

7

Mensuration

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Points to Remember:

• Introduction :

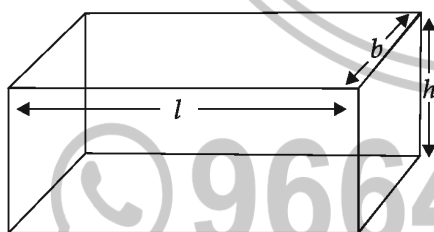
Mensuration is a special branch of mathematics that deals with the measurement of geometric figures.

In previous classes we have studied certain concepts related to areas of plane figures (shapes) such as triangles, quadrilaterals, polygons and circles.

• Cuboid [Rectangular Parallelopiped]

A cuboid is a solid figure bounded by six rectangular faces, where the opposite faces are equal.

A cuboid has a **length**, **breadth** and **height** denoted as ' l ', ' b ' and ' h '



respectively as shown in the figure,

In our day to day life we come across cuboids such as rectangular room, rectangular box, brick, rectangular fish tank, etc.

FORMULAE

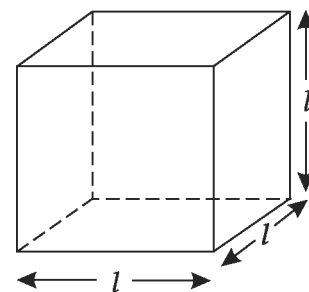
- (1) Total surface area of a cuboid = $2(lb + bh + lh)$
- (2) Lateral surface area of a cuboid = $2(l + b) \times h$
- (3) Volume of a cuboid = $l \times b \times h$
- (4) Diagonal of the cuboid = $\sqrt{l^2 + b^2 + h^2}$

• Cube

A cube is a cuboid bounded by six equal squares faces.

Hence its length, breadth and height are equal.

$\therefore$ The edge of the cube = length = breadth = height



The edge of the cube is denoted as ' l '.

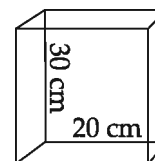
A dice is an example of cube.

FORMULAE

- (1) Total surface area of a cube = $6l^2$
- (2) Lateral surface area of a cube = $4l^2$
- (3) Volume of cube = l^3
- (4) Diagonal of the cube = $\sqrt{3}l$

Solve the following example

- (1) The length, breadth and height of an oil can are 20 cm, 20 cm and 30 cm respectively as shown in the adjacent figure. How much oil will it contain? (1 litre = 1000 cm³)



Solution :

For oil can, length (l) = 20 cm, breadth (b) = 20 cm, height (h) = 30 cm.

$$\begin{aligned} \text{Volume of oil can} &= l \times b \times h \\ &= 20 \times 20 \times 30 \end{aligned}$$

$$= 12000 \text{ cm}^3$$

Capacity of oil it contains = Volume of oil can

$$= \frac{12000}{1000} [\because 1 \text{ ltr} = 1000 \text{ cm}^3]$$

$$= 12 \text{ litres}$$

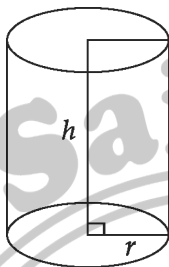
$\therefore$ The oil can will contain 12 litres of oil

● Right Circular Cylinder

A right circular cylinder (Cylinder) is a solid figure bounded by two flat circular surfaces and a curved surface.

The perpendicular distance between the two base faces is called height of the cylinder and is denoted by 'h'. The radius of the base of the cylinder is denoted by 'r'.

The cylinders which we see regularly are drum, pipe, road roller, coins, test tube, refill of a ball pen, syringe etc.



FORMULAE

- (1) Curved surface area of a right circular cylinder = $2\pi rh$
- (2) Total surface area of a right circular cylinder = $2\pi r(r + h)$
- (3) Volume of a right circular cylinder = $\pi r^2 h$

Practice Set - 7.1 (Textbook Page No. 145)

- (3) Find the total surface area of a cylinder if the radius of its base is 5 cm and height is 40 cm.

(1 mark)

Solution :

For a cylinder,

$$r = 5 \text{ cm}$$

...(Given)

$$h = 40 \text{ cm}$$

...(Given)

$$\begin{aligned} \text{Total surface area} &= 2\pi r(r + h) \\ &= 2 \times 3.14 \times 5 \times (5 + 40) \\ &= 31.4 \times 45 \end{aligned}$$

$$\therefore \text{Total surface area} = 1,413 \text{ cm}^2$$

- (9) In the adjoining figure a cylindrical wrapper of flat tablets is shown. The radius of a tablet is 7 mm and its thickness is 5 mm. How many such tablets are wrapped in the wrapper? (3 marks)



Solution :

For cylindrical wrapper,

$$\text{Diameter} = 14 \text{ mm}$$

$$\text{Radius (R)} = \frac{14}{2} \text{ mm} = 7 \text{ mm}$$

$$\text{Height (H)} = 10 \text{ cm}$$

$$\text{i.e. } H = 100 \text{ mm}$$

For cylindrical tablet,

$$\text{Radius (r)} = 7 \text{ mm, Height (h)} = 5 \text{ mm}$$

Let 'N' number of tablets can be wrapped in the given wrapper.

$$\therefore N \times \text{Volume of tablet} = \text{Volume of wrapper.}$$

$$\therefore N \times \pi r^2 h = \pi R^2 H$$

$$\therefore N \times \pi \times 7 \times 7 \times 5 = \pi \times 7 \times 7 \times 100$$

$$\therefore N = \frac{\pi \times 7 \times 7 \times 100}{\pi \times 7 \times 7 \times 5}$$

$$\therefore N = 20$$

$\therefore$ 20 tablets can be packed in the given wrapper.

Problem Set - 7 (Textbook Pg No. 161)

- * (3) Some plastic balls of radius 1 cm were melted and cast into a tube. The thickness, length and outer radius of the tube were 2 cm, 90 cm and 30 cm respectively. How many balls were melted to make the tube? (4 marks)

Solution :

For spherical solid ball, $r = 1 \text{ cm}$,

For cylindrical pipe, Outer radius (r_1) = 30 cm

$$\text{Thickness (t)} = 2 \text{ cm}$$

$$\text{Height (h)} = 90 \text{ cm}$$

$$\text{Inner radius (r}_2\text{)} = r_1 - t$$

$$= 30 - 2$$

$$r_2 = 28 \text{ cm}$$

Volume of cylindrical pipe = Number of spherical balls required (N) $\times$ Volume of spherical ball

$$\therefore \pi \times h (r_1^2 - r_2^2) = N \times \frac{4}{3} \pi r^3$$

$$\therefore \pi \times 90 (30^2 - 28^2) = N \times \frac{4}{3} \pi \times (1)^3$$

$$\therefore \frac{\pi \times 90 \times (30 + 28)(30 - 28) \times 3}{4 \times \pi} = N$$

$$\therefore \frac{90 \times 58 \times 2 \times 3}{4} = N$$

$$\therefore N = 7,830$$

$\therefore$ Number of spherical balls required is 7,830

- (4) A metal parallelepiped of measures 16 cm × 11 cm × 10 cm was melted to make coins. How many coins were made if the thickness and diameter of each coin was 2 mm and 2 cm respectively? (2 marks)

Solution :

For the metallic cuboid,

$$l = 16 \text{ cm}, b = 11 \text{ cm}, h = 10 \text{ cm}$$

For the cylindrical coin,

$$\text{Diameter} = 2 \text{ cm}, \text{Thickness}(h_1) = 2 \text{ mm} = 0.2 \text{ cm}$$

$$\text{i.e. Radius}(r_1) = 1 \text{ cm}$$

Let number of coins made be N.

$$\therefore N \times \text{Volume of coin} = \text{Volume of cuboid}$$

$$\therefore N \times \pi r_1^2 h_1 = l \times b \times h$$

$$\therefore N \times \frac{22}{7} \times 1 \times 1 \times \frac{2}{10} = 16 \times 11 \times 10$$

$$\therefore N = \frac{16 \times 11 \times 10 \times 10 \times 7}{22 \times 2}$$

$$\therefore N = 2800$$

$$\therefore \text{Number of coins made are 2800}$$

- (5) The diameter and length of a roller is 120 cm and 84 cm respectively. To level the ground, 200 rotations of the roller are required. Find the expenditure to level the ground at the rate of ₹ 10 per sq. m. (3 marks)

Solution :

For circular roller,

$$\text{Diameter} = 120 \text{ cm}, \therefore \text{radius}(r) = \frac{120}{2} = 60 \text{ cm}$$

$$\text{length}(h) = 84 \text{ cm}$$

Number of rotations required to level

$$\text{the ground}(N) = 200$$

$$\text{Rate of levelling}(R) = ₹ 10 \text{ per sq. metre}$$

$$\text{Area levelled in 1 rotation} = \text{curved surface area of the roller.}$$

$$\therefore \text{Area levelled in 200 rotations}(A) = 200 \times 2\pi rh$$

$$= 200 \times 2 \times \frac{22}{7} \times 60 \times 84$$

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

$$= \frac{6336000}{100 \times 100} \text{ m}^2$$

$$\therefore A = 633.6 \text{ m}^2$$

$$\text{Cost of levelling} = A \times R$$

$$= 633.6 \times 10 = ₹ 6336$$

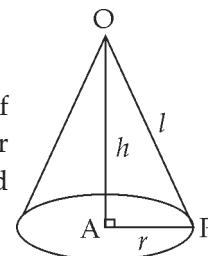
$$\therefore \text{Cost of levelling the ground is ₹ 6336.}$$



Points to Remember:

• Right Circular Cone

An ice-cream cone, a clown's hat, a funnel are examples of cones. A cone has one circular flat surface and one curved surface.



In the diagram alongside,

seg OA is the height of the cone denoted by 'h'.

seg AP is the radius of the base denoted by 'r'.

seg OP is the slant height of the cone denoted by 'l'.

FORMULAE

- (1) The h , r and l of a cone represents the sides of a right angled triangle where l is the hypotenuse.

$$\therefore l^2 = r^2 + h^2$$

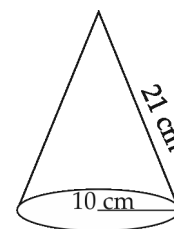
- (2) Curved surface area of a right circular cone = πrl

- (3) Total surface area of a right circular cone = $\pi r(r + l)$

- (4) Volume of a right circular cone = $\frac{1}{3} \times \pi r^2 h$

Solve the following example (Textbook pg no. 141)

- (1) The adjoining figure shows the measures of a joker's cap. How much cloth is needed to make such a cap?



