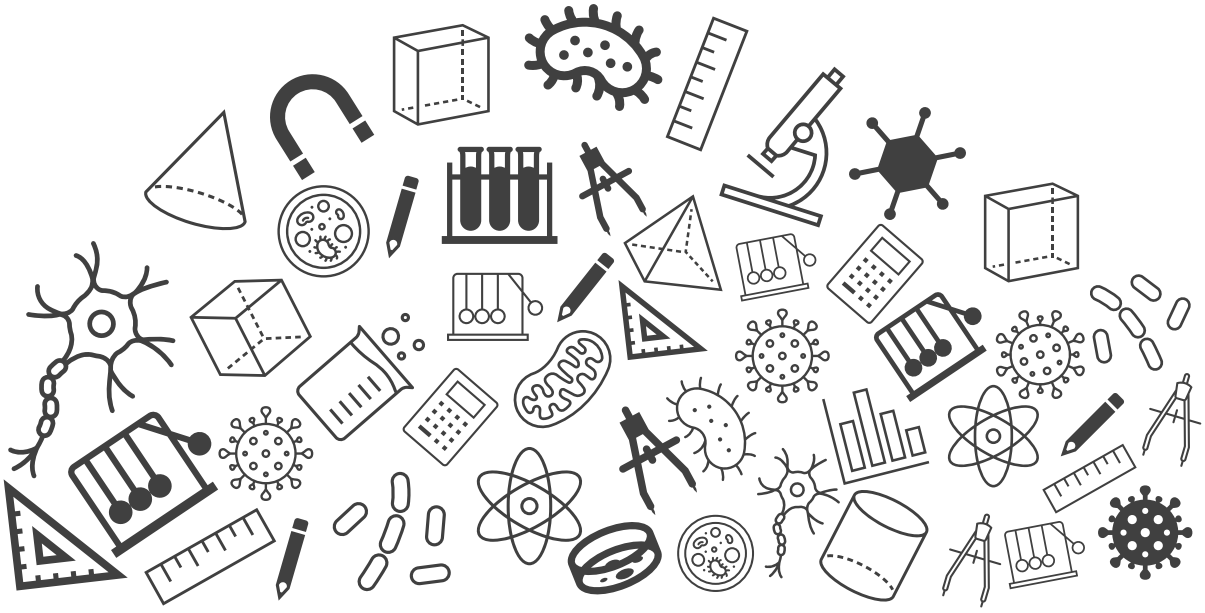
Grade 10

Mathematics

Exam Important Questions



Topic : Exam Important Questions

1. A tent is in the shape of a right circular cylinder up to a height of 3 m and conical above it. The total height of the tent is 13.5 m and the radius of its base is 14 m. Find the cost of cloth required to make the tent at the rate of Rs 80 per square metre. $[Take\ \pi = \frac{22}{7}]$
(3 Marks)

CSA of cylinder $= 2\pi rh$
$2 \times \frac{22}{7} \times 14 \times 3$
$= 264m^2$

radius = 14 m
height = 13.5 - 3 = 10.5

$l^2 = r^2 + h^2$
$= 14^2 + 10.5^2$
$= 196 + 110.25$
$= 306.25$

$l = \sqrt{306.25}$
$l = 17.5m$
(1 Mark)

CSA of cone $= \pi rl$

$\frac{22}{7} \times 14 \times 17.5$
$= 770m^2$
(1 Mark)

Total area $= 264 + 770 = 1034m^2$

cost of cloth per square m = Rs 80

cost of cloth $= 1034m^2 = 80 \times 1034$
= Rs 82720
(1 Mark)

2. 25 circular plates, each of radius 10.5 cm and thickness 1.6 cm, are placed one above the other to form a solid circular cylinder. Find the curved surface area and the volume of the cylinder so formed.
(3 Marks)

Given that 25 circular plates each with radius 10.5 cm are stacked one above another and the thickness of each plate is 1.6 cm.

