

# Maharashtra Board Solutions for Class 10-Maths (Part 2): Chapter 7- Mensuration



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# Maharashtra Board Solutions for Class 10-Maths (Part 2): Chapter 7- Mensuration

Class 10: Maths Chapter 7 solutions. Complete Class 10 Maths Chapter 7 Notes.

## Maharashtra Board Solutions for Class 10-Maths (Part 2): Chapter 7- Mensuration

Maharashtra Board 10th Maths Chapter 7, Class 10 Maths Chapter 7 solutions

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

**Given:** For the cone,

radius (r) = 1.5 cm,

perpendicular height (h) = 5 cm

**To find:** Volume of the cone.

**Solution:**

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

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$$\begin{aligned} &= \frac{1}{3} \times \frac{22}{7} \times (1.5)^2 \times 5 \\ &= \frac{1}{3} \times \frac{22}{7} \times 1.5 \times 1.5 \times 5 \\ &= \frac{22}{7} \times 0.5 \times 1.5 \times 5 \\ &= 11.785 \text{ cm}^3 \\ &\approx 11.79 \text{ cm}^3 \end{aligned}$$

∴ The volume of the cone is 11.79 cm<sup>3</sup>.

**Question 2. Find the volume of a sphere of diameter 6 cm. [ $\pi = 3.14$ ]**

**Given: For the sphere, diameter (d) = 6 cm**

**To find: Volume of the sphere.**

**Solution:**

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

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

$$= \frac{4}{3} \times 3.14 \times (3)^3$$

$$= 4 \times 3.14 \times 3 \times 3$$

$$= 113.04 \text{ cm}^3$$

∴ The volume of the sphere is 113.04 cm<sup>3</sup>.

**Question 3. Find the total surface area of a cylinder if the radius of its base is 5 cm and height is 40 cm. [ $\pi = 3.14$ ]**

**Given: For the cylinder,**

**radius (r) = 5 cm,**

**height (h) = 40 cm**

**To find: Total surface area of the cylinder.**

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**Solution:**

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

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

$$= 2 \times 3.14 \times 5 \times 45$$

$$= 1413 \text{ cm}^2$$

The total surface area of the cylinder is  $1413 \text{ cm}^2$ .

**Question 4. Find the surface area of a sphere of radius 7 cm.**

**Given:** For the sphere, radius (r) = 7 cm

**To find:** Surface area of the sphere.

**Solution:**

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

$$= 4 \times 227 \times (7)^2$$

$$= 88 \times 7$$

$$= 616 \text{ cm}^2$$

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

**Question 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.**

**Given:** For the cuboid,

length (l) = 44 cm, breadth (b) = 21 cm,

height (h) = 12 cm

For the cone, height (H) = 24 cm

**To find:** Radius of base of the cone (r).

**Solution:**

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Volume of cuboid =  $l \times b \times h$

$$= 44 \times 21 \times 12 \text{ cm}^3$$

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

$$= \frac{1}{3} \times 22 \times r^2 \times 24 \text{ cm}^3$$

Since the cuboid is melted to form a cone,

$\therefore$  volume of cuboid = volume of cone

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

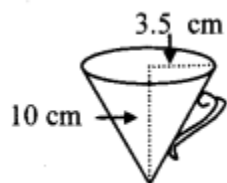
$$\therefore r^2 = \frac{44 \times 21 \times 12 \times 3 \times 7}{22 \times 24}$$

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

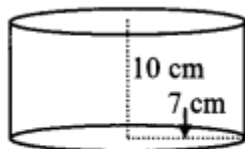
$$\therefore r = 21 \text{ cm} \dots [\text{Taking square root of both sides}]$$

$\therefore$  The radius of the base of the cone is 21 cm.

**Question 6. Observe the measures of pots in the given figures. How many jugs of water can the cylindrical pot hold?**



**Conical water jug**



**Cylindrical water pot**

Given: For the conical water jug,

radius ( $r$ ) = 3.5 cm, height ( $h$ ) = 10 cm

For the cylindrical water pot,

radius ( $R$ ) = 7 cm, height ( $H$ ) = 10 cm

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To find: Number of jugs of water the cylindrical pot can hold.

**Solution:**

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

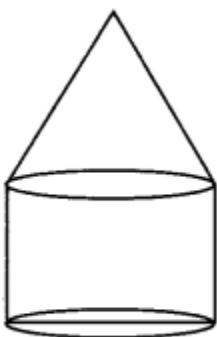
$$\begin{aligned} &= \frac{1}{3} \times \pi \times 3.5^2 \times 10 \\ &= \frac{1}{3} \times 3.5^2 \times 10\pi \text{ cm}^3 \end{aligned}$$

$$\begin{aligned} \text{Volume of cylindrical pot} &= \pi R^2 H \\ &= \pi \times 7^2 \times 10 \\ &= 49 \times 10\pi \text{ cm}^3 \end{aligned}$$

$$\begin{aligned} \text{Number of jugs} &= \frac{\text{Volume of cylindrical pot}}{\text{Volume of conical jug}} \\ &= \frac{49 \times 10\pi}{\frac{1}{3} \times 3.5^2 \times 10\pi} \\ &= \frac{49 \times 3}{3.5 \times 3.5} \\ &= \frac{49 \times 3 \times 100}{35 \times 35} = 12 \end{aligned}$$

$\therefore$  The cylindrical pot can hold 12 jugs of water.

**Question 7.** A cylinder and a cone have equal bases. The height of the cylinder is 3 cm and the area of its base is  $100 \text{ cm}^2$ . The cone is placed up on the cylinder. Volume of the solid figure so formed is  $500 \text{ cm}^3$ . Find the total height of the figure



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Given: For the cylindrical part,

height (h) = 3 cm,

area of the base ( $\pi r^2$ ) = 100 cm<sup>2</sup>

Volume of the entire figure = 500 cm<sup>3</sup>

To find: Total height of the figure.

Solution:

A cylinder and a cone have equal bases.

$\therefore$  they have equal radii.

radius of cylinder = radius of cone = r

Area of base = 100 cm<sup>2</sup>

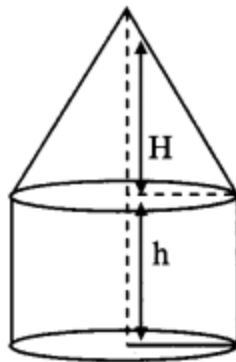
$\therefore \pi r^2 = 100 \dots (i)$

Let the height of the conical part be H.

Volume of the entire figure

= Volume of the entire + Volume of cone

$$\begin{aligned}
 \therefore 500 &= \pi r^2 h + \frac{1}{3} \pi r^2 H \\
 \therefore 500 &= \pi r^2 \left( h + \frac{H}{3} \right) \\
 \therefore 500 &= 100 \left( 3 + \frac{H}{3} \right) \dots [\text{From (i)}] \\
 \therefore 3 + \frac{H}{3} &= \frac{500}{100} \\
 \therefore 3 + \frac{H}{3} &= 5 \\
 \therefore \frac{H}{3} &= 5 - 3 \\
 \therefore \frac{H}{3} &= 2 \\
 \therefore H &= 6 \text{ cm}
 \end{aligned}$$



$\therefore$  Height of conical part (H) = 6 cm

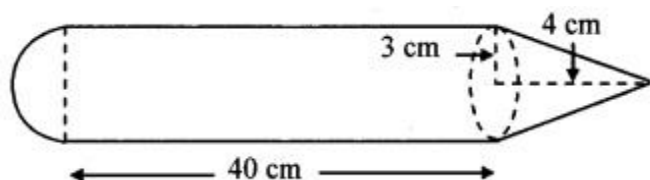
Total height of the figure = h + H

$$= 3 + 6$$

$$= 9 \text{ cm}$$

$\therefore$  The total height of the figure is 9 cm.