Solution :

For the jokers cap,

$$\text{radius}(r) = 10 \text{ cm}, \text{slant height}(l) = 21 \text{ cm}$$

cloth required to make such cap

$$= \text{curved surface area of cone}$$

$$= \pi rl$$

$$= \frac{22}{7} \times 10 \times 21$$

$$= 660 \text{ cm} \quad [\because 1 \text{ m} = 100 \text{ cm}]$$

$$= 6.6 \text{ m}$$

$$\therefore \text{6.6 m cloth is needed to make such a cap.}$$

Pracitce Set - 7.1 (Textbook Page No. 145)

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

(1 mark)

Solution :

For the cone.

$$\text{radius}(r) = 1.5 \text{ cm}, \text{height}(h) = 5 \text{ cm}$$

$$\text{Volume (V)} = \frac{1}{3} \pi r^2 h$$

$$\therefore = \frac{1}{3} \times 3.14 \times 1.5 \times 1.5 \times 5$$

$$\therefore V = 11.775 \text{ cm}^3$$

$$\therefore \text{Volume of the cone is } 11.775 \text{ cm}^3$$

- (5) The dimensions of a cuboid are 44 cm, 21 cm, 12 cm. It is melted and a cone of height 24 cm is made. Find the radius of its base. (3 marks)

Solution :

For the solid cuboid,

$$l = 44 \text{ cm}, b = 21 \text{ cm}, h = 12 \text{ cm}$$

For the solid cone,

$$h_1 = 24 \text{ cm}$$

$$r = ?$$

Cone is made by melting the cuboid.

$$\therefore \text{Volume of cone} = \text{volume of cuboid.}$$

$$\frac{1}{3} \pi r^2 h_1 = l \times b \times h$$

$$\frac{1}{3} \times \frac{22}{7} \times r^2 \times 24 = 44 \times 21 \times 12$$

$$\therefore r^2 = \frac{44 \times 21 \times 12 \times 3 \times 7}{22 \times 24}$$

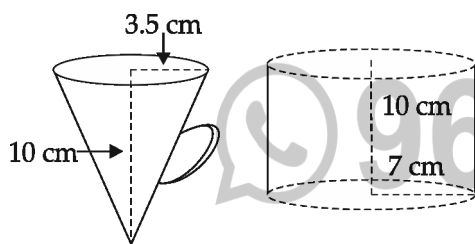
$$\therefore r^2 = 21 \times 3 \times 7$$

$$\therefore r^2 = 21 \times 21$$

$$\therefore r = 21 \text{ cm} \quad \dots (\text{Taking square roots})$$

$$\therefore \text{Radius of the cone is } 21 \text{ cm}$$

- (6) Observe the measures of pots in below figure. How many jugs of water can the cylindrical pot hold. (3 marks)



Solution :

For the conical watering, $r = 3.5 \text{ cm}$, $h = 10 \text{ cm}$

For the cylindrical water pot, $r_1 = 7 \text{ cm}$, $h_1 = 10 \text{ cm}$

Let 'N' be the number of jugs required to fill the cylindrical pot completely.

$$\therefore N \times \text{Volume of cone} = \text{Volume of cylinder}$$

$$\therefore N \times \frac{1}{3} \pi r^2 h = \pi r_1^2 h_1$$

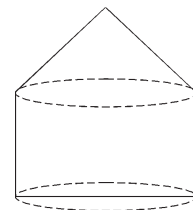
$$\therefore N \times \frac{1}{3} \pi \times 3.5 \times 3.5 \times 10 = \pi \times 7 \times 7 \times 10$$

$$\therefore N = \frac{\pi \times 7 \times 7 \times 10 \times 3}{\pi \times 3.5 \times 3.5 \times 10}$$

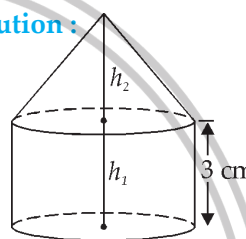
$$\therefore N = 12$$

$\therefore$ Number of conical jugs required to fill up cylindrical pot completely is 12.

- (7) A cylinder and a cone have equal bases. The height of the cylinder is 3 cm and the area of its base is 100 cm^2 . The cone is placed upon the cylinder. Volume of the solid figure so formed is 500 cm^3 . Find the total height of figure. (3 marks)



Solution :



Let the radius of base of each part be r .

Height of the cylinder (h_1) = 3 cm.

Let the height of the cone be h_2

$$\text{Area of the base} = 100 \text{ cm}^2$$

$$\therefore \pi r^2 = 100 \text{ cm}^2 \quad \dots (i)$$

Volume of the solid figure formed =

Volume of the cylinder + Volume of the cone

$$\therefore 500 = \pi r^2 h_1 + \frac{1}{3} \pi r^2 h_2$$

$$\therefore 500 = \pi r^2 \left(h_1 + \frac{1}{3} h_2 \right) \quad \dots [\text{From (i)}]$$

$$\therefore 500 = 100 \left(3 + \frac{h_2}{3} \right)$$

$$\therefore \frac{500}{100} = 3 + \frac{h_2}{3}$$

$$\therefore 5 = 3 + \frac{h_2}{3}$$

$$\therefore 5 - 3 = \frac{h_2}{3}$$

$$\therefore \frac{h_2}{3} = 2$$

$$\therefore h_2 = 6$$

$$\text{Total height} = h_1 + h_2 \\ = 3 + 6$$

$$\text{Total height of the figure is } 9 \text{ cm}$$

Problem Set - 7 (Textbook Pg No. 161)

- (7) A cylinder bucket of diameter 28 cm and height 20 cm was full of sand. When the sand in the bucket was poured on the ground, the sand got converted into a shape of a cone. If the height of

the cone was 14 cm, what was the base area of the cone?
(3 marks)

Solution :

For the cylindrical bucket,

diameter = 28 cm

∴ Radius (r) = 14 cm.

height (h) = 20 cm

Volume of sand in the bucket =

$$\text{Volume of the bucket} = \pi r^2 h$$

For conical shape sand

height (h_1) = 14 cm

Let the radius be r_1

Sand from the bucket is emptied to form a cone.

∴ Volume of sand in the conical shape = Volume of the sand in the bucket

$$\therefore \frac{1}{3} \pi r_1^2 h_1 = \pi r^2 h$$

$$\therefore \frac{1}{3} \pi r_1^2 h_1 = \frac{22}{7} \times 14 \times 14 \times 20$$

$$\therefore \frac{1}{3} \times \pi r_1^2 \times 14 = \frac{22}{7} \times 14 \times 14 \times 20$$

$$\therefore \pi r_1^2 = \frac{22}{7} \times 14 \times 14 \times 20 \times \frac{3}{14}$$

$$\pi r_1^2 = 2,640 \text{ sq.cm}$$

∴ **Area of base of the cone is 2640 cm²**



Points to Remember:

• Sphere

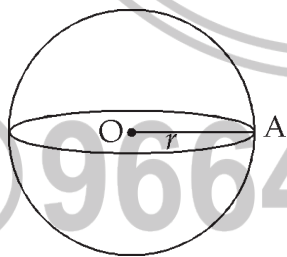
The set of all points in the space which are at a fixed distance from a fixed point is called a sphere.

The fixed point is called the **centre** and the fixed distance is called the **Radius of the sphere**.

In the adjoining figure, point O is the centre of the sphere and seg OA is the radius of the sphere which is denoted as ' r '.

Since the entire surface of the sphere is curved, its area is called as curved surface area or simply surface area of the sphere.

Some common examples of a sphere are cricket ball, football, globe, spherical soap bubble etc.



FORMULAE

(1) Surface area (curved surface area) of a sphere

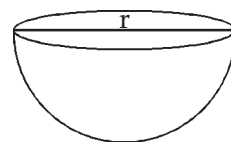
$$= 4\pi r^2$$

(2) Volume of a sphere = $\frac{4}{3} \times \pi r^3$

• Hemisphere

Half of a sphere is called as hemisphere.

Any hemisphere is made up of a curved surface and a plane circular surface.



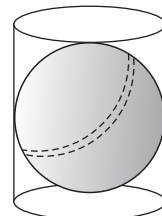
FORMULAE

(1) Curved surface area of a hemisphere = $2\pi r^2$

(2) Total surface area of a solid hemisphere = $3\pi r^2$

(3) Volume of a hemisphere = $\frac{2}{3} \times \pi r^3$

As shown in the adjacent figure, a sphere is placed in a cylinder. It touches the top, bottom and the curved surface of the cylinder. If radius of the base of the cylinder is ' r ',



(1) What is the ratio of the radii of the sphere and the cylinder?

(2) What is the ratio of the curved surface area of the cylinder and the surface area of the sphere?

(3) What is the ratio of the volumes of the cylinder and the sphere?

Solution :

radius of the base of the cylinder = r

∴ ball touches the top, bottom and curved surface of the cylinder,

radius of the sphere = r

height of cylinder = diameter of sphere = $2r$ } ... (i)

(i) $\frac{\text{Radius of sphere}}{\text{Radius of cylinder}} = \frac{r}{r} = 1$... [From (i)]

(ii) Curved surface area of the cylinder

$$= 2\pi rh$$

$$= 2\pi r (2r) \text{ ... [From (i)]}$$

$$= 4\pi r^2$$

Also surface area of sphere = $4\pi r^2$

$$\therefore \frac{\text{Curved surface area of cylinder}}{\text{Surface area of sphere}} = \frac{4\pi r^2}{4\pi r^2} = 1$$

(iii) Volume of cylinder = $\pi r^2 h$

$$= \pi r^2 (2r) \text{ ... [From (i)]}$$

$$\begin{aligned} \text{Volume of sphere} &= \frac{4}{3} \pi r^3 \\ \therefore \frac{\text{Volume of cylinder}}{\text{Volume of sphere}} &= \frac{2\pi r^3}{\frac{4}{3}\pi r^3} = \frac{3}{2} \end{aligned}$$

Practice Set - 7.1 (Textbook Page No. 145)

- (2) Find the volume of a sphere with diameter 6 cm. (1 mark)

Solution :

For the sphere,
Diameter = 6 cm

$$\therefore \text{Radius } (r) = \frac{6}{2} \text{ cm} = 3 \text{ cm}$$

$$\begin{aligned} \text{Volume of the sphere} &= \frac{4}{3} \times \pi r^3 \\ &= \frac{4}{3} \times 3.14 \times 3 \times 3 \times 3 \\ &= 113.04 \text{ cm}^3 \end{aligned}$$

$$\therefore \text{Volume of the sphere } 113.04 \text{ cm}^3$$

- (4) Find the surface area of sphere of radius 7 cm. (1 mark)

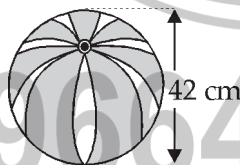
Solution :

For the sphere,
Radius $(r) = 7 \text{ cm}$

$$\begin{aligned} \text{Curved surface area of the sphere} &= 4\pi r^2 \\ &= 4 \times \frac{22}{7} \times 7 \times 7 \\ &= 616 \text{ cm}^2 \end{aligned}$$

$$\therefore \text{Curved surface area of the sphere is } 616 \text{ cm}^2$$

- (11) Find the surface area and the volume of a beach ball shown in the figure. (3 marks)



Solution :

For a spherical beach ball.