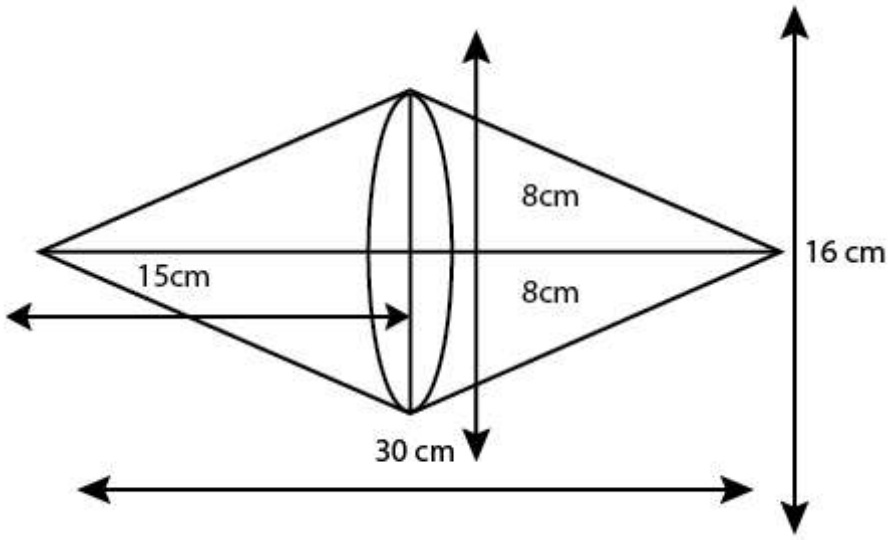
So, the height $= 1.6 \times 25 = 40\ cm$ (1 Mark)

Now, volume of the cylinder $= \pi r^2 h = \frac{22}{7} \times 10.5 \times 10.5 \times 40 = 13860\ cm^3$
(1 Mark)

Curved surface area of the cylinder $= 2\pi rh = 2 \times \frac{22}{7} \times 10.5 \times 40 = 2640\ cm^2$
(1 Mark)

3. Two cones with same base radius 8 cm and height 15 cm are joined together along their bases. Find the surface area of the shape so formed.
(3 Marks)

If two cones with same base and height are joined together along their bases. Then the shape so formed is look like as figure shown.



Given:

Radius of cone, r = 8cm and
Height of cone, h = 15 cm

So, Surface area of the shape so formed
= Curved area of first cone + Curved surface area of second cone (1 Mark)
= 2.(Surface area of cone) [Since , both cones are identical]

$= 2 \times \pi rl$

$= 2 \times \pi \times r \times \sqrt{r^2 + h^2} \quad (l = \sqrt{r^2 + h^2})$

$= 2 \times \frac{22}{7} \times 8 \times \sqrt{(8)^2 + (15)^2}$

$= \frac{2 \times 22 \times 8 \times \sqrt{64+225}}{7}$

$= \frac{44 \times 8 \times \sqrt{289}}{7}$

$= \frac{5984}{7}$

$= 854.85\ cm^2$

$= 855\ cm^2 (approx)$

Hence , the surface area of shape so formed is $855\ cm^2$
(2 Marks)

4. A hemispherical bowl is made of steel, 0.25 cm thick.The inner radius of the bowl is 5 cm. Find the outer curved surface area of the bowl. $\left[Assume\ \pi = \frac{22}{7}\right]$

[2 marks]
[NCERT]
[Surface Area of Solids]

Solution:

Given:
Inner radius of the hemispherical bowl = 5 cm

Thickness of the bowl = 0.25 cm

∴ Outer radius (r) of the hemispherical bowl = inner radius+thickness = (5 + 0.25) cm

= 5.25 cm
[1 mark]

Outer CSA of hemispherical bowl $= 2\pi r^2$

$= 2 \times \frac{22}{7} \times (5.25cm)^2 = 173.25\ cm^2$
[1 mark]

5. A hemispherical bowl is made of steel, 0.25 cm thick.The inner radius of the bowl is 5 cm. Find the outer curved surface area of the bowl. $\left[Assume\ \pi = \frac{22}{7}\right]$

[2 marks]
[NCERT]
[Surface Area of Solids]

Solution:

Given:
Inner radius of the hemispherical bowl = 5 cm

Thickness of the bowl = 0.25 cm

∴ Outer radius (r) of the hemispherical bowl = inner radius+thickness = (5 + 0.25) cm

= 5.25 cm
[1 mark]

Outer CSA of hemispherical bowl $= 2\pi r^2$

$= 2 \times \frac{22}{7} \times (5.25cm)^2 = 173.25\ cm^2$
[1 mark]

6. The rain water from a $22\ m \times 20m$ roof drains into a cylindrical vessel of diameter 2 m and height 3.5 m. If the rain waer collected from the roof fills $\frac{4}{5}$th of the cylindrical vessel then find the rainfall in centimetre.

[2 marks]

Given that,
Dimensions of roof top is $22\ m \times 20m$

Cylindrical vessel has a diameter of 2 m and height of 3.5 m.

We know that,
Volume of the cylinder is $\pi r^2 h$.
Volume of the cuboid is $l \times b \times h$.