**Question 8.** In the given figure, a toy made from a hemisphere, a cylinder and a cone is shown. Find the total area of the toy.



Given: For the conical Part,

height (h) = 4 cm, radius (r) = 3 cm

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For the cylindrical part,

height (H) = 40 cm, radius (r) = 3 cm

For the hemispherical part,

radius (r) = 3 cm

To find: Total area of the toy.

**Solution:**

Slant height of cone (l) =  $\sqrt{h^2 + r^2}$

$$= \sqrt{40^2 + 3^2}$$

$$= \sqrt{1600 + 9}$$

$$= \sqrt{1609} = 40.11 \text{ cm}$$

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

$$= \pi \times 3 \times 40.11$$

$$= 120.33\pi \text{ cm}^2$$

Curved surface area of cylinder =  $2\pi r H$

$$= 2 \times \pi \times 3 \times 40$$

$$= 240\pi \text{ cm}^2$$

Curved surface area of hemisphere =  $2\pi r^2$

$$= 2 \times \pi \times 3^2$$

$$= 18\pi \text{ cm}^2$$

Total area of the toy

= Curved surface area of cone + Curved surface area of cylinder + Curved surface area of hemisphere

$$= 120.33\pi + 240\pi + 18\pi$$

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$$= 2737 \pi \text{ cm}^2$$

$\therefore$  The total area of the toy is  $273\pi \text{ cm}^2$ .

**Question 9.** In the given 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?



Given: For the cylindrical tablets,

radius ( $r$ ) = 7 mm,

thickness = height( $h$ ) = 5 mm

For the cylindrical wrapper,

diameter ( $D$ ) = 14 mm, height ( $H$ ) = 10 cm

To find: Number of tablets that can be wrapped.

**Solution:**

Radius of wrapper ( $R$ ) = Diameter $\div 2$

$$= 14 \div 2 = 7 \text{ mm}$$

Height of wrapper ( $H$ ) = 10 cm

$$= 10 \times 10 \text{ mm}$$

$$= 100 \text{ mm}$$

Volume of a cylindrical wrapper =  $\pi R^2 H$

$$= \pi (7)^2 \times 100$$

$$= 4900\pi \text{ mm}^3$$

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Volume of a cylindrical tablet =  $\pi r^2 h$

$$= \pi(7)^2 \times 5$$

$$= 245 \pi \text{ mm}^3$$

No. of tablets that can be wrapped

$$\begin{aligned} &= \frac{\text{volume of a cylindrical wrapper}}{\text{volume of a cylindrical tablet}} \\ &= \frac{4900\pi}{245\pi} \\ &= 20 \end{aligned}$$

$\therefore$  20 tables can be wrapped in the wrapper

**Question 10.** The given 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.

( $\pi = 3.14$ )

Given: For the conical part,

height (h) = 4 cm, radius (r) = 3 cm

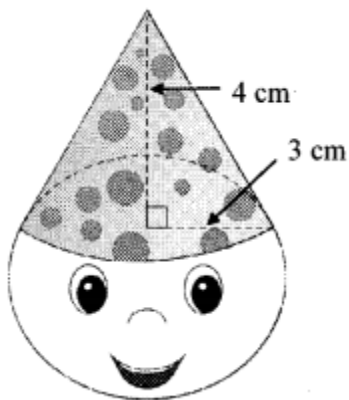
For the hemispherical part,

radius (r) = 3 cm

To find: Volume and surface area of the toy.

**Solution:**

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Now, volume of the toy

= Volume of cone + volume of hemisphere

$$= 12\pi + 18\pi$$

$$= 30\pi$$

$$= 30 \times 3.14$$

$$= 94.20 \text{ cm}^3$$

Also, surface area of the toy

= Curved surface area of cone + Curved surface area of hemisphere

$$= 15\pi + 18\pi$$

$$= 33\pi$$

$$= 33 \times 3.14$$

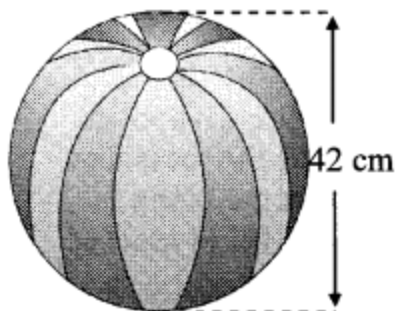
$$= 103.62 \text{ cm}^2$$

$\therefore$  The volume and surface area of the toy are  $94.20 \text{ cm}^3$  and  $103.62 \text{ cm}^2$  respectively.

**Question 11.**

**Find the surface area and the volume of a beach ball shown in the figure.**

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Given: For the spherical ball,

diameter (d) = 42 cm

To find: Surface area and volume of the beach ball.

**Solution:**

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

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

$$= 4 \times 3.14 \times (21)^2$$

$$= 4 \times 3.14 \times 21 \times 21$$

$$= 5538.96 \text{ cm}^2$$

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

$$= \frac{4}{3} \times 3.14 \times (21)^3$$

$$= \frac{4}{3} \times 3.14 \times 7 \times 21 \times 21$$

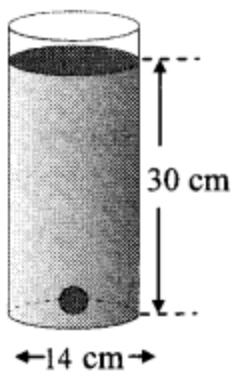
$$= 38772.72 \text{ cm}^3$$

∴ The surface area and the volume of the beach ball are  $5538.96 \text{ cm}^2$  and  $38772.72 \text{ cm}^3$  respectively.

Question 12.

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

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Given: For the metal sphere,

diameter (d) = 2 cm

For the cylindrical glass, diameter (D) = 14 cm,

height of water in the glass (H) = 30 cm

To find: Volume of water in the glass.

Solution:

Let the radii of the sphere and glass be r and R respectively.

$$\text{Radius of sphere (r)} = \frac{d}{2} = \frac{2}{2} = 1 \text{ cm}$$

$$\text{Radius of glass (R)} = \frac{D}{2} = \frac{14}{2} = 7 \text{ cm}$$

$$\begin{aligned}\text{Now, Volume of sphere} &= \frac{4}{3} \pi r^3 \\ &= \frac{4}{3} \pi (1)^3 \\ &= \frac{4}{3} \pi \text{ cm}^3\end{aligned}$$

Volume of water with sphere in it =  $\pi R^2 H$

$$= \pi \times (7)^2 \times 30$$

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$$= 1470\pi \text{ cm}^3$$

Volume of water in the glass

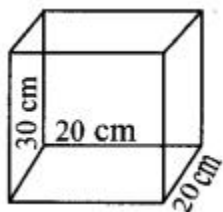
= Volume of water with sphere in it – Volume of sphere

$$\begin{aligned} &= 1470\pi - \frac{4}{3}\pi \\ &= \frac{4410\pi - 4\pi}{3} \\ &= \frac{4406\pi}{3} \quad (\text{OR}) \quad \left| \begin{aligned} &= \frac{4406}{3} \times \frac{22}{7} \\ &= \frac{96932}{21} \\ &= 4615.80 \text{ cm}^3 \end{aligned} \right. \\ &= 1468.67\pi \text{ cm}^3 \end{aligned}$$

$\therefore$  The volume of the water in the glass is  $1468.67 \pi \text{ cm}^3$  (i.e.  $4615.80 \text{ cm}^3$ ).

