{External length of open box (L)} = 36\ cm$

$\text{Breadth (B)} = 25\ cm$

$\text{and Height (H)} = 16.5\ cm$

$\text{Width of iron sheet used} = 1.5\ cm$

$\therefore\ \text{Inner length (l)} = 36 - 1.5 \times 2$

$= 36 - 3 = 33\ cm$

$\text{Breadth (b)} = 25 - 2 \times 1.5$

$= 25 - 3 = 22\ cm$

$\text{and Height (h)} = 16.5 - 1.5 = 15\ cm$

$\therefore\ \text{Volume of the iron used}$

$=$ Outer volume - Inner volume

(1 Mark)

$= 36 \times 25 \times 16.5 - 33 \times 22 \times 15$

$= 14850 - 10890 = 3960\ cm^3 \qquad (1 Mark)$

$\text{Weight of } 1\ cm^3 = 15\ g$

$\therefore\ \text{Total weight} = \frac{3960 \times 15}{1000} = \frac{59400}{1000} kg$

$= 59.4\ kg$

(1 Mark)

12. It is required to make a closed cylindrical tank of height 1 m and base diameter 140 cm from a metal sheet. How many square meters of the sheet is required for the same?
$\left[Assume\ \pi = \frac{22}{7}\right]$
(3 Marks)

Height (h) of the cylindrical tank = 1 m
Base radius (r) of cylindrical tank
$= \left(\frac{140}{2}\right) cm = 70\ cm = 0.7\ m$ $(1Mark)$

Area of sheet required = Total surface area of the tank $= 2\pi r(r+h)$
$\Rightarrow \left[2 \times \frac{22}{7} \times 0.7(0.7+1)\right] m^2$
$= (4.4 \times 1.7) m^2$
$= 7.48\ m^2$ $(2Marks)$

13. A river 3 m deep and 40 m wide is flowing at the rate of 2 km per hour. How much water will fall into the sea in a minute?
(3 marks)

$\text{Speed of water in a river } = 2\ km/hr$

$\therefore \text{ Length of flow of water in 1 minute}$

$= \frac{2 \times 1000}{60} = \frac{100}{3} m$
(0.5 Marks)

$\text{Breadth of river (b)} = 40\ m$

$\text{and depth (h)} = 3\ m$

$\therefore \text{ Volume of water } = lbh = \frac{100}{3} \times 40 \times 3\ m^3 = 4000\ m^3$
(1 Mark)

$\text{and volume in litres } = 4000 \times 1000\ l$

$(1\ m^3 = 1000\ litres)$

$= 4000000\ litres$
(1.5 Marks)

14. A storage tank is in the form of a cube. When it is full of water, the volume of water is $15.625\ m^3$. If the present depth of water is 1.3 m, then find the volume of water already used from the tank.

[NCERT]
[3 Marks]

Let the side of cube $= x\ m$
Volume of cubical tank $= 15.625\ m^3$ [given]
$\Rightarrow x^3 = 15.625\ m^3$
$\Rightarrow x = 2.5\ m$
(1 Mark)

And present depth of the water in the cubical tank = 1.3 m
$\therefore$ Height of water used = 2.5 - 1.3 = 1.2 m

Now, volume of water used $= 1.2 \times 2.5 \times 2.5 = 7.5\ m^3$ [volume of cubical tank$= l \times b \times h$]
$= 7.5 \times 1000 = 7500L$

$[\because 1\ m^3 = 1000\ L]$
Hence, the volume of water already used from the tanks is 7500 L.
(2 Marks)

15. The diameter of a roller is 84 cm and its length is 120 cm. It takes 500 complete revolutions to move once over to level a playground. Find the area of the playground in m^2?
$\left[Assume\ \pi = \frac{22}{7}\right]$

[2 Marks]

A roller is cylindrical shaped.
Height (h) of cylindrical roller = Length of roller = 120 cm
Radius (r) of the circular end of roller
$= \left(\frac{84}{2}\right) cm = 42\ cm$

(0.5 Marks)

CSA of roller
$= 2\pi rh$
$= 2\pi \times 42 \times 120$
$= 31680\ cm^2$

(0.5 Marks)

Area of field
$= Number\ of\ revolutions \times CSA\ of\ roller = 500 \times CSA\ of\ roller$
$= (500 \times 31680) cm^2$
$= 15840000\ cm^2$
$= 1584\ m^2$

(1 Marks)