SHIKSHA CLASSES

Subject : Geometry **Answer Paper** **Marks : 20**

Class : X **7. Mensuration**

Q.1: A) Choose the correct alternative from the following questions. 2

1) If measure of an arc of a circle is 160^0 and its length is 44cm, find the circumference of the circle.

Ans: 99cm

2) Find the side of a cube of volume $1m^3$.

Ans: 100cm

B) Solve the following questions. 1

1) What is the area of a sector whose arc length and radius are 22cm and 7cm respectively?

Ans: Area of sector =

$$\frac{\text{Length of the arc} \times \text{radius}}{2}$$

$$= \frac{22 \times 7}{2} = 11 \times 7 = 77 cm^2$$

Area of section is $77cm^2$

Q.2: A) Attempt any ONE of the following. 2

1) Find the volume of a cone if the radius of its base is 1.5cm and its perpendicular height is 5cm.

Ans: Radius (r) = $\boxed{1.5}$ cm, height (h)= $\boxed{5}$ cm

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

$$= \frac{1}{\cancel{3}} \times \frac{22}{7} \times \overset{0.5}{\cancel{1.5}} \times 1.5 \times 5$$

$$= \frac{82.5}{7} = 11.785 = \boxed{11.79} cm^3$$

Volume of cone is $11.79cm^3$

2) Find the total surface area of a cylinder if the radius of it's base is 5cm and height is 40cm.

Ans. Radius (r) = 5cm, height (h) = 40cm

Total surface area of cylinder = $2\pi r(r+h)$

$= 2 \times 3.14 \times 5 \times (5+40)$

= 31.4 x 45

= $1413cm^2$

Total surface area of cylinder is $1413\ cm^2$

B) Attempt any ONE of the following. 2

1) Radius of a circle is 10cm. Measure of an arc of the circle is 54^0. Find the area of the sector associated with the arc.

Ans: Here r = 10cm, $\theta = 54^0$

Area of sector = $\frac{\theta}{360} \times \pi r^2$

$$= \frac{\overset{3}{\cancel{54}}}{\underset{20}{\cancel{360}}} \times 3.14 \times 10 \times 10$$

$$= \frac{942}{20} = 47.1 cm^2$$

Area of sector is $47.1\ cm^2$

2) The radii of ends of a frustum are 14cm and 6cm respectively and it's height is 6cm. Find its curved surface area.

Ans: Here $r_1 = 14cm$, $r_2 = 6cm$, $h = 6cm$

$$\ell = \sqrt{h^2 + (r_1 - r_2)^2} = \sqrt{6^2 + (14-6)^2}$$

$$= \sqrt{36+64} = \sqrt{100} = 10cm$$

curved surface area of frustum = $\pi(r_1 + r_2)\ell$

$= 3.14 \times (14+6) \times 10$

$= 3.14 \times 20 \times 10$

$= 628 cm^2$

curved surface area of frustum is $628 cm^2$

Q.3: A) Attempt any ONE of the following. 3

1) How many solid cylinders of radius 10cm and height 6cm can be made by melting a solid sphere of radius 30cm?

Ans: Radius of a sphere, r=30cm

Radius of the cylinder, R = 10cm

Height of cylinder, H = 6cm

Let the number of cylinders be n.

volume of the sphere = n x volume of cylinder

$$\therefore n = \frac{\text{volume of the sphere}}{\text{volume of cylinder}} = \frac{\frac{4}{3}\pi(r)^3}{\pi(R)^2 H}$$

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

$$= \frac{\frac{4}{3} r^3}{R^2 H}$$

$$= \frac{\frac{4}{3} \times (\overset{10}{\cancel{30}}) \times \overset{3}{\cancel{30}} \times \overset{5}{\cancel{30}}}{\cancel{10} \times \cancel{10} \times \cancel{6}}$$

$= 60$

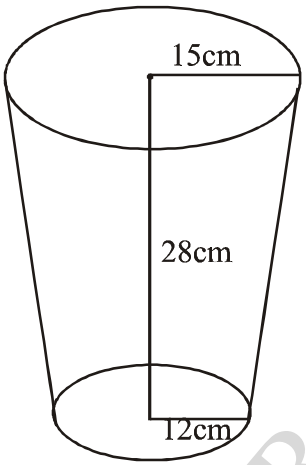
$\therefore$ 60 cylinders can be made.