#### Question 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 =  $1000 \text{ cm}^3$ ) (Textbook pg. no.141)



Given: For the cuboidal can,

length (l) = 20 cm,

breadth (b) = 20 cm,

height (h) = 30 cm

To find: Oil that can be contained in the can.

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**Solution:**

Volume of cuboid =  $l \times b \times h$

$$= 20 \times 20 \times 30$$

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

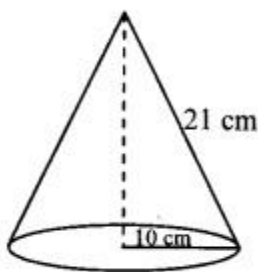
$$= 12000/1000 \text{ litres}$$

$$= 12 \text{ litres}$$

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

**Question 2.**

The adjoining figure shows the measures of a Joker's cap. How much cloth is needed to make such a cap? (Textbook pg. no. 141)



Given: For the conical cap,

radius ( $r$ ) = 10 cm,

slant height ( $l$ ) = 21 cm

To find: Cloth required to make the cap.

**Solution:**

Cloth required to make the cap

= Curved surface area of the conical cap

$$= \pi rl = 227 \times 10 \times 21$$

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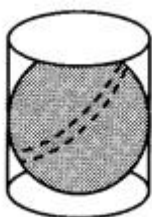
$$= 22 \times 10 \times 3$$

$$= 660 \text{ cm}^2$$

$\therefore$  660 cm<sup>2</sup> of cloth will be required to make the cap.

### Question 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',



- what is the ratio of the radii of the sphere and the cylinder ?
- what is the ratio of the curved surface area of the cylinder and the surface area of the sphere?
- what is the ratio of the volumes of the cylinder and the sphere? (Textbook pg. no. 141)

### Solution:

Radius of base of cylinder = radius of sphere

$\therefore$  Radius of sphere = r

Also, height of cylinder = diameter of sphere

$\therefore$  h = d

$\therefore$  h = 2r ... (i)

$$\text{i. } \frac{\text{Radius of sphere}}{\text{Radius of cylinder}} = \frac{r}{r} = \frac{1}{1}$$

$\therefore$  radius of sphere : radius of cylinder = 1 : 1.

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$$\begin{aligned}
 \text{ii. } \frac{\text{Curved surface area of cylinder}}{\text{Surface area of sphere}} &= \frac{2\pi rh}{4\pi r^2} \\
 &= \frac{h}{2r} \\
 &= \frac{2r}{2r} \dots [\text{From (i)}] \\
 &= \frac{1}{1}
 \end{aligned}$$

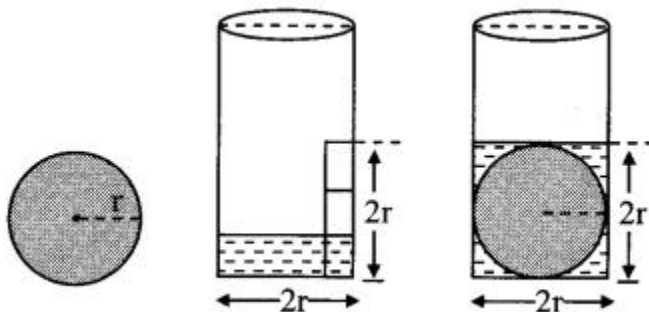
$\therefore$  curved surface area of cylinder : surface area of sphere = 1:1.

$$\begin{aligned}
 \text{iii. } \frac{\text{Volume of cylinder}}{\text{Volume of sphere}} &= \frac{\pi r^2 h}{\frac{4}{3}\pi r^3} \\
 &= \frac{3h}{4r} \\
 &= \frac{3(2r)}{4r} \dots [\text{From (i)}] \\
 &= \frac{3}{2}
 \end{aligned}$$

$\therefore$  volume of cylinder : volume of sphere = 3 : 2.

#### Question 4.

Finding volume of a sphere using cylindrical beaker and water. (Textbook, pg. no. 142)



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- i. Take a ball and a beaker of the same radius.
- ii. Cut a strip of paper of length equal to the diameter of the beaker.
- iii. Draw two lines on the strip dividing it into three equal parts.
- iv. Stick this strip on the beaker straight up from the bottom.
- v. Fill the water in the beaker upto the first mark of the strip from bottom.
- vi. Push the ball in the beaker so that it touches the bottom.

Observe how much water level rises.

You will notice that the water level has risen exactly upto the total height of the strip. Try to obtain the formula for volume of sphere using the volume of the cylindrical beaker.

**Solution:**

Suppose volume of beaker upto height  $2r$  is  $V$ .

$$V = \pi r^2 h$$

$$\therefore V = \pi r^2(2r) \dots [\because h = 2r]$$

$$\therefore V = 2\pi r^3$$

But,  $V$  = volume of the ball + volume of water in the beaker

$$\therefore 2\pi r^3 = \text{Volume of the ball} + 13 \times 2\pi r^3$$

$$\therefore \text{Volume of the ball} = 2\pi r^3 - 26\pi r^3$$

$$= 6\pi r^3 - 26\pi r^3$$

$$\therefore \text{Volume of the ball} = -20\pi r^3$$

$$\therefore \text{Volume of a sphere} = 20\pi r^3$$

**Practice Set 7.2**

**Question 1.**

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The radii of two circular ends of frustum shaped 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 cm<sup>3</sup>)

Given: Radii ( $r_1$ ) = 14 cm, and ( $r_2$ ) = 7 cm,

height ( $h$ ) = 30 cm

To find: Amount of water the bucket can hold.

**Solution:**

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

$$\begin{aligned} &= \frac{1}{3} \times \frac{22}{7} \times 30 (14^2 + 7^2 + 14 \times 7) \\ &= \frac{22 \times 10}{7} (196 + 49 + 98) \\ &= \frac{220}{7} \times 343 \\ &= 220 \times 49 \\ &= 10780 \text{ cm}^3 \\ &= \frac{10780}{1000} \text{ litres} \quad \dots [\because 1 \text{ litre} = 1000 \text{ cm}^3] \\ &= 10.78 \text{ litres} \end{aligned}$$

$\therefore$  The bucket can hold 10.78 litres of water.