[1 Mark]

Volume of roof = $\frac{4}{5}$ of the volume of the cylindrical vessel

$\Rightarrow 22 \times 20 \times h = \frac{4}{5} \times \frac{22}{7} \times 1 \times 1 \times \frac{7}{2}$

$\Rightarrow h = \frac{1}{50}(cm)$

$\Rightarrow h = 2\ cm$

[1 Mark]

7. Water is flowing through a cylindrical pipe of internal diameter 2 cm, into a cylindrical tank of base radius 40 cm, at the rate of 0.4 m per second. Determine the rise in level of water in the tank in half an hour.

[2 marks]

See the volume of water which passes through the cylindrical pipe is equal to the volume of water present in the cylindrical tank after half an hour.

So volume will remain conserved.

For cylindrical pipe
Radius 0.01 m
Height 0.4 m/s ie $0.4 \times 60 \times 30$ m In half an hour.

For cylindrical tank
Radius 0.4 m
Let the Height be x

Now $V_1 = V_2$
$3.14 \times (0.01)^2 \times 720 = 3.14 \times (0.4)^2 \times x$

[1 Mark]

Solving for x

We get x = 45 cm.

[1 Mark]

8. A pen stand made of wood is in the shape of a cuboid with four conical depressions to hold pens. The dimensions of the cuboid are 15 cm by 10 cm by 3.5 cm. The radius of each of the depressions is 0.5 cm and the depth is 1.4 cm. Find the volume of wood in the entire stand.
(3 Marks)

Dimensions of cuboid $= 15cm \times 10cm \times 3.5cm$, radius of cone $= 0.5$ cm, depth of cone = 1.4 cm

Volume of cuboid = length $\times$ width $\times$ height
$= 15 \times 10 \times 3.5 = 525\ cm^3$

(1 Mark)

Volume of cone
$= \frac{1}{3}\pi r^2 h$
$= \frac{1}{3} \times \frac{22}{7} \times 0.5^2 \times 1.4$
$= \frac{11}{30} cm^3$

(1 Mark)

Volume of wood = Volume of cuboid $-$ 4 $\times$ Volume of cone
$= 525 - 4 \times \frac{11}{30}$
$= 525 - \frac{22}{15}$
$= 523.53\ cm^3$

(1 Mark)

9. A solid is in the shape of a cone surmounted on a hemisphere, the radius of each of them being 3.5 cm and the total height of the solid is 9.5 cm. Find the volume of the solid.
[3 marks]

Total height of the solid = 9.5 cm
Radius of the cone = Radius of the hemisphere = r = 3.5 cm

Radius of the hemisphere = height of hemisphere = 3.5 cm

Height of cone,(h) = total height of the solid - height of the hemisphere

h = 9.5 - 3.5 cm
h of cone = 6cm
(1 mark)

The volume of the solid = volume of cone + volume of the hemisphere

$= \frac{1}{3}\pi r^2 h + \frac{2}{3}\pi r^3$
$= \frac{1}{3}\pi r^2 (h + 2r)$
$= \frac{1}{3} \times \frac{22}{7} \times 3.5 \times 3.5 \times (6 + 2 \times 3.5)$
$= \frac{1}{3} \times \frac{22}{7} \times 3.5 \times 3.5 \times (6 + 7)$
$= \frac{1}{3} \times \frac{22}{7} \times 3.5 \times 3.5 \times (13)$
$= \frac{1}{3} \times 22 \times .5 \times 3.5 \times (13)$
$= \frac{500.5}{3}$
$= 166.83\ cm^3$

Hence, the volume of the solid is $166.83\ cm^3$
(2 marks)

10. A container shaped like a right circular cylinder having diameter 12 cm and height 15 cm is full of ice cream. The ice cream is to be filled into cones of height 12 cm and diameter 6 cm, having a hemispherical shape on the top. Find the number of such cones which can be filled with ice cream.
[3 marks]

Radius of cylinder = 6 cm, height of cylinder = 15 cm
Radius of cone = 3 cm, height of cone = 12 cm
Radius of hemispherical top on ice cream = 3 cm

Volume of cylinder
$= \pi r^2 h$
$= \pi \times 6 \times 6 \times 15$
$= 540\pi \ cm^3$
[0.5 marks]

Volume of cone
$= \frac{1}{3} \times \pi \times 3^2 \times 12$
$= 36\pi \ cm^3$
[0.5 marks]

Volume of hemisphere
$= \frac{2}{3}\pi r^3$
$= \frac{2}{3} \times \pi \times 3^3$
$= 18\pi \ cm^3$
[0.5 marks]

Volume of ice cream
$= (36 + 18)\pi$
$= 54\pi \ cm^3$
[0.5 marks]

$\Rightarrow \text{Number of ice creams}$
$= \frac{\text{Volume of cylinder}}{\text{Volume of ice cream}}$
$= \frac{540\pi}{54\pi}$
$= 10$
[1 mark]