Diameter = 42 cm

...(Given)

$$\therefore \text{Radius } (r) = \frac{42}{2} = 21 \text{ cm}$$

$$\begin{aligned} \text{Volume of the spherical beach ball} &= \frac{4}{3} \times \pi r^3 \\ &= \frac{4}{3} \times \frac{22}{7} \times 21 \times 21 \times 21 \\ &= 38,808 \text{ cm}^3 \end{aligned}$$

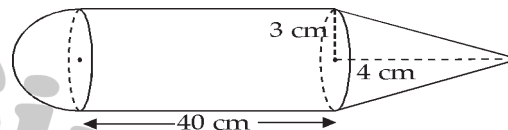
$$\therefore \text{Volume of the spherical beach ball is } 38,808 \text{ cm}^3$$

$$\text{Surface area of the spherical beach ball} = 4\pi r^2$$

$$\begin{aligned} &= 2\pi r^3 \\ &= \frac{4}{3} \pi r^3 \\ &= 4 \times \frac{22}{7} \times 21 \times 21 \\ &= 5,544 \text{ cm}^3 \end{aligned}$$

Surface area of the spherical beach ball is 5,544 cm²

- (8) In below figure, a toy made from a hemisphere, a cylinder and a cone is shown. Find the total area of the toy. (4 marks)



Solution :

Toy is made up of a cone, cylinder and hemisphere of equal radii.

For the conical part	For the cylindrical part	For hemisphere
Radius $(r) = 3 \text{ cm}$	Radius $(r) = 3 \text{ cm}$	Radius $(r) = 3 \text{ cm}$
Height $(h) = 4 \text{ cm}$	height $(h_1) = 40 \text{ cm}$	

Let the slant height of conical part be l .

$$l^2 = r^2 + h^2$$

$$\therefore = 3^2 + 4^2$$

$$= 9 + 16$$

$$\therefore l^2 = 25$$

$$\therefore l = 5 \text{ cm}$$

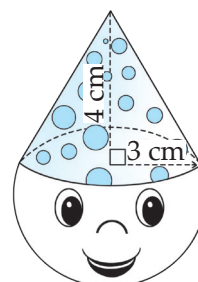
(Taking square roots)

Total surface area of the toy =

$$\begin{aligned} &\text{Curved surface area of the hemisphere} \\ &+ \text{Curved surface area of the cylinder} \\ &+ \text{Curved surface area of the cone} \\ &= 2\pi r^2 + 2\pi r h_1 + \pi r l \\ &= \pi r(2r + 2h_1 + l) \\ &= \frac{22}{7} \times 3 \times (3 \times 2 + 2 \times 40 + 5) \\ &= \frac{22}{7} \times 3 \times (6 + 80 + 5) \\ &= \frac{22}{7} \times 3 \times 91 \\ &= 22 \times 3 \times 13 \\ &= 858 \text{ cm}^2 \end{aligned}$$

$$\therefore \text{Total Surface area of the toy is } 858 \text{ sq.cm}$$

- (10)



The adjoining figure shows a toy. Its lower part is a hemisphere and the upper part is a cone. Find the volume and the surface area of the toy from the measures shown in the figure. ($\pi = 3.14$) (4 marks)

Solution :

For the conical part

Radius (r) = 3 cm

Height (h) = 4 cm

Let l be the slant height of conical part

$$l^2 = r^2 + h^2$$

$$\therefore = 3^2 + 4^2$$

$$= 9 + 16$$

$$\therefore l^2 = 25$$

$$\therefore l = 5 \text{ cm} \quad (\text{Taking square roots})$$

For the

hemisphere

Radius (r) = 3 cm

Volume of the toy = Volume of the Cone
+ volume of the hemisphere

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

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

$$= \frac{1}{3} \times 3.14 \times 3 \times 3 (4 + 2 \times 3)$$

$$= 3.14 \times 3 (4 + 6)$$

$$= 3.14 \times 3 \times 10$$

$$= 3.14 \times 30$$

$$= 94.2 \text{ cm}^3$$

$$\therefore \text{Volume of the toy is } 94.2 \text{ cm}^3$$

Surface area of toy = Curved surface area of the cone
+ Curved surface area of the hemisphere

$$= \pi r l + 2\pi r^2$$

$$= \pi r (l + 2r)$$

$$= 3.14 \times 3 (5 + 2 \times 3)$$

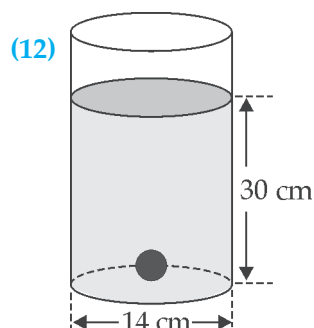
$$= 3.14 \times 3 (5 + 6)$$

$$= 3.14 \times 3 \times 11$$

$$= 3.14 \times 33$$

$$= 103.62 \text{ cm}^2$$

$$\therefore \text{Surface area of toy is } 103.62 \text{ cm}^2$$



As shown in the figure, a cylindrical glass contains water. A metal sphere of diameter 2 cm is immersed in it water. Find the volume of water. (3 marks)

Solution :

For the cylindrical vessel

Diameter = 14 cm

Radius (r_1) = 7 cm

Height of the water level (h_1)
= 30 cm

(When sphere is immersed)

For the Sphere

Diameter = 2 cm

Radius (r_2) = 1 cm

Apparent volume of water when sphere is immersed in water (V_1) = $\pi r_1^2 h_1$

$$= \frac{22}{7} \times 7 \times 7 \times 30$$

$$= 4620 \text{ cm}^3$$

$$\text{Volume of the Sphere } (V_2) = \frac{4}{3} \times \pi r_2^3$$

$$= \frac{4}{3} \times 3.14 \times 1 \times 1 \times 1$$

$$= 4.19 \text{ cm}^3$$

$$\text{Actual volume of water} = V_1 - V_2$$

$$= 4620 - 4.19$$

$$= 4615.81 \text{ cm}^3$$

$$\therefore \text{Actual volume of Water is } 4615.81 \text{ cm}^3$$

Problem Set - 7 (Textbook Pg No. 161)

- (6) The diameter and thickness of a hollow metallic sphere are 12 cm and 0.01 m respectively. The density of the metal is 8.88 gm per cm^3 . Find the outer surface area and mass of the sphere.

(4 marks)

Solution :

For the metallic hollow sphere,

Outer diameter = 12 cm

$$\therefore \text{Outer radius } (r_1) = \frac{12}{2} = 6 \text{ cm}$$

Thickness = 0.01 m

$$= 0.01 \times 100 \quad \dots [1 \text{ m} = 100 \text{ cm}]$$

$$= 1 \text{ cm}$$

$$\text{Inner radius } (r_2) = r_1 - \text{thickness}$$

$$= 6 - 1$$

$$= 5 \text{ cm}$$

Outer surface area of the hollow sphere

$$= 4 \pi r_1^2$$

$$= 4 \times 3.14 \times 6 \times 6$$

$$= 452.16 \text{ cm}^2$$

$$\therefore \text{Outer surface area is } 452.16 \text{ sq. cm.}$$

Volume of metal in the hollow metallic sphere

$$= \text{Volume of the outer sphere} - \text{Volume of the inner sphere}$$

$$\begin{aligned}
 &= \frac{4}{3} \pi r_1^3 - \frac{4}{3} \pi r_2^3 \\
 &= \frac{4}{3} \pi (r_1^3 - r_2^3) \\
 &= \frac{4}{3} \times \frac{22}{7} \times (6^3 - 5^3) \\
 &= \frac{4}{3} \times \frac{22}{7} \times (216 - 125) \\
 &= \frac{4}{3} \times \frac{22}{7} \times 91 \\
 &= \frac{4}{3} \times 22 \times 13 \\
 V &= \frac{1144}{3} \text{ cm}^3
 \end{aligned}$$

$$\text{Density} = \frac{\text{Mass}}{\text{Volume}} \quad \dots(\text{Formula})$$

$$\therefore \text{Mass} = \text{Density} \times \text{Volume}$$

Mass of the hollow sphere =

Volume of the hollow sphere $\times$ Density of Sphere

$$\begin{aligned}
 V &= \frac{1144}{3} \times 8.88 \\
 &= 1144 \times 2.96 \\
 &= 3386.24 \text{ gm}
 \end{aligned}$$

$\therefore$ **Mass of the hollow sphere is 3386.24 gm**

- (8) The radius of a metallic sphere is 9 cm. It was melted to make a wire of diameter 4 mm. Find the length of the wire. (3 marks)

Solution :

For the sphere, $r = 9$ cm

For the wire, Thickness (diameter) = 4 mm

$$\therefore \text{Radius } (r_1) = \frac{4}{2} \text{ mm} = 2 \text{ mm} = \frac{2}{10} \text{ cm} \quad \dots[1 \text{ cm} = 10 \text{ mm}]$$

Let the length of wire be h_1

Wire is made by melting the sphere,

Volume of the wire = Volume of the sphere

$$\therefore \pi r_1^2 h_1 = \frac{4}{3} \pi r^3$$

$$\therefore \pi \times \frac{2}{10} \times \frac{2}{10} \times h_1 = \frac{4}{3} \pi \times 9 \times 9 \times 9$$

$$\therefore h_1 = \frac{4 \times \pi \times 9 \times 9 \times 9 \times 10 \times 10}{3 \times \pi \times 2 \times 2}$$

$$\therefore h_1 = 24,300 \text{ cm}$$

$$\therefore h_1 = 243 \text{ m} \quad \dots[1 \text{ m} = 100 \text{ cm}]$$

$\therefore$ **Length of the wire formed is 243 m.**



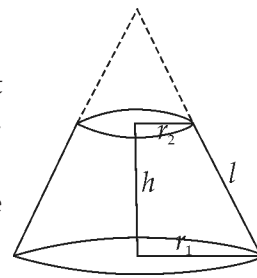
Points to Remember:

• Frustum Of The Cone :

If the cone is cut off by a plane parallel to the base not passing through the vertex, two parts are formed as