**Question 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, ( $\pi = 3.14$ )

Given: Radii ( $r_1$ ) = 14 cm, and ( $r_2$ ) = 6 cm,

height ( $h$ ) = 6 cm

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**Solution:**

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

i. Curved surface area of frustum

$$\begin{aligned}&= \pi l (r_1 + r_2) \\ &= 3.14 \times 10(14 + 6) \\ &= 3.14 \times 10 \times 20 = 628 \text{ cm}^2\end{aligned}$$

∴ The curved surface area of the frustum is 628 cm<sup>2</sup>.

ii. Total surface area of frustum

$$\begin{aligned}&= \pi l (r_1 + r_2) + \pi r_1^2 + \pi r_2^2 \\ &= 628 + 3.14 \times (14)^2 + 3.14 \times (6)^2 \\ &= 628 + 3.14 \times 196 + 3.14 \times 36 \\ &= 628 + 3.14(196 + 36) \\ &= 628 + 3.14 \times 232 \\ &= 628 + 728.48 \\ &= 1356.48 \text{ cm}^2\end{aligned}$$

∴ The total surface area of the frustum is 1356.48 cm<sup>2</sup>.

iii. Volume of frustum

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

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$$= 13 \times 3.14 \times 6(14^2 + 6^2 + 14 \times 6)$$

$$= 3.14 \times 2(196 + 36 + 84)$$

$$= 3.14 \times 2 \times 316$$

$$= 1984.48 \text{ cm}^3$$

$\therefore$  The volume of the frustum is  $1984.48 \text{ cm}^3$ .

### Question 3.

The circumferences of circular faces of a frustum are 132 cm and 88 cm and its height is 24 cm. To find the curved surface area of frustum, complete the following activity. ( $\pi = 227$ )

**Solution:**

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

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

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

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

$$\begin{aligned} \text{Slant height of frustum } (l) &= \sqrt{h^2 + (r_1 - r_2)^2} \\ &= \sqrt{24^2 + (21 - 14)^2} \\ &= \sqrt{\boxed{24}^2 + \boxed{7}^2} \\ &= \sqrt{576 + 49} \\ &= \sqrt{625} \\ &= \boxed{25} \text{ cm} \end{aligned}$$

$$\text{Curved surface area of frustum} = \pi (r_1 + r_2) l$$

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

$$= \pi \times 35 \times 25$$

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$$= 227 \times 35 \times 25$$

$$= 2750 \text{ cm}^2$$

### Practice Set 7.3

#### Question 1.

Radius of a circle is 10 cm. Measure of an arc of the circle is  $54^\circ$ . Find the area of the sector associated with the arc. ( $\pi = 3.14$ )

Given : Radius ( $r$ ) = 10 cm,

Measure of the arc ( $\theta$ ) =  $54^\circ$

To find : Area of the sector.

**Solution:**

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

$$= \frac{54}{360} \times 3.14 \times (10)^2$$

$$= 320 \times 3.14 \times 100$$

$$= 3 \times 3.14 \times 5$$

$$= 15 \times 3.14$$

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

$\therefore$  The area of the sector is  $47.1 \text{ cm}^2$ .

#### Question 2.

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

Given: Radius ( $r$ ) = 18 cm,

Measure of the arc ( $\theta$ ) =  $80^\circ$

To find: Length of the arc.

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**Solution:**

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

$$= \frac{8360}{360} \times 2 \times 3.14 \times 18$$

$$= 29 \times 2 \times 3.14 \times 18$$

$$= 2 \times 2 \times 3.14 \times 2 = 25.12 \text{ cm}$$

$\therefore$  The length of the arc is 25.12 cm.

**Question 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.

**Solution:**

**Given:** Radius (r) = 3.5 cm,

length of arc (l) = 2.2 cm

**To find:** Area of the sector.

**Solution:**

$$\text{Area of sector} = l \times r$$

$$= 2.2 \times 3.5$$

$$= 1.1 \times 3.5 = 3.85 \text{ cm}^2$$

$\therefore$  The area of the sector is 3.85 cm<sup>2</sup>.

**Question 4.**

Radius of a circle is 10 cm. Area of a sector of the circle is 100 cm<sup>2</sup>. Find the area of its corresponding major sector, ( $\pi = 3.14$ )

**Given:** Radius (r) = 10 cm,

area of minor sector = 100 cm<sup>2</sup>

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**To find: Area of maj or sector.**

**Solution:**

$$\text{Area of circle} = \pi r^2$$

$$= 3.14 \times (10)^2$$

$$= 3.14 \times 100 = 314 \text{ cm}^2$$

Now, area of major sector

$$= \text{area of circle} - \text{area of minor sector}$$

$$= 314 - 100$$

$$= 214 \text{ cm}^2$$

$\therefore$  The area of the corresponding major sector is  $214 \text{ cm}^2$ .

**Question 5.**

**Area of a sector of a circle of radius 15 cm is  $30 \text{ cm}^2$ . Find the length of the arc of the sector.**

**Given: Radius (r) = 15 cm,**

**area of sector =  $30 \text{ cm}^2$**

**To find: Length of the arc (l).**

**Solution:**

$$\text{Area of sector} = \frac{\text{length of the arc} \times \text{radius}}{2}$$

$$\therefore 30 = \frac{l \times 15}{2}$$

$$\therefore l = \frac{30 \times 2}{15} = 4 \text{ cm}$$

$\therefore$  The length of the arc is 4 cm.

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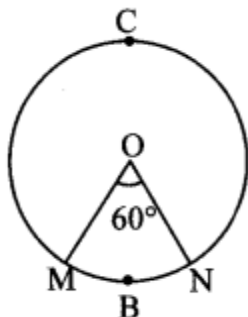
**Question 6.**

In the adjoining figure, radius of the circle is 7 cm and  $m(\text{arc MBN}) = 60^\circ$ , find

i. Area of the circle.

ii.  $A(\text{O-MBN})$ .

iii.  $A(\text{O-MCN})$ .



Given: radius ( $r$ ) = 7 cm,

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

Solution:

i. Area of circle =  $\pi r^2$

$$= 227 \times (7)^2$$

$$= 22 \times 7$$

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

$\therefore$  The area of the circle is  $154 \text{ cm}^2$

ii. Central angle ( $\theta$ ) =  $\angle \text{MON} = 60^\circ$

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

$$\therefore A(\text{O-MBN}) = \frac{60}{360} \times 227 \times (7)^2$$

$$= \frac{16}{9} \times 22 \times 7$$

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$$= 25.67 \text{ cm}^2$$

$$= 25.7 \text{ cm}^2$$

$$\therefore A(\text{O-MBN}) = 25.7 \text{ cm}^2$$

iii. Area of major sector = area of circle – area of minor sector

$$\therefore A(\text{O-MCN}) = \text{Area of circle} - A(\text{O-MBN})$$

$$= 154 - 25.7$$

$$\therefore A(\text{O-MCN}) = 128.3 \text{ cm}^2$$

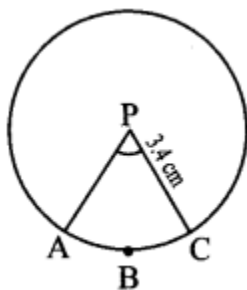
#### Question 7.

In the adjoining figure, radius of circle is 3.4 cm and perimeter of sector P-ABC is 12.8 cm. Find  $A(\text{P-ABC})$ .