2) A bucket is frustum shaped. Its height is 28cm. Radii of circular faces are 12cm and 15cm. Find the capacity of the bucket. $\left(\pi = \frac{22}{7}\right)$

Ans: $r_1 = \boxed{15}$ cm, $r_2 = \boxed{12}$ cm, $h = \boxed{28}$ cm

Capacity of the bucket = Volume of frustum

$$= \frac{1}{3}\pi h\left(r_1^2 + r_2^2 + r_1 \times r_2\right)$$



$$= \frac{1}{3} \times \frac{22}{7} \times 28 \boxed{\left(15^2 + 12^2 + 15 \times 12\right)}$$

$$= \frac{22 \times 4}{3} \times (225 + 144 + 180)$$

$$= \frac{22 \times 4}{3} \times 549$$

$= 88 \times 183$

$= 16104 cm^3$

$= \boxed{16.104}$ litre $[1 litre = 1000 cm^3]$

Capacity of bucket is $\boxed{16.104}$ litre.

B) Attempt any ONE of the following. 3

1) The area of a sector of a circle of 6cm radius is 15π sq.cm find the measure of the arc and length of the arc corresponding to the sector.

Ans: Given :

Area of sector = 15π cm^2

Radius = 6 cm

Measure of the arc = ?

Length of the arc = ?

We know that

$$\text{Area of a sector} = \frac{\theta}{360} \times \pi r^2$$

$$15\pi = \frac{\theta}{360} \times \pi \times (6)^2$$

$$15\pi = \frac{\theta}{360} \times 36\pi$$

$$\theta = \frac{15\pi \times 360}{36\pi}$$

$$\theta = 15 \times 10$$

$$\boxed{\theta = 150°}$$

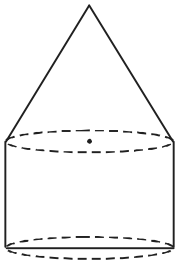
$$\text{Length of the arc} = \frac{\theta}{360} \times 2\pi r$$

$$= \frac{150}{360} \times 2\pi \times 6$$

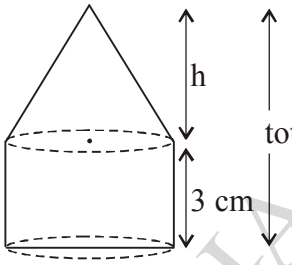
$$= 5\ \pi$$

$\therefore$ The length of the arc = 5π

2) A cylinder and a cone have equal bases. The height of the cylinder is 3cm and the area of its base is 100cm². The cone is placed upon the cylinder volume of the solid so formed is 500 cm³. Find the total height of the figure.



Ans:



Given : Height of cylinder = H = 3 cm
Area of base = 100 cm²
Volume of the fig = 500 cm³