(i) cone (a part towards the vertex)

(ii) frustum of cone (the part left over on the other side i.e. towards base of the original cone)



FORMULAE

- (1) Slant height (l) of the frustum = $\sqrt{h^2 + (r_1 - r_2)^2}$
- (2) Curved surface area = $\pi (r_1 + r_2) l$
- (3) Total surface area of the frustum = $\pi (r_1 + r_2) l + \pi r_1^2 + \pi r_2^2$
- (4) Volume of the frustum = $\frac{1}{3} \pi (r_1^2 + r_2^2 + r_1 \times r_2) h$

Practice Set - 7.2 (Textbook Page No. 148)

- (1) The radii of two circular ends of frustum shape bucket are 14 cm and 7 cm. Height of the bucket is 30 cm. How many litres of water it can hold? (1 litre = 1000 cm³) (3 marks)

Solution :

For a frustum shaped bucket,

radius of bigger circle (r_1) = 14 cm

radius of smaller circle (r_2) = 7 cm

height (h) = 30 cm

Capacity of the bucket = Volume of the bucket

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

$$= \frac{1}{3} \times \frac{22}{7} \times 30 (14^2 + 7^2 + 14 \times 7)$$

$$= \frac{22}{7} \times 10 \times (196 + 49 + 98)$$

$$= \frac{22}{7} \times 10 \times 343$$

$$= 22 \times 10 \times 49$$

$$= 10,780 \text{ cm}^3$$

$$= \frac{10780}{1000}$$

$$= 10.78 \text{ litres}$$

$\dots(\because 1 \text{ litre} = 1000 \text{ cm}^3)$

$\therefore$ **Capacity of the bucket is 10.780 litres**

- (2) The radii of ends of a frustum are 14 cm and 6 cm respectively and its height is 6 cm. Find its
(i) curved surface area (ii) Total surface area
(iii) Volume ($\pi = 3.14$). (4 marks)

Solution :

For a frustum

$$\text{radius of bigger circle } (r_1) = 14 \text{ cm}$$

$$\text{radius of smaller circle } (r_2) = 6 \text{ cm}$$

$$\text{height } (h) = 6 \text{ cm}$$

$$\begin{aligned} \text{Slant height of the frustum } (l) &= \sqrt{h^2 + (r_1 - r_2)^2} \\ &= \sqrt{6^2 + (14 - 6)^2} \\ &= \sqrt{6^2 + 8^2} \\ &= \sqrt{36 + 64} \\ &= \sqrt{100} \\ &= 10 \text{ cm} \end{aligned}$$

...(Taking square roots)

$$\begin{aligned} \text{(i) Curved surface area of the frustum} &= \pi (r_1 + r_2) l \\ &= 3.14 \times (14 + 6) \times 10 \\ &= 3.14 \times 20 \times 10 \\ &= 628 \text{ cm}^2 \end{aligned}$$

Curved surface area of the frustum is 628 cm²

$$\begin{aligned} \text{(ii) Total surface area of the frustum} &= \pi (r_1 + r_2) l + \pi r_1^2 + \pi r_2^2 \\ &= 628 + \pi (14^2 + 6^2) \\ &= 628 + \pi (196 + 36) \\ &= 628 + 3.14 \times 232 \\ &= 628 + 728.48 \\ &= 1,356.48 \text{ cm}^2 \end{aligned}$$

Total surface area of the frustum is 1356.48 cm²

$$\begin{aligned} \text{(iii) Volume of the frustum} &= \frac{1}{3} \pi h (r_1^2 + r_2^2 + r_1 \times r_2) \\ &= \frac{1}{3} \times 3.14 \times 6 (14^2 + 6^2 + 14 \times 6) \\ &= 3.14 \times 2 (196 + 36 + 84) \\ &= 3.14 \times 2 \times 316 \\ &= 1,984.48 \text{ cm}^3 \end{aligned}$$

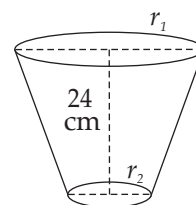
∴ Volume of the frustum is 1,984.48 cm³

- (3) The circumferences of circular faces of a frustum are 132 cm and 88 cm and its height is 24 cm. To find curved surface area of frustum complete the following activity. ($\pi = \frac{22}{7}$) (3 marks)

Solution :

For the frustum

$$\text{Circumference}_1 = 2 \pi r_1 = 132$$



$$\therefore r_1 = \frac{132}{2\pi} = 21 \text{ cm}$$

$$\text{Circumference}_2 = 2 \pi r_2 = 88$$

$$\therefore r_2 = \frac{88}{2\pi} = 14 \text{ cm}$$

$$\begin{aligned} \text{Slant height of the frustum } (l) &= \sqrt{h^2 + (r_1 - r_2)^2} \\ &= \sqrt{(24)^2 + (21 - 14)^2} \\ &= \sqrt{(24)^2 + (7)^2} \\ l &= 25 \text{ cm} \end{aligned}$$

$$\begin{aligned} \text{Curved surface area of frustum} &= \pi (r_1 + r_2) l \\ &= \pi \times 35 \times 25 \\ &= 2,750 \text{ sq. cm.} \end{aligned}$$

Problem Set - 7 (Textbook Pg No. 161)

- (2) A washing tub in the shape of a frustum of a cone has height 21 cm. The radii of the circular top and bottom are 20 cm and 15 cm respectively. What is the capacity of the tub? ($\pi = \frac{22}{7}$) (3 marks)

Solution :

For frustum shaped tub,

$$r_1 = 20 \text{ cm}, r_2 = 15 \text{ cm}, h = 21 \text{ cm}$$

Quantity of water that can be contained in the tub

= Inner volume of tub

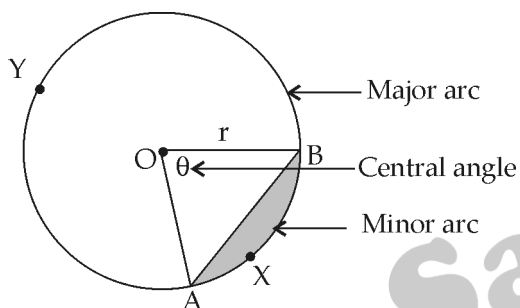
$$\begin{aligned} &= \frac{1}{3} \pi \times h (r_1^2 + r_2^2 + r_1 \times r_2) \\ &= \frac{1}{3} \times \frac{22}{7} \times 21 (20^2 + 15^2 + 20 \times 15) \\ &= 22 (400 + 225 + 300) \\ &= 22 \times 925 \\ &= 20,350 \text{ cm}^3 \\ &= \frac{20350}{1000} \text{ litres} \quad [\because 1 \text{ litres} = 1000 \text{ cm}^3] \\ &= 20.35 \text{ litres} \end{aligned}$$

∴ Quantity of water that can be contained in the tub is 20.35 litres



Points to Remember:

Now we will study how to find some measurements related to circle



Circle : Arc, Sector, Segment

Area of sector :

Sector of a circle is the part of the circle enclosed by two radii of the circle and their intercepted arc. (i.e. arc between the two ends of radii)

$$\text{Area of the sector (A)} = \frac{\theta}{360} \times \pi r^2$$

Length of an arc :

Length of an arc of a circle (arc length) is the distance along the curved line making up the arc.

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

Relation between the area of the sector and the length of an arc :

Activity I :

(Textbook page no. 154)

$$\text{Area of a sector, (A)} = \frac{\theta}{360} \times \pi r^2 \quad \dots(i)$$

$$\begin{aligned} \text{Length of the arc, (l)} &= \frac{\theta}{360} \times 2\pi r \\ \therefore &= \frac{\theta}{360} = \frac{l}{2\pi r} \quad \dots(ii) \end{aligned}$$

$$\therefore A = \frac{l}{2\pi r} \times \pi r^2 \quad \dots[\text{From (i) and (ii)}]$$

$$\therefore A = \frac{l}{2} r = \frac{lr}{2}$$

$$\therefore \text{Area of the sector} = \frac{\text{Length of the arc} \times \text{Radius}}{2}$$

$$\text{Similarity} = \frac{A}{\pi r^2} = \frac{l}{2\pi r} = \frac{\theta}{360}$$

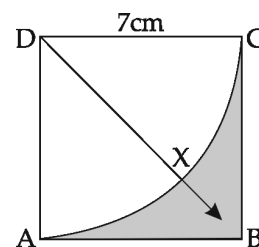
Area of circle = A (minor sector O - AXB) + A (major sector O - AYB)

Activity II :

(Textbook page no. 154)

In the figure given, side of square ABCD is 7 cm with centre D and radius DA. Sector D - AXC is

drawn. Fill in the following boxes properly and find out the area of the shaded region.



Solution :

$$\text{Area of a square} = (\text{side})^2$$

$$= 7^2$$

$$= 49 \text{ cm}^2$$

$$\text{Area of sector (D - AXC)} = \frac{\theta}{360} \times \pi r^2$$

$$= \frac{90}{360} \times \frac{22}{7} \times 7^2$$

$$= 38.5 \text{ cm}^2$$

$$A (\text{shaded region}) = A \square ABCD - A \text{ sector (D - AXC)}$$

$$= 49 \text{ cm}^2 - 38.5 \text{ cm}^2$$

$$= 10.5 \text{ cm}^2$$

Practice Set - 7.3 (Textbook Page No. 154)

- (1) Radius of a circle is 10 cm. Measure of an arc of the circles 54° . Find the area of the sector associated with the arc. ($\pi = 3.14$) (2 marks)

Solution :

For the sector, $r = 10 \text{ cm}$, $\theta = 54^\circ$

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

$$= \frac{54}{360} \times 3.14 \times 10 \times 10$$

$$= \frac{3}{20} \times 314$$

$$= \frac{942}{20}$$

$$= 47.1 \text{ cm}^2$$

$$\therefore \text{Area of the sector is } 47.1 \text{ cm}^2$$

- (2) Measure of an arc of a circle is 80 cm and its radius is 18 cm. Find the length of the arc ($\pi = 3.14$) (2 marks)

Solution :

For a sector, $r = 18 \text{ cm}$, $\theta = 80$

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

$$= \frac{80}{360} \times 2 \times 3.14 \times 18$$

$$= 3.14 \times 8$$

$$= 25.12 \text{ cm}$$

$$\therefore \text{Length of the arc is } 25.12 \text{ cm}$$

- (3) Radius of a sector of a circle is 3.5 cm and length of its arc is 2.2 cm. Find the area of the sector. (1 mark)

Solution :

For the sector, $r = 3.5$ cm, length of arc (l) = 2.2 cm

$$\begin{aligned}\text{Area of the sector} &= l \times \frac{r}{2} \\ &= 2.2 \times \frac{3.5}{2} \\ &= 3.85 \text{ cm}^2\end{aligned}$$