Given: Radius ( $r$ ) = 3.4 cm,

perimeter of sector 12.8 cm

To find:  $A(\text{P-ABC})$

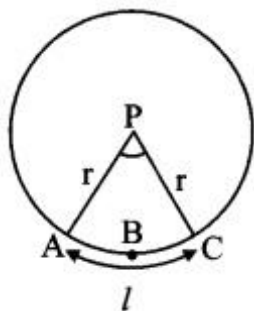


#### Solution:

Perimeter of sector

$$= \text{length of arc ABC} + AP + CP$$

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

$$\therefore 12.8 = l + 6.8$$

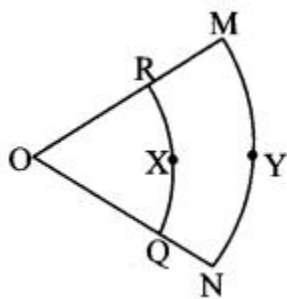
$$\therefore l = 12.8 - 6.8 = 6\text{ cm}$$

$$\begin{aligned} A(P\text{-}ABC) &= \frac{\text{length of the arc} \times \text{radius}}{2} \\ &= \frac{6 \times 3.4}{2} \\ &= 10.2 \text{ cm}^2 \end{aligned}$$

$$\therefore A(P\text{-}ABC) = 10.2 \text{ cm}^2$$

#### Question 8.

In the adjoining figure, O is the centre of the sector.  $\angle ROQ = \angle MON = 60^\circ$ .  $OR = 7 \text{ cm}$ , and  $OM = 21 \text{ cm}$ . Find the lengths of arc  $RXQ$  and  $(\pi = 227)$



Given:  $\angle ROQ = \angle MON = 60^\circ$ ,

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radius ( $r$ ) =  $OR = 7$  cm, radius ( $R$ ) =  $OM = 21$  cm

To find: Lengths of arc  $RXQ$  and arc  $MYN$ .

**Solution:**

i. Length of arc  $RXQ = \frac{\theta}{360} \times 2\pi r$

$$= \frac{60}{360} \times 2 \times \frac{22}{7} \times 7$$

$$= \frac{16}{3} \times 2 \times 22$$

$$= 7.33 \text{ cm}$$

ii. Length of arc  $MYN = \frac{\theta}{360} \times 2\pi R$

$$= \frac{60}{360} \times 2 \times \frac{22}{7} \times 21$$

$$= \frac{16}{3} \times 2 \times 22 \times 3$$

$$= 22 \text{ cm}$$

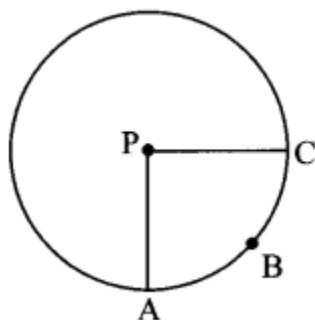
$\therefore$  The lengths of arc  $RXQ$  and arc  $MYN$  are 7.33 cm and 22 cm respectively.

**Question 9.**

In the adjoining figure, if  $A(P-ABC) = 154 \text{ cm}^2$ , radius of the circle is 14 cm, find

i.  $\angle APC$ ,

ii.  $l(\text{arc } ABC)$ .



Given:  $A(P-ABC) = 154 \text{ cm}^2$ ,

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radius (r) = 14 cm

**Solution:**

i. Let  $\angle APC = \theta$

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

$$\therefore 154 = \frac{\theta}{360} \times \frac{22}{7} \times 14^2$$

$$\begin{aligned}\therefore \theta &= \frac{154 \times 360 \times 7}{22 \times 14^2} = \frac{154 \times 360 \times 7}{22 \times 14 \times 14} \\ &= \frac{7 \times 360}{14 \times 2} = \frac{360}{2 \times 2} = 90^\circ\end{aligned}$$

$$\therefore \angle APC = 90^\circ$$

---

$$\begin{aligned}\text{ii. } l(\text{arc ABC}) &= \frac{\theta}{360} \times 2\pi r \\ &= \frac{90}{360} \times 2 \times \frac{22}{7} \times 14 \\ &= \frac{1}{4} \times 2 \times 22 \times 2\end{aligned}$$

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

**Question 10.**

Radius of a sector of a circle is 7 cm. If measure of arc of the sector is

i.  $30^\circ$

ii.  $210^\circ$

iii. three right angles, find the area of the sector in each case.

Given: Radius (r) = 7 cm

To find: Area of the sector.

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**Solution:**

i. Measure of the arc ( $\theta$ ) =  $30^\circ$

$$\begin{aligned}\text{Area of sector} &= \frac{\theta}{360} \times \pi r^2 \\ &= \frac{30}{360} \times \frac{22}{7} \times (7)^2 \\ &= \frac{1}{12} \times 22 \times 7 \\ &= 12.83 \text{ cm}^2\end{aligned}$$

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

ii. Measure of the arc ( $\theta$ ) =  $210^\circ$

$$\begin{aligned}\text{Area of sector} &= \frac{\theta}{360} \times \pi r^2 \\ &= \frac{210}{360} \times \frac{22}{7} \times (7)^2 \\ &= \frac{7}{12} \times 22 \times 7 \\ &= 89.83 \text{ cm}^2\end{aligned}$$

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

iii. Measure of the arc ( $\theta$ ) = 3 right angle

$$= 3 \times 90^\circ = 270^\circ$$

$$\begin{aligned}\text{Area of sector} &= \frac{\theta}{360} \times \pi r^2 \\ &= \frac{270}{360} \times \frac{22}{7} \times (7)^2 \\ &= \frac{3}{4} \times 22 \times 7 \\ &= 115.50 \text{ cm}^2\end{aligned}$$

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∴ Area of the sector is 115.50 cm<sup>2</sup>.

**Question 11.**

The area of a minor sector of a circle is 3.85 cm<sup>2</sup> and the measure of its central angle is 36°. Find the radius of the circle.

**Given:** Area of minor sector = 3.85 cm<sup>2</sup>,

**central angle (θ) = 36°**

**To find:** Radius of the circle (r).

**Solution:**

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

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

$$\therefore 3.85 = \frac{1}{10} \times \frac{22}{7} \times r^2$$

$$\therefore r^2 = \frac{3.85 \times 10 \times 7}{22}$$

$$= \frac{385}{100} \times \frac{10}{22} \times 7$$

$$= \frac{385}{10} \times \frac{7}{22}$$

$$= \frac{77}{2} \times \frac{7}{22}$$

$$\therefore r^2 = \frac{7 \times 7}{2 \times 2}$$

$$\therefore r = \frac{7}{2} \quad \dots [\text{Taking square root of both sides}]$$

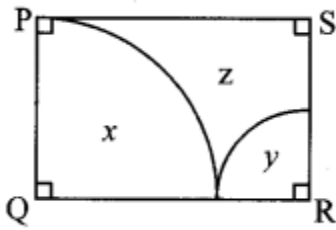
$$= 3.5 \text{ cm}$$

∴ The radius of the circle is 3.5 cm.

**Question 12.**

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In the given figure, PQRS is a rectangle. If  $PQ = 14$  cm,  $QR = 21$  cm, find the areas of the parts  $x$ ,  $y$  and  $z$ .

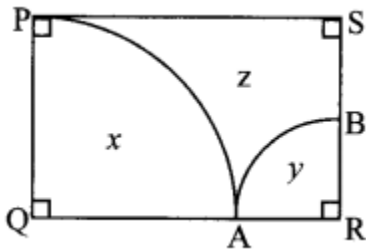


Given: In rectangle PQRS,

$PQ = 14$  cm,  $QR = 21$  cm

To find: Areas of the parts  $x$ ,  $y$  and  $z$ .

