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Practice Set 7.1 Geometry 10th Std Maths Part 2 Answers Chapter 7 Mensuration

Practice Set 7.1 Geometry 10th 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 = $\frac{1}{3}\pi r^2 h$

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

∴ The volume of the cone is 11.79 cm^3.

Mensuration Practice Set 7.1 Question 2. Find the volume of a sphere of diameter 6 cm. [π = 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 = $\frac{4}{3}\pi r^2$
= $\frac{4}{3}$ × 3.14 × $(3)^3$
= 4 × 3.14 × 3 × 3
= 113.04 cm^3
∴ The volume of the sphere is 113.04 cm^3.

Practice Set 7.1 Geometry Class 10 Question 3. Find the total surface area of a cylinder if the radius of its base is 5 cm and height is 40 cm. [π = 3.14]
Given: For the cylinder,
radius (r) = 5 cm,
height (h) = 40 cm
To find: Total surface area of the cylinder.
Solution:
Total surface area of cylinder = 2πr (r + h)
= 2 × 3.14 × 5 (5 + 40)
= 2 × 3.14 × 5 × 45
= 1413 cm^2
The total surface area of the cylinder is 1413 cm^2.

Practice Set 7.1 Geometry 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 = $A\pi r^2$
= 4 × $\frac{22}{7}$ × $(7)^2$
= 88 × 7
= 616 cm^2
∴ The surface area of the sphere is 616 cm^2.

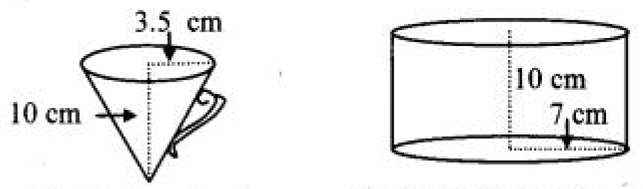
Practice Set 7.1 Question 5. The dimensions of a cuboid are 44 cm, 21 cm, 12 cm. It is melted and a cone of height 24 cm is made. Find the radius of its base.
Given: For the cuboid,
length (l) = 44 cm, breadth (b) = 21 cm,
height (h) = 12 cm
For the cone, height (H) = 24 cm
To find: Radius of base of the cone (r).
Solution:
Volume of cuboid = l × b × h
= 44 × 21 × 12 cm^3
Volume of cone = $\frac{1}{3}\pi r^2 H$
= $\frac{1}{3}$ × $\frac{22}{7}$ × r^2 × 24 cm^3
Since the cuboid is melted to form a cone,
∴ volume of cuboid = volume of cone

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

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

∴ $r^2 = 21 \times 21$
∴ r = 21 cm …[Taking square root of both sides]
∴ The radius of the base of the cone is 21 cm.

10th Class Geometry Practice Set 7.1 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
To find: Number of jugs of water the cylindrical pot can hold.
Solution:
Volume of conical jug = $\frac{1}{3} \pi r^2 h$

$$= \frac{1}{3} \times \pi \times 3.5^2 \times 10$$

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

$$\text{Volume of cylindrical pot} = \pi R^2 H$$

$$= \pi \times 7^2 \times 10$$

$$= 49 \times 10\pi \text{ cm}^3$$

$$\text{Number of jugs} = \frac{\text{Volume of cylindrical pot}}{\text{Volume of conical jug}}$$

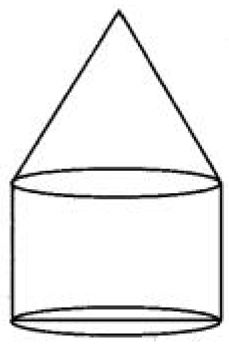
$$= \frac{49 \times 10\pi}{\frac{1}{3} \times 3.5^2 \times 10\pi}$$

$$= \frac{49 \times 3}{3.5 \times 3.5}$$

$$= \frac{49 \times 3 \times 100}{35 \times 35} = 12$$

∴ The cylindrical pot can hold 12 jugs of water.

Mensuration Class 10 Practice Set 7.1 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 cm^2. The cone is placed up on the cylinder. Volume of the solid figure so formed is 500 cm^3. Find the total height of the figure

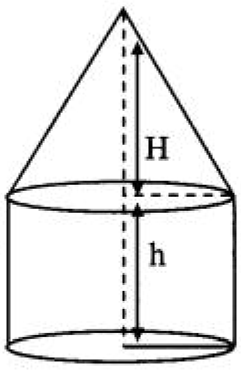


Given: For the cylindrical part,
height (h) = 3 cm,
area of the base (πr^2)= 100 cm^2
Volume of the entire figure = 500 cm^3
To find: Total height of the figure.
Solution:
A cylinder and a cone have equal bases.
∴ they have equal radii.
radius of cylinder = radius of cone = r
Area of base = 100 cm^2
∴ πr^2 =100 …(i)
Let the height of the conical part be H.
Volume of the entire figure
= Volume of the entire + Volume of cone

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

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

$\therefore \quad 500 = 100\left(3 + \frac{H}{3}\right)$ …[From (i)]