∴ **Area of the sector is 3.85 cm²**

- (4) Radius of a circle is 10 cm. Area of a sector of the circle is 100 cm². Find the area its corresponding major sector. ($\pi = 3.14$) (2 marks)

Solution :

For the circle, $r = 10$ cm

Area of minor sector = 100 cm²

$$\begin{aligned}\text{Area of the circle} &= \pi r^2 \\ &= 3.14 \times 10 \times 10 \\ &= 314 \text{ cm}^2\end{aligned}$$

Area of a major circle =

$$\begin{aligned}\text{Area of the circle} - \text{Area of corresponding minor sector} \\ &= 314 - 100 \\ &= 214 \text{ cm}^2\end{aligned}$$

∴ **Area of the major sector is = 214 cm²**

- (5) Area of a sector of a circle of radius 15 cm is 30 cm². Find the length of the arc of the sector (2 marks)

Solution :

For the circle, $r = 15$ cm

Area of the sector = 30 cm²

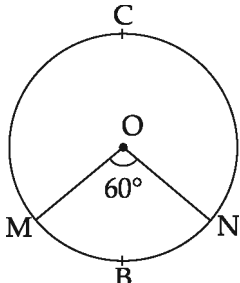
$$\text{Area of the sector} = \text{Length of arc} \times \frac{r}{2}$$

$$\therefore 30 = \text{Length of arc} \times \frac{15}{2}$$

$$\therefore \text{Length of arc} = \frac{30 \times 2}{15}$$

$$\therefore \text{Length of arc} = 4 \text{ cm}$$

∴ **Length of the arc is 4 cm**

- (6)  In the adjoining figure, the radius of the circle is 7 cm and $m(\text{arc MBN}) = 60^\circ$. Find (i) Area of the circle (ii) A (O – MBN) (iii) A (O – MCN) (3 marks)

Solution :

For the circle, $r = 7$ cm

$m(\text{arc MBN}) = \theta = 60^\circ$

$$\begin{aligned}\text{(i) Area of the circle} &= \pi r^2 \\ &= \frac{22}{7} \times 7 \times 7 \\ &= 154 \text{ cm}^2\end{aligned}$$

Area of the circle is 154 cm²

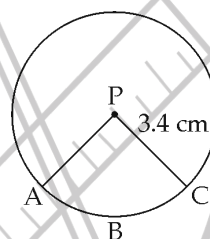
$$\begin{aligned}\text{(ii) A (sector O – MBN)} &= \frac{\theta}{360} \times \pi r^2 \\ &= \frac{60}{360} \times 154 \\ &= \frac{1}{6} \times 154 \\ &= 25.67 \text{ cm}^2\end{aligned}$$

A (sector O – MBN) is 25.67 cm²

$$\begin{aligned}\text{(iii) A (sector O – MCN)} &= \\ \text{Area of the circle} - \text{A (sector O – MBN)} \\ &= 154 - 25.67 \\ &= 128.33 \text{ cm}^2\end{aligned}$$

A (sector O – MCN) is 128.33 cm²

(7)



In the adjoining figure, radius of circle is 3.4 cm and perimeter of sector P–ABC is 12.8 cm. Find A(P–ABC). (2 marks)

Solution :

For the circle, $r = 3.4$ cm

perimeter of sector P–ABC = 12.8 cm

P(P–ABC) = Length of arc (l) + r + r

$$\therefore 12.8 = l + 3.4 + 3.4$$

$$\therefore 12.8 - 6.8 = l$$

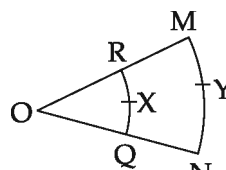
$$\therefore l = 6 \text{ cm}$$

$$\begin{aligned}\text{Area of the sector} &= l \times \frac{r}{2} \\ &= 6 \times \frac{3.4}{2} \times 7 \times 7\end{aligned}$$

$$\text{Area of the sector} = 10.2 \text{ cm}^2$$

Area of the sector is 10.2 cm²

(8)



In the adjoining figure, 'O' is centre of arcs. $\angle ROQ = \angle MON = 60^\circ$, $OR = 7$ cm, $OM = 21$ cm. Find the lengths of arc RXQ and arc MYN. ($\pi = \frac{22}{7}$) (3 marks)

Solution :

- (i) For arc RXQ, $\theta = \angle ROQ = 60^\circ$
 $OR (r) = 7$ cm

$$\begin{aligned}\text{Length of arc RXQ} &= \frac{\theta}{360} \times 2\pi r \\ &= \frac{60}{360} \times 2 \times \frac{22}{7} \times 7 \\ &= 7.33 \text{ cm}\end{aligned}$$

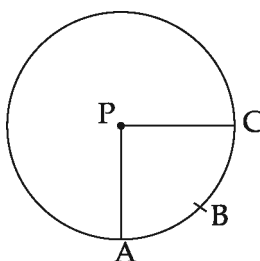
Length of arc RXQ is 7.33 cm

- (ii) For arc MYN, OM (r) = 21 cm, $\theta = \angle \text{MON} = 60^\circ$

$$\begin{aligned}\text{Length of arc MYN} &= \frac{\theta}{360} \times 2\pi r \\ &= \frac{60}{360} \times 2 \times \frac{22}{7} \times 21 \\ &= 22 \text{ cm}\end{aligned}$$

Length of arc (MYN) is 22 cm

(9)



In the adjoining figure A (P - ABC) = 154 cm² and radius of the circle is 14 cm. Find (i) $\angle \text{APC}$ (ii) l (arc ABC).

(3 marks)

Solution :

Region P - ABC is a sector

$$A (\text{P - ABC}) = \frac{\theta}{360} \times \pi r^2$$

$$\therefore 154 = \frac{\theta}{360} \times \frac{22}{7} \times 14 \times 14$$

$$\therefore \frac{154 \times 360 \times 7}{22 \times 14 \times 14} = \theta$$

$$\therefore \theta = 90^\circ$$

$$\therefore \angle \text{APC} = 90^\circ$$

$$\text{length of arc ABC} = \frac{\theta}{360} \times 2\pi r$$

$$= \frac{90}{360} \times 2 \times \frac{22}{7} \times 14$$

$$\text{length of arc ABC} = 22 \text{ cm}$$

$$\therefore l (\text{arc ABC}) \text{ is } 22 \text{ cm}$$

- (10) Radius of a sector of a circle is 7 cm. If measure of arc of the sector is (1) 30° (2) 210° (3) three right angles; find the area of the sector in each case

(3 marks)

Solution :

For the circle, $r = 7 \text{ cm}$

- (i) For the sector, $\theta = 30^\circ$

$$\begin{aligned}\text{Area of sector} &= \frac{\theta}{360} \times \pi r^2 \\ &= \frac{30}{360} \times \frac{22}{7} \times 7 \times 7 \\ &= 12.83\end{aligned}$$

$$\therefore \text{Area of the sector is } 12.83 \text{ cm}^2$$

- (ii) For the sector, $\theta = 210^\circ$

$$\begin{aligned}\text{Area of sector} &= \frac{\theta}{360} \times \pi r^2 \\ &= \frac{210}{360} \times \frac{22}{7} \times 7 \times 7 \\ &= 89.83\end{aligned}$$

$$\therefore \text{Area of sector is } 89.83 \text{ cm}^2$$

- (iii) For the sector, $\theta = 3 \text{ right angles} = 3 \times 90^\circ = 270^\circ$

$$\begin{aligned}\text{Area of sector} &= \frac{\theta}{360} \times \pi r^2 \\ &= \frac{270}{360} \times \frac{22}{7} \times 7 \times 7 \\ &= 115.5\end{aligned}$$

$$\therefore \text{Area of the sector is } 115.50 \text{ cm}^2$$

- (11) The area of a minor sector of a circle is 3.85 cm² and the measure of its central angle is 36° . Find the radius of the circle. (2 marks)

Solution :

For the sector, Area = 3.85 cm², $\theta = 36^\circ$

$$A = \frac{\theta}{360} \times \pi r^2$$

$$\therefore 3.85 = \frac{36}{360} \times \frac{22}{7} \times r^2$$

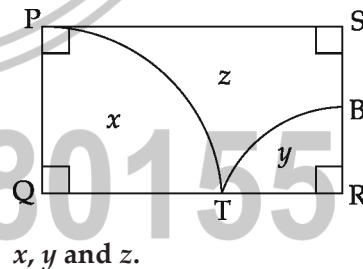
$$\therefore \frac{3.85 \times 360 \times 7}{36 \times 22} = r^2$$

$$\therefore r^2 = 12.25$$

$$\therefore r = 3.5 \text{ cm}$$

$$\therefore \text{Radius of the circle is } 3.5 \text{ cm}$$

(12)



In the adjoining figure, $\square \text{PQRS}$ is a rectangle. PQ = 14 cm, QR = 21 cm, find the areas of the parts x, y and z. (4 marks)

Solution :

$\square \text{PQRS}$ is a rectangle with $l = 21 \text{ cm}$ and $b = 14 \text{ cm}$

$$\begin{aligned}A (\square \text{PQRS}) &= l \times b \\ &= 21 \times 14\end{aligned}$$

$$A (\square \text{PQRS}) = 294 \text{ cm}^2 \quad \dots(i)$$

For region x ie. for sector Q - PT,

$$r = 14 \text{ cm}, \theta = 90^\circ$$

$$\begin{aligned}A (\text{region x}) &= A (\text{sector Q - PT}) \\ &= \frac{\theta}{360} \times \pi r^2\end{aligned}$$

$$= \frac{90}{360} \times \frac{22}{7} \times 14 \times 14$$

$$= 154 \text{ cm}^2$$

A (region x) is 154 cm² ... (ii)

QP = QT ... (Radii of the same circle)

∴ QT = 14 cm ... (iii)

QR = QT + RT ... (Q - T - R)

∴ 21 = 14 + RT ... (From (iii) and given)

∴ RT = 21 - 14 = 7 cm ... (iv)

For region y i.e. for (sector R - B T)

$r_1 = 7 \text{ cm}$, $\theta = 90^\circ$

A (region y) = A (sector R - B T)

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

$$= \frac{90}{360} \times \frac{22}{7} \times 7 \times 7$$

$$= 38.5 \text{ cm}^2$$

A (region y) is 38.5 cm²

A (rectangle PQRS) =

A (region x) + A (region y) + A (region z) [Area addition property]