Solution:



$\angle Q = \angle R = \theta = 90^\circ \dots$  [Angles of a rectangle]

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

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

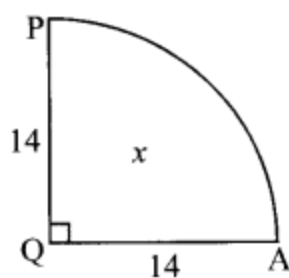
$$= \frac{1}{4} \times \frac{22}{7} \times 14^2$$

$$= \frac{1}{4} \times \frac{22}{7} \times 14 \times 14$$

$$= \frac{1}{2} \times 11 \times 2 \times 14$$

$$= 11 \times 14$$

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



For the sector (Q – PA),

PQ = QA ... [Radii of the same circle]

∴ QA = 14 cm

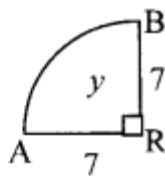
Now, QR = QA + AR ... [Q – A – R]

∴ 21 = 14 + AR

∴ AR = 7 cm

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$$\begin{aligned}
 \text{Area of part } y &= \frac{\theta}{360} \times \pi R^2 \\
 &= \frac{90}{360} \times \frac{22}{7} \times (AR)^2 \\
 &= \frac{1}{4} \times \frac{22}{7} \times (7)^2 \\
 &= \frac{1}{4} \times \frac{22}{7} \times 7 \times 7 \\
 &= \frac{1}{4} \times 22 \times 7 \\
 &= \frac{154}{4} \\
 &= 38.5 \text{ cm}^2
 \end{aligned}$$



Area of rectangle = length  $\times$  breadth

area of PQRS = PQ  $\times$  QR

$$= 14 \times 21$$

$$= 294 \text{ cm}^2$$

Area of part z = area of PQRS

– area of part x – area of part y

$$= 294 - 154 - 38.5$$

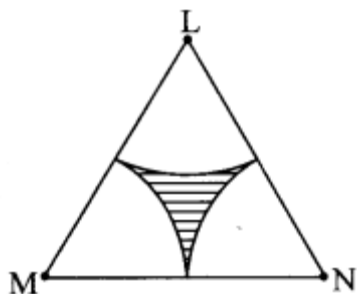
$$= 101.5 \text{ cm}^2$$

$\therefore$  The area of part x is  $154 \text{ cm}^2$ , the area of part y is  $38.5 \text{ cm}^2$  and the area of part z is  $101.5 \text{ cm}^2$ .

**Question 13.**

$\triangle ALMN$  is an equilateral triangle.  $LM = 14 \text{ cm}$ . As shown in figure, three sectors are drawn with vertices as centres and radius  $7 \text{ cm}$ . Find,

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- i.  $A(\triangle LMN)$ .
- ii. Area of any one of the sectors.
- iii. Total area of all the three sectors.
- iv. Area of the shaded region. ( $3 - \sqrt{3} = 1.732$ )

Given: In equilateral triangle LMN,  $LM = 14$  cm,

radius of sectors ( $r$ ) = 7 cm

**Solution:**

- i.  $\triangle LMN$  is an equilateral triangle.

$$\begin{aligned}
 \therefore A(\triangle LMN) &= \frac{\sqrt{3}}{4} LM^2 \\
 &= \frac{\sqrt{3}}{4} \times 14^2 \\
 &= 49 \times 1.732 \\
 &= 84.868 \\
 &= 84.87 \text{ cm}^2
 \end{aligned}$$

- ii. Central angle ( $\theta$ ) =  $60^\circ$  ...[Angle of an equilateral triangle]

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$$\begin{aligned}\text{Area of sector} &= \frac{\theta}{360} \times \pi r^2 \\ &= \frac{60}{360} \times \frac{22}{7} \times 7^2 \\ &= \frac{1}{6} \times 22 \times 7 \\ &= \frac{11 \times 7}{3} = \frac{77}{3} \\ &= 25.67 \text{ cm}^2\end{aligned}$$

∴ Area of one sector = 25.67 cm<sup>2</sup>

iii. Total area of all three sectors

= 3 × Area of one sector

= 3 × 25.67

= 77.01 cm<sup>2</sup>

∴ Total area of all three sectors = 77.01 cm<sup>2</sup>

iv. Area of shaded region

= A(ΔLMN) – total area of all three sectors

= 84.87 – 77.01

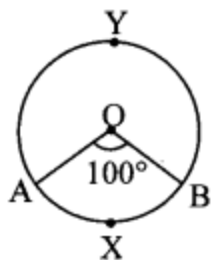
= 7.86 cm<sup>2</sup>

∴ Area of shaded region = 7.86 cm

**Question 1.**

**Complete the following table with the help of given figure. (Textbook pg. no. 149)**

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| Type of arc | Name of the arc | Measure of the arc |
|-------------|-----------------|--------------------|
| Minor arc   | arc AXB         |                    |
| Major arc   | arc AYB         |                    |

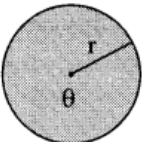
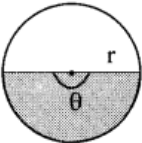
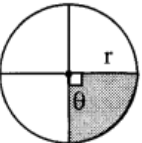
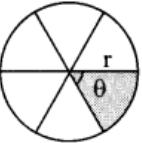
**Solution:**

| Type of arc | Name of the arc | Measure of the arc                  |
|-------------|-----------------|-------------------------------------|
| Minor arc   | arc AXB         | $100^\circ$                         |
| Major arc   | arc AYB         | $360^\circ - 100^\circ = 260^\circ$ |

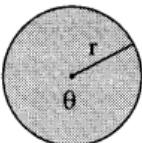
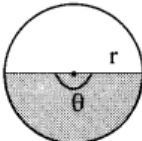
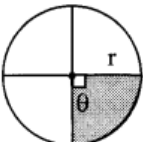
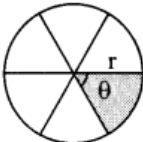
**Question 2.**

Observe the figures below. Radii of all circles are equal. Observe the areas of the shaded regions and complete the following table. (Textbook pg. no. 150)

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| Central angle of a circle = $360^\circ$ , Area of a circle = $\pi r^2$ |                                                                                                      |                                                                                                                  |                                                                                                                  |                                                                                                                    |   |
|------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|---|
| Sector of circle                                                       | <br>$A_1 = \pi r^2$ | <br>$A_2 = \frac{1}{2} \pi r^2$ | <br>$A_3 = \frac{1}{4} \pi r^2$ | <br>$A_4 = \frac{1}{6} \pi r^2$ | A |
| Measure of arc of the sector ( $\theta$ )                              |                                                                                                      |                                                                                                                  |                                                                                                                  |                                                                                                                    |   |
| $\frac{\theta}{360}$                                                   |                                                                                                      |                                                                                                                  |                                                                                                                  |                                                                                                                    |   |
| Area of the sector (A)                                                 |                                                                                                      |                                                                                                                  |                                                                                                                  |                                                                                                                    |   |