Volume of the fig = volume of the cylinder + Volume of the cone

$$500 = \pi r^2 H + \frac{1}{3}\ \pi r^2 h$$

$$500 = \pi r^2 \left(H + \frac{1}{3} h \right)$$

$$500 = 100 \left(3 + \frac{1}{3} h \right)$$

$$\frac{500}{100} = 3 + \frac{h}{3}$$

$$5 = \frac{9 + h}{3}$$

$$15 = 9 + h$$

$$h = 15 - 9$$

$$h = 6$$

$\therefore$ Total height = H + h = 3 + 6 = 9

$\therefore$ **Total height = 9 cm**

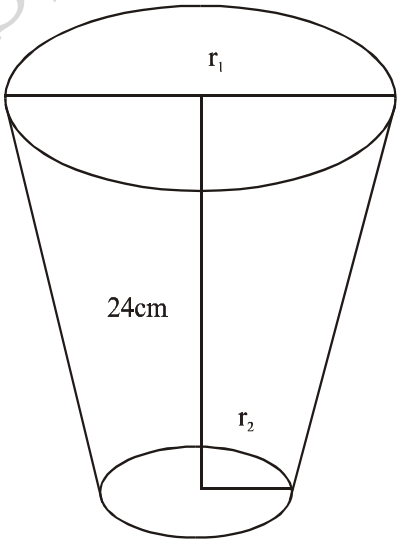
Q.4 : Attempt any ONE of the following. 4

1) The circumferences of circular faces of a frustum are 132 cm and 88cm and its height is 24cm. Find the curved surface area and total surface area of the frustum.

Ans: circumference - 1 = $2\pi r_1 = 132$

$$\therefore \frac{2 \times 22}{7} \times r_1 = 132$$

$$r_1 = \frac{132 \times 7}{2 \times 22} = 21\text{cm}$$



Circumference-2 = $2\pi r_2 = 88$

$$2 \times \frac{22}{7} \times r_2 = 88$$

$$r_2 = \frac{88 \times 7}{2 \times 22} = 14\text{cm}$$

Slant height of frustum $\ell = \sqrt{h^2 + (r_1 - r_2)^2}$

$= \sqrt{24^2 + (21-14)^2}$

$= \sqrt{576 + 49}$

$= \sqrt{625}$

$= 25\text{cm}$

Curved surface area of frustum $= \pi(r_1 + r_2)\ell$

$= \pi \times (21+14) \times 25$

$= \frac{22}{\cancel{7}} \times \cancel{35}^{5} \times 25$

$= 2750\text{cm}^2$

Total surface area of frustum

$= \pi\ell(r_1 + r_2) + \pi r_1^2 + \pi r_2^2$

$= \frac{22}{7} \times 25 \times (21+14) + \frac{22}{7} \times 21 \times 21 + \frac{22}{7} \times 14 \times 14$

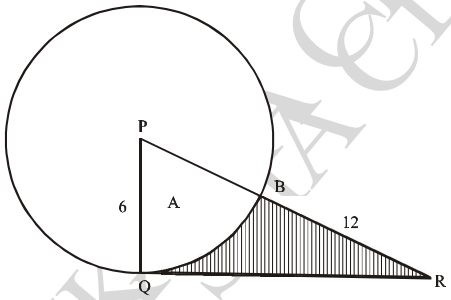
$= 2750 + 1386 + 616$

$= 4,752\text{cm}^2$

2) In figure, P is the centre of the circle of radius 6cm. seg QR is a tangent at Q.

If PR = 12, find the area of the shaded region. ($\sqrt{3} = 1.73$).

Ans: Radius joining point of contact of the tangent is perpendicular to the tangent.



$\therefore$ In ΔPQR, $\angle PQR = 90^0$, $PQ = 6\text{cm}$, $PR = 12\text{cm}$, $\therefore PQ = \frac{PR}{2}$

If one side of a right angled triangle is half the hypotenuse then angle opposite to, that side is of 30^0 measure.