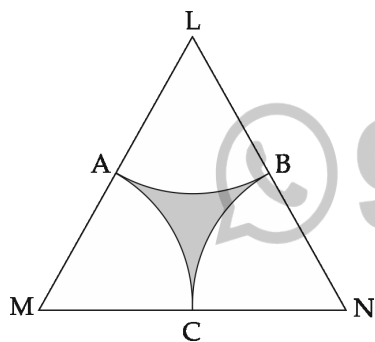
$$294 = 154 + A (\text{region z}) + 38.5$$

$$A (\text{region z}) = 294 - 154 - 38.5 \quad [\text{From (i), (ii) and (iv)}]$$

$$= 101.5 \text{ cm}^2$$

A (region z) is 101.5 cm²

(13)



ΔLMN is an equilateral triangle. LM = 14 cm. As shown in the figure, three sectors are drawn with vertices as centre and radius 7 cm. Find,

- (i) A (ΔLMN) (ii) Area of any one of the sectors.
(iii) Total area of all the three sectors (iv) Area of the shaded region. (4 marks)

Solution :

- (i) ΔLMN is an equilateral triangle with side 14 cm

$$A (\Delta LMN) = \frac{\sqrt{3}}{4} \times \text{side}^2$$

$$= \frac{1.73}{4} \times 14 \times 14$$

$$= 87.77 \text{ cm}^2$$

A (ΔLMN) is 84.77 cm² ... (i)

- (ii) For sector L - AB, $r = 7 \text{ cm}$

$\theta = 60^\circ$ (Angle of an equilateral triangle)

$$A (\text{sector L - AB}) = \frac{\theta}{360} \times \pi r^2$$

$$= \frac{60}{360} \times \frac{22}{7} \times 7 \times 7$$

$$= \frac{77}{3}$$

$$\therefore A (\text{sector L - AB}) = 25.67 \text{ cm}^2$$

∴ **Area of a sector is 25.67 cm²**

- (iii) For all three sectors, radii and central angles are equal

∴ Area of all sectors are equal.

∴ Total of areas of all three sectors =

$$3 \times A (\text{sector A - LB})$$

$$= 3 \times \frac{77}{3}$$

$$= 77 \text{ cm}^2$$

∴ **Total areas of all three sectors = 77 cm²**

- (iv) Area of the shaded region =

$$A (\Delta LMN) - \text{Area of three sectors}$$

$$= 84.77 - 77 \quad \dots [\text{From (i) and (ii)}]$$

$$= 7.77 \text{ cm}^2$$

∴ **Area of the shaded region is 7.77 cm²**

Problem Set - 7 (Textbook Pg No. 161)

- (9) The area of a sector of a circle of 6 cm radius is 15π sq. cm. Find the measure of the arc and length of the arc corresponding to the sector. (3 marks)

Solution :

For the sector,

$$\text{Radius (r)} = 6 \text{ cm}$$

$$\text{Area of the sector} = 15\pi \text{ cm}^2$$

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

$$\therefore 15\pi = \frac{\theta}{360} \times \pi \times 6 \times 6$$

$$\therefore \frac{15\pi \times 360}{\pi \times 6 \times 6} = \theta$$

$$\therefore \theta = 150$$

∴ **Measure of the arc is 150°**

Area of the sector =

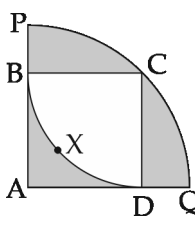
$$\text{Length of corresponding arc } (l) \times \frac{r}{2}$$

$$\therefore 15\pi = l \times \frac{6}{2}$$

$$\therefore \frac{15\pi \times 2}{6} = l$$

$$\therefore 5\pi = l$$

Length of the corresponding arc is 5π cm

- (11)  In the adjoining figure, square ABCD is inscribed in the sector A-PCQ. The radius of sector C-BXD is 20 cm. Complete the following activity to find the area of shaded region. (4 marks)

Solution :

Side of square ABCD = Radius of sector

$$C - BXD = 20 \text{ cm}$$

$$\text{Area of square} = (\text{side})^2 = 20^2 = 400 \text{ sq cm} \dots(i)$$

Area of shaded region inside the square

$$= A(\text{square ABCD}) - A(\text{sector C - BXD})$$

$$= 400 - \frac{\theta}{360} \times \pi r^2$$

$$= 400 - \frac{90}{360} \times \frac{3.14}{1} \times \frac{400}{1}$$

$$= 400 - 314$$

$$= 86 \text{ sq cm}$$

Radius of bigger sector = Length of diagonal of square ABCD

$$= 20\sqrt{2} \text{ cm}$$

Area of shaded portion outside square within bigger sector

$$= A(A - PCQ) - A(\square ABCD)$$

$$= \frac{\theta}{360} \times \pi r^2 - (\text{side})^2$$

$$= \frac{90}{360} \times 3.14 \times (20\sqrt{2})^2 - (20)^2$$

$$= 628 - 400$$

$$= 228$$

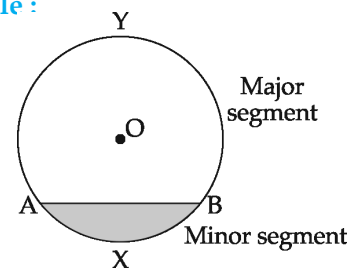
$$\therefore \text{Total Area of the shaded region} = 86 + 228 = 314 \text{ sq cm}$$



Points to Remember:

Segment of a circle :

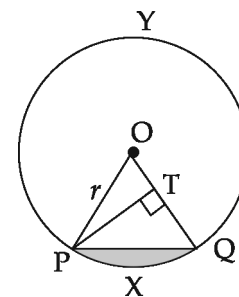
A segment of a circle is the region bounded by a chord and an arc.



Minor segment: The area enclosed by a chord and its corresponding minor arc is called a minor segment. In the figure, segment AXB is a minor segment.

Major segment: The area enclosed by a chord and its corresponding minor arc is called a major segment. In the figure, segment AYB is a major segment.

Area of a segment :



$$A(\text{segment PXQ}) = A(O - PXQ) - A(\triangle OPQ)$$

$$= \frac{\theta}{360} \times \pi r^2 - A(\triangle OPQ) \dots(i)$$

Seg PT $\perp$ radius OQ,

$$\text{In } \triangle OPT, \sin \theta = \frac{PT}{OP}$$

$$\therefore PT = OP \sin \theta$$

$$\therefore PT = r \times \sin \theta (\because OP = r)$$

$$A(\triangle OPQ) = \frac{1}{2} \times \text{base} \times \text{height}$$

$$= \frac{1}{2} \times OQ \times PT$$

$$= \frac{1}{2} \times r \times r \sin \theta$$

$$= \frac{1}{2} \times r^2 \sin \theta \dots(ii)$$

$$\therefore A(\text{segment PXQ}) = \frac{\theta}{360} \times \pi r^2 - \frac{1}{2} r^2 \sin \theta \dots[\text{From (i) and (ii)}]$$

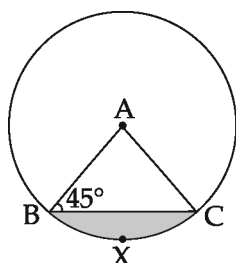
$$= r^2 \left[\frac{\pi \theta}{360} - \frac{\sin \theta}{2} \right]$$

Also,

Area of circle = A(minor seg PXQ) + A(major seg PRQ)

Practice Set - 7.4 (Textbook Page No. 159)

(1)



In the adjoining figure, is the centre of the circle. $\angle ABC = 45^\circ$ and $AC = 7\sqrt{2}$ cm. Find the area of segment BXC. ($\pi = 3.14$, $\sqrt{2} = 1.41$)

(3 marks)

Solution :

In $\triangle ABC$, $AB = AC$... (Radii of same circle)
 $\therefore \angle ABC = \angle ACB$... (Isosceles triangle theorem)
 But $\angle ABC = 45^\circ$... (given)

$\therefore \angle ACB = 45^\circ$... (i)

In $\triangle ABC$, $\angle ACB = \angle ABC = 45^\circ$... [From (i) and given]

$\therefore \angle BAC = 90^\circ$... (Remaining angle of $\triangle ABC$)

For segment BXC, $\theta = 90^\circ$, $r = 7\sqrt{2}$ cm

$$\text{Arc of segment BXC} = r^2 \left[\frac{\pi\theta}{360} - \frac{\sin\theta}{2} \right]$$

$$= (7\sqrt{2})^2 \left[\frac{3.14 \times 90}{360} - \frac{\sin 90}{2} \right]$$

$$= (7\sqrt{2})^2 \left[\frac{3.14 \times 90}{360} - \frac{\sin 90}{2} \right]$$

$$= 98 \times \left[\frac{1.57}{2} - \frac{1}{2} \right]$$

$$= 98 \times \left[\frac{1.57 - 1}{2} \right]$$

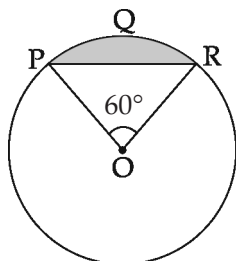
$$= 98 \times \frac{0.57}{2}$$

$$= 49 \times 0.57$$

$$= 27.93$$

$\therefore$ Arc of segment BXC is 27.93 sq cm

(2)



In the adjoining figure, point 'O' is the centre of the circle, $m(\text{arc PQR}) = 60^\circ$, $OP = 10$ cm. Find the area of the shaded portion. ($\pi = 3.14$, $\sqrt{3} = 1.73$)

(3 marks)

Solution :

$m(\text{arc PQR}) = m\angle POR$... (Definition of measure of minor arc)

$m\angle PQR = 60^\circ$... (i)

For segment PQR, $r = OP = 10$ cm

$\theta = m\angle POR = 60^\circ$ [From (i)]

Area of shaded portion = A (segment PQR)

$$= r^2 \left[\frac{\pi\theta}{360} - \frac{\sin\theta}{2} \right]$$

$$= 10 \times 10 \left[\frac{3.14 \times 60}{360} - \frac{\sin 60}{2} \right]$$

$$= 100 \left[\frac{3.14}{6} - \frac{\sqrt{3}}{2 \times 2} \right]$$

$$= 100 \left[\frac{3.14 \times 2}{6 \times 2} - \frac{1.73 \times 3}{4 \times 3} \right]$$

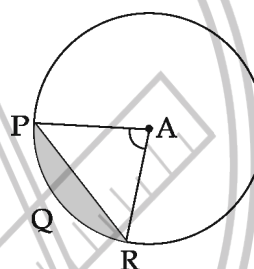
$$= 100 \left[\frac{6.28 - 5.19}{12} \right]$$

$$= 100 \times \frac{1.09}{12}$$

$$= 9.08 \text{ cm}^2$$

$\therefore$ Area of shaded portion = 9.08 cm²

(3)