**Solution:**

| Central angle of a circle = $360^\circ$ , Area of a circle = $\pi r^2$ |                                                                                                       |                                                                                                                   |                                                                                                                   |                                                                                                                     |                                     |
|------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|-------------------------------------|
| Sector of circle                                                       | <br>$A_1 = \pi r^2$ | <br>$A_2 = \frac{1}{2} \pi r^2$ | <br>$A_3 = \frac{1}{4} \pi r^2$ | <br>$A_4 = \frac{1}{6} \pi r^2$ | A                                   |
| Measure of arc of the sector ( $\theta$ )                              | $360^\circ$                                                                                           | $180^\circ$                                                                                                       | $90^\circ$                                                                                                        | $60^\circ$                                                                                                          | $\theta$                            |
| $\frac{\theta}{360}$                                                   | $\frac{360}{360} = 1$                                                                                 | $\frac{180}{360} = \frac{1}{2}$                                                                                   | $\frac{90}{360} = \frac{1}{4}$                                                                                    | $\frac{60}{360} = \frac{1}{6}$                                                                                      | $\frac{\theta}{360}$                |
| Area of the sector (A)                                                 | $1 \times \pi r^2$                                                                                    | $\frac{1}{2} \times \pi r^2$                                                                                      | $\frac{1}{4} \times \pi r^2$                                                                                      | $\frac{1}{6} \times \pi r^2$                                                                                        | $\frac{\theta}{360} \times \pi r^2$ |

Thus, if measure of an arc of a circle is  $\theta$ , then

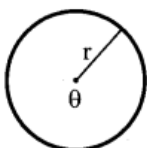
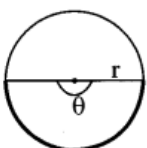
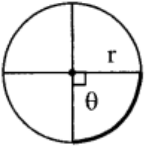
Area of sector (A) =  $\frac{\theta}{360} \times$  Area of circle

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

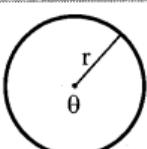
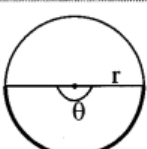
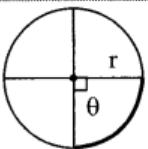
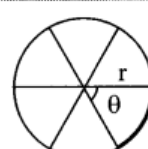
**Question 3.**

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In the following figures, radii of all circles are equal. Observe the length of arc in each figure and complete the table. (Textbook pg. no. 151)

| Circumference of a circle = $2\pi r$ |                                                                                                     |                                                                                                                        |                                                                                                                        |                                                                                                                          |     |
|--------------------------------------|-----------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|-----|
| Length of the arc                    | <br>$l_1 = 2\pi r$ | <br>$l_2 = \frac{1}{2} \times 2\pi r$ | <br>$l_3 = \frac{1}{4} \times 2\pi r$ | <br>$l_4 = \frac{1}{6} \times 2\pi r$ | $l$ |
| Measure of the arc ( $\theta$ )      |                                                                                                     |                                                                                                                        |                                                                                                                        |                                                                                                                          |     |
| $\frac{\theta}{360}$                 |                                                                                                     |                                                                                                                        |                                                                                                                        |                                                                                                                          |     |
| Length of the arc ( $l$ )            |                                                                                                     |                                                                                                                        |                                                                                                                        |                                                                                                                          |     |

**Solution:**

| Circumference of a circle = $2\pi r$ |                                                                                                      |                                                                                                                         |                                                                                                                         |                                                                                                                           |                                    |
|--------------------------------------|------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|------------------------------------|
| Length of the arc                    | <br>$l_1 = 2\pi r$ | <br>$l_2 = \frac{1}{2} \times 2\pi r$ | <br>$l_3 = \frac{1}{4} \times 2\pi r$ | <br>$l_4 = \frac{1}{6} \times 2\pi r$ | $l$                                |
| Measure of the arc ( $\theta$ )      | $360^\circ$                                                                                          | $180^\circ$                                                                                                             | $90^\circ$                                                                                                              | $60^\circ$                                                                                                                | $\theta$                           |
| $\frac{\theta}{360}$                 | $\frac{360}{360} = 1$                                                                                | $\frac{180}{360} = \frac{1}{2}$                                                                                         | $\frac{90}{360} = \frac{1}{4}$                                                                                          | $\frac{60}{360} = \frac{1}{6}$                                                                                            | $\frac{\theta}{360}$               |
| Length of the arc ( $l$ )            | $1 \times 2\pi r$                                                                                    | $\frac{1}{2} \times 2\pi r$                                                                                             | $\frac{1}{4} \times 2\pi r$                                                                                             | $\frac{1}{6} \times 2\pi r$                                                                                               | $\frac{\theta}{360} \times 2\pi r$ |

Thus, if the measure of an arc of a circle is  $\theta$ , then

Length of arc ( $l$ ) =  $\frac{\theta}{360} \times$  circumference of circle

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

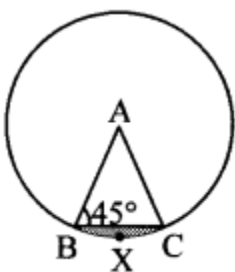
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$$\therefore \frac{l}{2\pi r} = \frac{\theta}{360}$$

$$\text{i.e., } \frac{\text{Length of arc}}{\text{Circumference}} = \frac{\theta}{360}$$

#### Practice Set 7.4

**Question 1.** In the adjoining figure, A is the centre of the circle.  $\angle ABC = 45^\circ$  and  $AC = 72\sqrt{2}$  cm. Find the area of segment BXC, ( $\pi = 3.14$ )



**Solution:**

In  $\triangle ABC$ ,

$AC = AB$  ... [Radii of same circle]

$\therefore \angle ABC = \angle ACB$  ... [Isosceles triangle theorem]

$\therefore \angle ABC = \angle ACB = 45^\circ$

In  $\triangle ABC$ ,

$\angle ABC + \angle ACB + \angle BAC = 180^\circ$  ... [Sum of the measures of angles of a triangle is  $180^\circ$ ]

$\therefore 45^\circ + 45^\circ + \angle BAC = 180^\circ$

$\therefore 90^\circ + \angle BAC = 180^\circ$

$\therefore \angle BAC = 90^\circ$

Let  $\angle BAC = \theta = 90^\circ$

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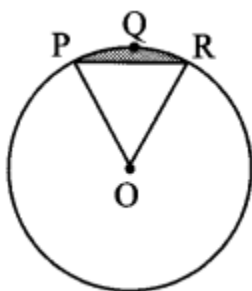
$$\begin{aligned}
 A(\text{segment BXC}) &= r^2 \left[ \frac{\pi\theta}{360} - \frac{\sin\theta}{2} \right] \\
 &= (7\sqrt{2})^2 \left[ \frac{3.14 \times 90}{360} - \frac{\sin 90}{2} \right] \\
 &= 49 \times 2 \left[ \frac{3.14}{4} - \frac{1}{2} \right] \\
 &= 98 \left[ \frac{3.14}{4} - \frac{2}{4} \right] = 98 \left[ \frac{3.14 - 2}{4} \right] \\
 &= 98 \left[ \frac{1.14}{4} \right] = 98 [0.285] \\
 &= 27.93 \text{ cm}^2
 \end{aligned}$$

∴ The area of segment BXC is 27.93 cm<sup>2</sup>.

**Question 2.** In the adjoining figure, O is the centre of the circle.

m(arc PQR) = 60°, OP = 10 cm. Find the area of the shaded region.