$\therefore \angle R = 30^0$ and $\angle P = 60^0$

$\therefore$ By 30^0-60^0 - 90^0 Theorem,

$QR = \frac{\sqrt{3}}{2} \times PR = \frac{\sqrt{3}}{2} \times 12 = 6\sqrt{3}$

$\therefore QR = 6\sqrt{3}$ cm

$\therefore A(\Delta PQR) = \frac{1}{2} \times QR \times PQ = \frac{1}{2} \times 6\sqrt{3} \times 6 = 18\sqrt{3}$

$= 18 \times 1.73 = 31.14\text{cm}^2$

Area of a sector $= \frac{\theta}{360} \times \pi r^2$

$\Delta(P - QAB) = \frac{60}{360} \times 3.14 \times 6 \times 6 = \frac{1}{6} \times 3.14 \times 6 \times 6$

$= 3.14 \times 6 = 18.84\text{cm}^2$

Area of shaded region

$= A(\Delta PQR) - A(P - QAB)$

$= 31.14 - 18.84$

$= 12.30\text{cm}^2$

Area of the shaded region $= 12.30\text{cm}^2$

Q.5: Attempt any ONE of the following. 3

1) The diameter and length of a roller is 120cm and 84cm respectively. To level the ground, 200 rotations, of the roller are required. Find the expenditure to level the ground at the rate of Rs. 10 per sq. m.

Ans: Diameter of cylindrical roller = d = 120cm

$r = \frac{d}{2} = \frac{120}{2} = 60\text{cm}$, height (h) = 84cm

Area covered in one rotation = curred surface area of Cylindrical roller

$= 2\pi rh$

$= 2 \times \frac{22}{7} \times 60 \times 84$

$= 31,680\text{cm}^2$

Area covered in 200 rotations = $31,680 \times 200$

$= 6336000\ \text{cm}^2$

$= 633.6\ \text{m}^2\ [1\text{m}^2 = 10000\text{cm}^2]$

Expenditure of levelling at Rs. 10 per sq. m. = 633.6 x 10

= 6336 Rs.

2) A tent of a circus is such that its lower part is cylindrical and upper part is conical. The diameter of the base of the tent is 48m and the height of the cylindrical part is 15m. Total height of the tent is 33m. Find area of canvas required to make the tent. Also find volume of air in the tent.

Ans: Total height of tent = 33m

Let height of the cylindrical part be H

$\therefore H = 15m$

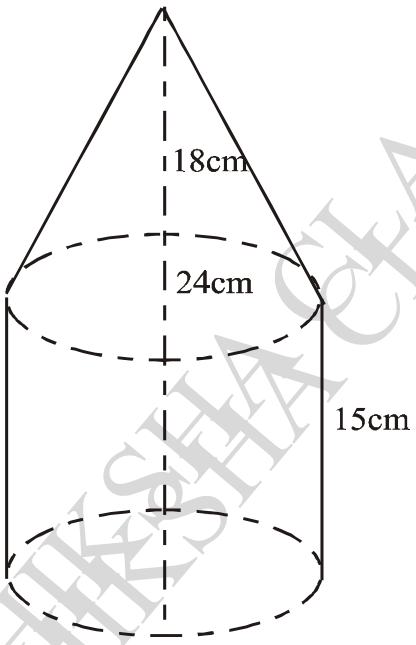
Let the height of the conical part be h

$\therefore h = (33-15) = 18m$

slant height of cone, $\ell = \sqrt{r^2 + h^2}$

$= \sqrt{24^2 + 18^2} = \sqrt{576 + 324}$

$= \sqrt{900} = 30m$



canvas required for tent = curved surface area of cylindrical part + curved surface area of conical part

$= 2\pi rH + \pi r\ell$

$= \pi r(2H + \ell)$

$= \frac{22}{7} \times 24 \times (2 \times 15 + 30)$

$= \frac{22}{7} \times 24 \times 60$

$= 4525.71 m^2$

Volume of air in the tent = volume of cylinder + volume of cone

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

$= \pi r^2 \left[H + \frac{1}{3} h \right]$

$= \frac{22}{7} \times 24^2 \left(15 + \frac{1}{3} \times 18 \right)$

$= \frac{22}{7} \times 576 \times 21$

$= 38,016 m^2$

$\therefore$ canvas required for the tent = $4525.71 m^2$

$\therefore$ Volume of air in the tent = $38,016 m^3$

* * *