In the adjoining figure, if A is the centre of the circle. $\angle PAR = 30^\circ$ $AP = 7.5$, find the area of segment PQR. ($\pi = 3.14$)

(3 marks)

Solution :

For segment PQR, $r = AP = 7.5$ units

$\theta = \angle PAR = 30^\circ$

$$A(\text{segment PQR}) = r^2 \left[\frac{\pi\theta}{360} - \frac{\sin\theta}{2} \right]$$

$$= (7.5)^2 \left[\frac{3.14 \times 30}{360} - \frac{\sin 30}{2} \right]$$

$$= 56.25 \left[\frac{3.14}{12} - \frac{1}{2 \times 2} \right]$$

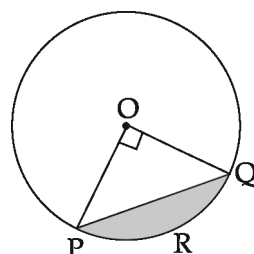
$$= 56.25 \left[\frac{3.14 - 3}{12} \right]$$

$$= 56.25 \times \frac{0.14}{12}$$

$$= 0.66$$

$\therefore$ A (segment PQR) is 0.66 sq. units

(4)



In the adjoining figure, if O is the centre of the circle, PQ is a chord. $\angle POQ = 90^\circ$, area of shaded region is 114 cm², find the radius of the circle ($\pi = 3.14$)

(3 marks)

Solution :

For segment PRQ, $\theta = \angle POQ = 90^\circ$

A (segment PRQ) = 114 cm^2

$$A (\text{segment PQR}) = r^2 \left[\frac{\pi\theta}{360} - \frac{\sin\theta}{2} \right]$$

$$\therefore 114 = r^2 \left[\frac{3.14 \times 90}{360} - \frac{\sin 90}{2} \right]$$

$$\therefore 114 = r^2 \left[\frac{3.14}{4} - \frac{1}{2} \right]$$

$$\therefore 114 = r^2 \left[\frac{1.57 - 1}{2} \right]$$

$$\therefore 114 = r^2 \left[\frac{0.57}{2} \right]$$

$$\therefore \frac{114 \times 2}{0.57} = r^2$$

$$\therefore r^2 = \frac{114 \times 2 \times 100}{57}$$

$$\therefore r^2 = 2 \times 2 \times 10 \times 10$$

$$\therefore r = 20 \quad \dots (\text{Taking square roots})$$

Radius of the circle is 20 cm

- (5) A chord PQ of a circle with radius 15 cm subtends an angle of 60° with the centre of the circle. Find the area of the minor as well as the major segment. ($\pi = 3.14$, $\sqrt{3} = 1.73$) (4 marks)

Solution :

For minor segment, $r = 15 \text{ cm}$ and $\theta = 60^\circ$

$$\text{Area of minor segment} = r^2 \left[\frac{\pi\theta}{360} - \frac{\sin\theta}{2} \right]$$

$$= 15 \times 15 \left[\frac{3.14 \times 60}{360} - \frac{\sin 60}{2} \right]$$

$$= 225 \times \left[\frac{3.14}{6} - \frac{\sqrt{3}}{2 \times 2} \right]$$

$$= 225 \times \left[\frac{3.14 \times 2}{6 \times 2} - \frac{1.73 \times 3}{4 \times 3} \right]$$

$$= 225 \times \left[\frac{6.28 - 5.19}{12} \right]$$

$$= 225 \times \frac{1.09}{12}$$

$$= 20.44$$

Area of minor segment is 20.44 cm^2

Area of circle = πr^2

$$= 3.14 \times 15 \times 15$$

$$= 706.5 \text{ cm}^2$$

Area of the circle is 706.5 cm^2

Area of major segment =

Area of circle – Area of minor segment

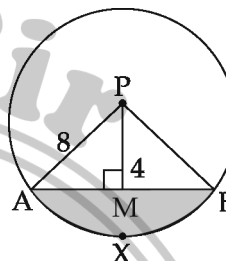
$$= 706.5 - 20.44$$

$$= 686.06 \text{ cm}^2$$

Area of the major segment is 686.06 cm^2

Problem Set - 7 (Textbook Pg No. 161)

(10)



In the adjoining figure, seg AB is a chord of a circle with centre P. If $PA = 8 \text{ cm}$ and distance of chord AB from the centre P is 4 cm, find the area of the shaded portion. ($\pi = 3.14$, $\sqrt{3} = 1.73$) (4marks)

Solution :

Radius of the circle is = 8 cm ... (i) (Given)

i.e. $PA = 8 \text{ cm}$

seg $PM \perp$ chord AB, $A - M - B$... (ii)

Distance of the chord AB from the centre P is 4 cm

i.e. $PM = 4 \text{ cm}$... (iii)

In $\triangle PMA$, $\angle PMA = 90^\circ$... [From (ii)]

$$PM = \frac{1}{2} PA \quad \dots [\text{From (i) and (iii)}]$$

$\therefore \angle PAM = 30^\circ$... (iv) (Converse of $30^\circ - 60^\circ - 90^\circ$ theorem)

In $\triangle PMA$, $\angle PMA = 90^\circ$... [From (ii)]

$\angle PAM = 30^\circ$... [From (iv)]

$\angle APM = 60^\circ$... (v) (Remaining angle of triangle)

Similarly, we can prove. $\angle BPM = 60^\circ$... (vi)

$\angle APB = \angle APM + \angle BPM$... (Angle addition property)

$$\therefore \angle APB = 60^\circ + 60^\circ \quad \dots [\text{From (v) and (vi)}]$$

$$\therefore \angle APB = 120^\circ \quad \dots (\text{vii})$$

For sector (P – AXB)

$$\theta = \angle APB = 120^\circ$$

$$r = 8 \text{ cm}$$

$$\text{Area (sector P – AXB)} = \frac{\theta}{360} \times \pi r^2$$

$$\therefore \text{Area (sector P – AXB)} = \frac{120}{360} \times 3.14 \times 8 \times 8$$

$$\text{Area (sector P – AXB)} = 66.99 \text{ sq cm} \quad \dots (\text{viii})$$

$\triangle PMA$ is $30^\circ - 60^\circ - 90^\circ$ triangle ... [From (ii), (iv) and (v)]

$$AM = \frac{\sqrt{3}}{2} \times PA \quad \dots (\text{Side opposite to } 30^\circ)$$

$$AM = \frac{\sqrt{3}}{2} \times 8 = 4\sqrt{3} \text{ cm} \quad \dots(\text{ix})$$

seg PM $\perp$ chord AB [From (i)]

$\therefore AB = 2AM$ (Perpendicular drawn from the centre to the chord bisects the chord)

$$AB = 2 \times 4\sqrt{3} \text{ cm} \quad \dots[\text{From (ix)}]$$

$$AB = 8\sqrt{3} \text{ cm} \quad \dots(\text{x})$$

$$A(\Delta PAB) = \frac{1}{2} \times \text{base} \times \text{height}$$

$$= \frac{1}{2} \times AB \times PM$$

$$= \frac{1}{2} \times 8\sqrt{3} \times 4$$

$$= 16\sqrt{3}$$

$$= 16 \times 1.73$$

$$A(\Delta PAB) = 27.68 \text{ sq cm} \quad \dots(\text{xi})$$

$$A(\text{sector P} - \text{AXB}) =$$

$$A(\Delta PAB) + A(\text{segment AXB})$$

...(Area addition property)

$$\therefore 66.99 = 27.68 + A(\text{segment AXB}) \quad \dots[\text{From (viii) and (xi)}]$$

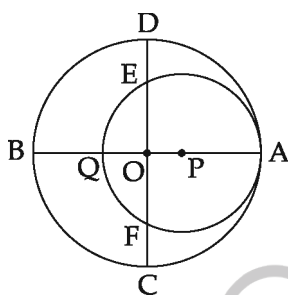
$$\therefore A(\text{segment AXB}) = 66.99 - 27.68$$

$$A(\text{segment AXB}) = 39.28 \text{ sq. cm}$$

$$\text{Area of shaded portion} = A(\text{seg PXB}) = 39.28 \text{ sq. cm}$$

$$\therefore \text{Area of the shaded portion is } 39.28 \text{ sq cm.}$$

(12)



In the adjoining figure, two circles with centres O and P are touching internally at point A. If BQ = 9, DE = 5, complete the following activity to find the radii of the circles. (4 marks)

Solution :

Let the radius of the bigger circle be R and the radius of the smaller circle be r

OA, OB, OC and OD are radii of the bigger circle.

$$\therefore OA = OB = OC = OD = R$$

$$PQ = PA = r$$

$$OQ = OB - BQ = R - 9$$

$$OE = OD - DE = R - 5$$

As the chords QA and EF of the circle with centre P intersect in the interior of the circle, so by the property of internal division of two chords of a circle,

$$OQ \times OA = OE \times OF$$

$$\dots(\because OE = OF)$$

$$(R - 9) \times R = (R - 5) \times (R - 5)$$

$$R^2 - 9R = R^2 - 10R + 25$$

$$-9R = -10R + 25$$

$$-9R + 10R = 25$$

$$\therefore R = 25 \text{ units}$$

$$AQ = 2r = AB - BQ$$

$$\therefore 2r = 50 - 9 = 41$$

$$\therefore r = \frac{41}{2} = 20.5$$

Problem Set - 7 (Textbook Pg No. 161)

MCQ's

Choose the correct alternative answer for each of the following questions. (1 mark each)

(1) The ratio of circumference and area of a circle is 2 : 7. Find its circumference.

- (A) 14π (B) $\frac{7}{\pi}$ (C) 7π (D) $\frac{14}{\pi}$

(2) If measure of an arc of circle is 160° and its length is 44 cm, find the circumference of the circle.

- (A) 66 cm (B) 44 cm (C) 160 cm (D) 99 cm

(3) Find the perimeter of a sector of a circle if its measure is 90° and radius is 7 cm.

- (A) 44 cm (B) 25 cm (C) 36 cm (D) 56 cm

(4) Find the curved surface area of a cone of radius 7 cm and height 24 cm.

- (A) 440 cm^2 (B) 550 cm^2 (C) 330 cm^2 (D) 110 cm^2

(5) The curved surface area of a cylinder is 440 cm^2 and its radius is 5 cm. Find its height.

- (A) $\frac{44}{\pi} \text{ cm}$ (B) $22\pi \text{ cm}$ (C) $44\pi \text{ cm}$ (D) $\frac{44}{\pi} \text{ cm}$

(6) A cone was melted and cast into a cylinder of the same radius as that of the base of the cone. If the height of the cylinder is 5 cm, find the height of the cone.