(π = 3.14, 3-√ = 1.73)



**Given:** m(arc PQR) = 60°, radius (r) = OP = 10 cm

**To find:** Area of shaded region.

**Solution:**

∠POR = m (arc PQR) ...[Measure of central angle]

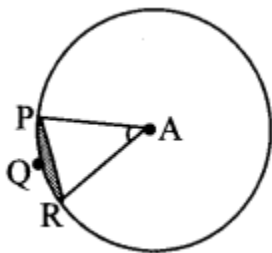
∴ ∠POR = θ = 60°

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$$\begin{aligned}
 A(\text{segment PQR}) &= r^2 \left[ \frac{\pi\theta}{360} - \frac{\sin\theta}{2} \right] \\
 &= 10^2 \left[ \frac{3.14 \times 60}{360} - \frac{\sin 60^\circ}{2} \right] \\
 &= 100 \left[ \frac{3.14}{6} - \frac{\sqrt{3}}{2} \times \frac{1}{2} \right] \\
 &= 100 \left[ \frac{3.14}{6} - \frac{1.73}{4} \right] \\
 &= 100 \left[ \frac{3.14 \times 2}{6 \times 2} - \frac{1.73 \times 3}{4 \times 3} \right] \\
 &= 100 \left[ \frac{6.28}{12} - \frac{5.19}{12} \right] \\
 &= 100 \left[ \frac{6.28 - 5.19}{12} \right] \\
 &= 100 \left[ \frac{1.09}{12} \right] \\
 &= 100 [0.0908] \\
 &= 9.08 \text{ cm}^2
 \end{aligned}$$

∴ The area of the shaded region is 9.08 cm<sup>2</sup>.

**Question 3.** In the adjoining figure, if A is the centre of the circle,  $\angle PAR = 30^\circ$ ,  $AP = 7.5$ , find the area of the segment PQR. ( $\pi = 3.14$ )



**Given:** Central angle ( $\theta$ ) =  $\angle PAR = 30^\circ$ ,

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radius (r) = AP = 7.5

To find: Area of segment PQR.

**Solution:**

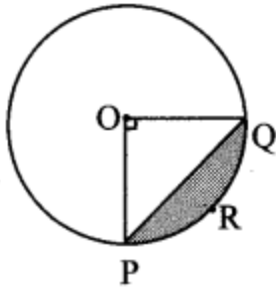
Let  $\angle PAR = \theta = 30^\circ$

$$\begin{aligned} A (\text{segment PQR}) &= r^2 \left[ \frac{\pi\theta}{360} - \frac{\sin \theta}{2} \right] \\ &= (7.5)^2 \left[ \frac{3.14 \times 30}{360} - \frac{\sin 30^\circ}{2} \right] \\ &= 56.25 \left[ \frac{3.14}{12} - \frac{1}{2} \times \frac{1}{2} \right] \\ &= 56.25 \left[ \frac{3.14}{12} - \frac{1 \times 1}{4 \times 1} \right] \\ &= 56.25 \left[ \frac{3.14}{12} - \frac{3}{12} \right] \\ &= 56.25 \left( \frac{3.14 - 3}{12} \right) \\ &= 56.25 \left( \frac{0.14}{12} \right) \\ &= \frac{7.875}{12} \\ &= 0.65625 \text{ sq. units} \end{aligned}$$

$\therefore$  The area of segment PQR is 0.65625 sq. units.

**Question 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 cm<sup>2</sup>, find the radius of the circle, ( $\pi = 3.14$ )

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Given: Central angle ( $\theta$ ) =  $\angle POQ = 90^\circ$ ,

A (segment PRQ) =  $114 \text{ cm}^2$

To find: Radius (r).

Solution:

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

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

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

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

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

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

$$\therefore 114 = r^2 \times \frac{1.14}{4}$$

$$\therefore r^2 = \frac{114 \times 4}{1.14}$$

$$\therefore r^2 = \frac{11400 \times 4}{114}$$

$$\therefore r^2 = 100 \times 4$$

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

...[Taking square root of both sides]

$\therefore r = 20$  cm

$\therefore$  The radius of the circle is 20 cm.

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

**Given:** Radius ( $r$ ) = 15 cm, central angle ( $\theta$ ) =  $60^\circ$

**To find:** Areas of major and minor segments.

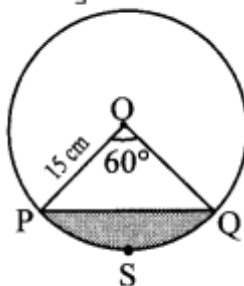
**Solution:**

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Let chord PQ subtend  $\angle POQ = 60^\circ$  at centre.

$$\therefore \theta = 60^\circ$$

$$\begin{aligned} A(\text{minor segment}) &= r^2 \left[ \frac{\pi\theta}{360} - \frac{\sin\theta}{2} \right] \\ &= 15^2 \left[ \frac{3.14 \times 60}{360} - \frac{\sin 60^\circ}{2} \right] \\ &= 225 \left[ \frac{3.14}{6} - \frac{\sqrt{3}}{2} \times \frac{1}{2} \right] \\ &= 225 \left[ \frac{3.14}{6} - \frac{1.73}{4} \right] \\ &= 225 \left[ \frac{3.14 \times 2}{6 \times 2} - \frac{1.73 \times 3}{4 \times 3} \right] \\ &= 225 \left[ \frac{6.28}{12} - \frac{5.19}{12} \right] \\ &= 225 \left[ \frac{6.28 - 5.19}{12} \right] \\ &= 225 \left[ \frac{1.09}{12} \right] \end{aligned}$$



$$= 225 [0.0908]$$

$$= 20.43 \text{ cm}^2$$

$$\therefore \text{area of minor segment} = 20.43 \text{ cm}^2$$

$$\text{Area of circle} = \pi r^2$$

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

$$= 3.14 \times 225$$

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

Area of major segment

$$= \text{Area of circle} - \text{area of minor segment}$$

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$$= 706.5 - 20.43$$

$$= 686.07 \text{ cm}^2$$

Area of major segment  $686.07 \text{ cm}^2$

$\therefore$  The area of minor segment is  $20.43 \text{ cm}^2$  and the area of major segment is  $686.07 \text{ cm}^2$ .



# Maharashtra Board Solutions

## Class 10 Maths (Part 2)

- Chapter 1- Similarity
- Chapter 2- Pythagoras Theorem
- Chapter 3- Circle
- Chapter 4- Geometric Constructions
- Chapter 5- Co-ordinate Geometry
- Chapter 6- Trigonometry
- Chapter 7- Mensuration

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The Maharashtra State Board of Secondary & Higher Secondary Education (MSBSHSE), Pune is an independent body of the Maharashtra Government. There are more than 1.4 million students that appear in the examination every year. The Maha State Board conducts the board examination twice a year. This board conducts the examination for SSC and HSC.

The Maharashtra government established the Maharashtra State Bureau of Textbook Production and Curriculum Research, also commonly referred to as Ebalbharati, in 1967 to take up the responsibility of providing quality textbooks to students from all classes studying under the Maharashtra State Board. MSBHSE prepares and updates the curriculum to provide holistic development for students. It is designed to tackle the difficulty in understanding the concepts with simple language with simple illustrations. Every year around 10 lakh students are enrolled in schools that are affiliated with the Maharashtra State Board.

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