- (A) 15 cm (B) 10 cm (C) 18 cm (D) 5 cm

(7) Find the volume of a cube of side 0.01 cm.

- (A) 1 cm^3 (B) 0.001 cm^3
(C) 0.0001 cm^3 (D) 0.000001 cm^3

(8) Find the side of a cube of volume 1 m^3 .

- (A) 1 cm (B) 10 cm (C) 100 cm (D) 1000 cm

Additional MCQ's

In each of the following, choose the correct alternative.

- (9) Vertical surface area of a cuboid is
 (A) $2(l \times b) + h$ (B) $2(l \times b) \times h$
 (C) $2(l + b) + h$ (D) $2(l + b) \times h$
- (10) Total surface area of a cube is 216 cm^2 . Find its volume.
 (A) 36 cm^3 (B) 100 cm^3
 (C) 216 cm^3 (D) 400 cm^3
- (11) The length, breadth, height of cuboid are in the ratio 1:1:2, its total surface area is 1000 cm^2 . Therefore $\therefore$ Its length is
 (A) 10 cm (B) 15 cm (C) 20 cm (D) 12 cm
- (12) A tent is made up of cylinder and mounted by a conical top. In order to calculate its total surface area, find sum of their.
 (A) Volumes (B) Total surface area
 (C) Curved surface area (D) Base areas
- (13) If diameter of a semicircle is 35 cm. Find its length.
 (A) 110 cm (B) 55 cm
 (C) 90 cm (D) 70 cm
- (14) If $r = 7 \text{ cm}$ and $\theta = 180^\circ$. Length of arc is
 (A) 44 cm (B) 22 cm (C) 10 cm (D) 18 cm
- (15) If $r = 7 \text{ cm}$ and $\theta = 36^\circ$ then area of sector is
 (A) 15.4 cm^2 (B) 20.36 cm^2
 (C) 10.46 cm^2 (D) 18.2 cm^2
- (16) Bricks of dimensions $15 \text{ cm} \times 8 \text{ cm} \times 5 \text{ cm}$ are used to build a wall of dimensions $120 \text{ cm} \times 16 \text{ cm} \times 200 \text{ cm}$. How many bricks are used?
 (A) 1280 (B) 640 (C) 160 (D) 320
- (17) If the volume of cylinder is 12436 cm^3 and radius and height of cylinder are in the ratio 2:3, find its height.
 (A) 21 cm (B) 7 cm (C) 14 cm (D) 18 cm
- (18) Find the volume of a right circular cone if $r = 14 \text{ cm}$ and $h = 9 \text{ cm}$.
 (A) 161 cm^3 (B) 2438 cm^3
 (C) 1848 cm^3 (D) 1488 cm^3
- (19) The volume of two spheres are in the ration 8:27, find the ratio of their radii.
 (A) 2:3 (B) 2:9 (C) 1:3 (D) 4:9

ANSWERS

- (1) (A) 14π (2) (D) 99 cm (3) (B) 25 cm (4) (B) 550 cm^2
 (5) (A) $\frac{44}{\pi}$ (6) (A) 15 cm (7) (D) 0.000001 cm^3
 (8) (C) 100 cm (9) (D) $2(l + b) \times h$ (10) (C) 216 cm^3
 (11) (A) 10 cm (12) (C) Curved surface area
 (13) (B) 55 cm (14) (B) 22 cm (15) (A) 15.4 cm^2
 (16) (B) 640 (17) (A) 21 cm (18) (C) 1848 cm^3
 (19) (A) 2:3

PROBLEMS FOR PRACTICE**Based on Practice Set 7.1**

- (1) Two cubes each with 12 cm edge, are joined end to end. Find the surface area of the resulting cuboid. (2 marks)
 (2) A solid cube with edge 'l' was divided exactly into two equal halves. Find the ratio of the total surface area of the given cube and that of the cuboid formed. (3 marks)
 (3) A beam 4 m long, 50 m wide and 20 m deep is made of wood, which weighs 25 kg per m^3 . Find the weight of the beam. (3 marks)
 (4) A fish tank is in the form of a cuboid, external measures of that cuboid are $80 \text{ cm} \times 40 \text{ cm} \times 30 \text{ cm}$. The base, side faces and back face are to be covered with a coloured paper. Find the area of the paper needed. (4 marks)
 (5) The base radii of two right circular cones of the same height are in the ratio 2 : 3. Find ratio of their volumes. (3 marks)
 (6) If the radius of a sphere is doubled, what will be the ratio of its surface area and volume as to that of the first? (4 marks)
 (7) The dimensions of a metallic cuboid are $44 \text{ cm} \times 42 \text{ cm} \times 21 \text{ cm}$. It is molten and recast into a sphere. Find the surface area of the sphere. (4 marks)

Based on Practice Set 7.2

- (8) If the radii of the conical frustum bucket are 14 cm and 7 cm. If its height is 30 cm, then find (i) Its total surface area (ii) capacity of the bucket. (4 marks)
 (9) The slant height of the frustum of the cone is 6.3 cm and the perimeters of its circular bases are 18 cm and 6 cm respectively. Find the curved surface area of the frustum. (4 marks)
 (10) The radii of the circular ends of a frustum of

a cone are 14 cm and 8 cm. If the height of the frustum is 8 cm. Find (i) Curved surface area of the frustum (ii) Total surface area of the frustum (iii) Volume of the frustum. (4 marks)

- (11) The curved surface area of the frustum of a cone is 180 sq cm and the circumference of its circular bases are 18 cm and 6 cm respectively. Find the slant height of the frustum of a cone. (4 marks)

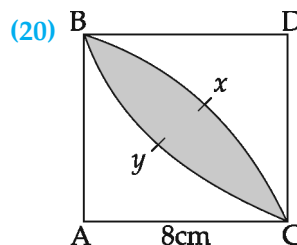
Based on Practice Set 7.3

- (12) A sector of a circle with radius 10 cm has central angle 72° . Find the area of the sector ($\pi = 3.14$) (3 marks)
- (13) If the area of a sector is $\frac{1}{12}$ th of the area of the circle, then what is the measure of the corresponding central angle. (3 marks)
- (14) In a clock, the minute hand is of length 14 cm. Find the area covered by the minute hand in 5 minutes. (3 marks)
- (15) The radius of the circle is 3.5 cm and the area of sector is 3.85 sq cm. Find the measure of the arc of the circle. (3 marks)
- (16) Find the area of the sector of a circle of radius 6 cm and arc with length 15 cm.
- (17) Find the length of the arc of the circle of diameter 8.4 cm with area of the sector 18.48 cm². Also find measure of the arc. (3 marks)

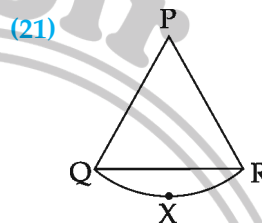
Based on Practice Set 7.4

- (18) Find the area of minor segment of a circle of radius 6 cm when its chord subtends an angle of 60° at its centre. ($\sqrt{3} = 1.73$) (3 marks)

- (19) Area of segment PRQ is 114 sq cm. Chord PQ subtends centre angle $\angle POQ$ measuring 90° . Find the radius of the circle. ($\pi = 3.14$) (3 marks)



In the adjoining figures, arc AXC and arc AYC are drawn with radius 8 cm and centres as point B and point D respectively. Find the area of shaded region if $\square ABCD$ is a square with side 8 cm. (4 marks)



In the adjoining figure, P is the centre of the circle with radius 18 cm. If the area of the ΔPQR is 100 cm². Find the central angle QPR. (4 marks)

ANSWERS

- (1) 1440 sq cm (2) 3 : 2 (3) 10 kg (4) 8000 cm³
- (5) 4 : 9 (6) 4 : 1, 8 : 1 (7) 5544 cm²
- (8) (i) $(770 + 66\sqrt{449})$ sq cm (ii) 10,780 cm³
- (9) 75.6 cm² (10) (i) 690.8 cm² (ii) 157.2 cm² (iii) 3114.88 cm³ (11) 15 cm (12) 62.8 cm² (13) 30°
- (14) 51.33 cm² (15) 36° (16) 45 cm² (17) 8.8 cm, 120°
- (18) 3.29 cm² (19) 20 cm (20) 36.48 cm² (21) 40°



ASSIGNMENT - 7

Time : 1 Hr.

Marks : 20

Q.1. Attempt the following:

(2)

- (1) Find the area of a circle with radius 7 cm.
- (2) Length of arc of a circle, with radius 5 cm, is 10 cm. Find the area of corresponding sector.

Q.2. Attempt the following:

(4)

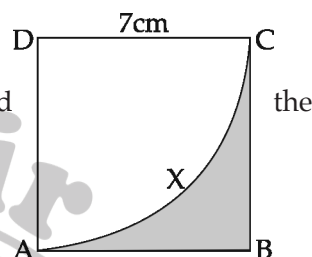
- (1) Find the volume of a sphere of diameter 6 cm. ($\pi = 3.14$)
- (2) Radii of the top and the base of a frustum are 14 cm, 8 cm respectively. Its height is 8 cm. Find its slant height and curved surface area.

Q.3. Attempt any two of the following:**(6)**

- (1) The radius of a circle with centre P is 10 cm. If chord AB of the circle subtends a right angle at P, find the areas of minor segment and the major segment ($\pi = 3.14$)
- (2) The diameter and length of a roller is 120 cm and 84 cm respectively. To level the ground, 200 rotations of the roller are required. Find the expenditure to level the ground at the rate of ₹ 10 per sq. m.
- (3) Complete the following activity to solve the following question

In the adjoining figure, $\square ABCD$ is a square with side 7 cm.

With centre D and radius DA, sector D – AXC is drawn. Find area of shaded portion.



Sol. Area of square = (Formula)

$$= \text{}$$

$$= 49 \text{ cm}^2$$

Area of sector Δ -AXC = (Formula)

$$= \frac{\text{}}{\text{}} \times \frac{22}{7} \times \text{}$$

$$= 38.5 \text{ cm}^2$$

Area of shaded region = A – A

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

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

Q.4. Attempt any two of the following:**(8)**

- (1) A regular hexagon is inscribed in a circle of radius 14 cm. Find the area of the region between the circle and the hexagon.
- (2) The radius of a metallic sphere is 9 cm. It was melted to make a wire of diameter 4 mm. Find the length of the wire.
- (3) The radius and height of a cylindrical water reservoir is 2.8 m and 3.5 m respectively. How much maximum water can the tank hold? A person needs 70 litres of water per day. For how many persons is the water sufficient for a day? ($\pi = \frac{22}{7}$).