$\therefore \quad 3 + \frac{H}{3} = \frac{500}{100}$

$\therefore \quad 3 + \frac{H}{3} = 5$

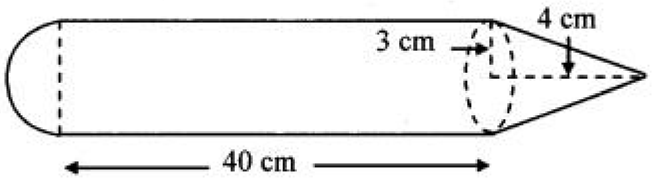
$\therefore \quad \frac{H}{3} = 5 - 3$

$\therefore \quad \frac{H}{3} = 2$

$\therefore \quad H = 6$ cm

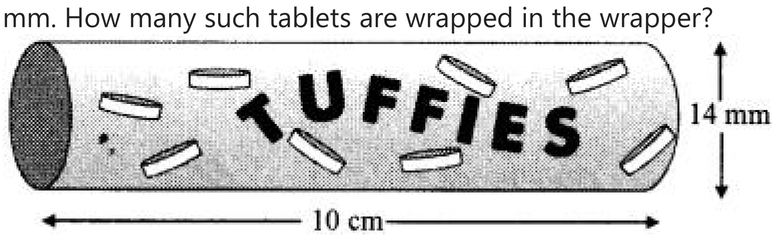
∴ Height of conical part (H) =6 cm
Total height of the figure = h + H
= 3 + 6
= 9 cm
∴ The total height of the figure is 9 cm.

10th Geometry Practice Set 7.1 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
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) = $\sqrt{h^2+r^2}$
= $\sqrt{4^2+3^2}$
= $\sqrt{16+9}$
= $\sqrt{25}$ = 5 cm
Curved surface area of cone = πrl
= π × 3 × 5
= 15π cm^2
Curved surface area of cylinder = 2πrH
= 2 × π × 3 × 40
= 240π cm^2
Curved surface area of hemisphere = $2\pi r^2$
= 2 × π × 3^2
= 18π cm^2
Total area of the toy
= Curved surface area of cone + Curved surface area of cylinder + Curved surface area of hemisphere
= 15π + 240π + 18π
= 2737 π cm^2
∴ The total area of the toy is 273π cm^2.

7.1.8 Practice 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) = $\frac{Diameter}{2}$
= $\frac{14}{2}$ = 7 mm
Height of wrapper (H) = 10 cm
= 10 × 10 mm
= 100 mm
Volume of a cylindrical wrapper = $\pi R^2 H$
= $\pi(7)^2 \times 100$
= 4900π mm^3
Volume of a cylindrical tablet = $\pi r^2 h$
= $\pi(7)^2 \times 5$
= 245π mm^3
No. of tablets that can be wrapped

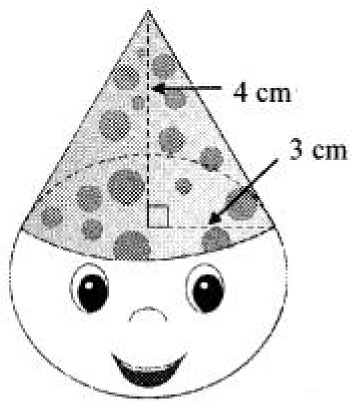
$$= \frac{\text{volume of a cylindrical wrapper}}{\text{volume of a cylindrical tablet}}$$

$$= \frac{4900\pi}{245\pi}$$

$$= 20$$

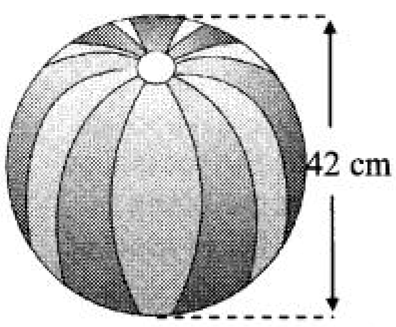
∴ 20 tables can be wrapped in the wrapper

Class 10 Maths 7.1 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.
(π = 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:



Now, volume of the toy
= Volume of cone + volume of hemisphere
= $12\pi + 18\pi$
= 30π
= 30 × 3.14
= 94.20 cm^3
Also, surface area of the toy
= Curved surface area of cone + Curved surface area of hemisphere
= $15\pi + 18\pi$
= 33π
= 33 × 3.14
= 103.62 cm^2
∴ The volume and surface area of the toy are 94.20 cm^3 and 103.62 cm^2 respectively.

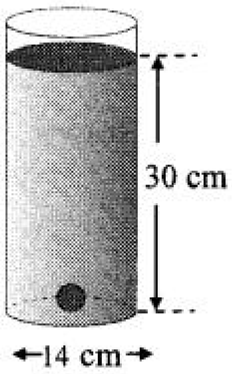
Question 11.
Find the surface area and the volume of a beach ball shown in the figure.



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 × 3.14 × $(21)^2$
= 4 × 3.14 × 21 × 21

= 5538.96 cm^2
Volume of sphere = $\frac{4}{3}\pi r^3$
= $\frac{4}{3}$ × 3.14 × $(21)^3$
= 4 × 3.14 × 7 × 21 × 21
= 38772.72 cm^3
∴ The surface area and the volume of the beach ball are 5538.96 cm^2 and 38772.72 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.



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.

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

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

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

$= \frac{4}{3}\pi (1)^3$

$= \frac{4}{3}\pi$ cm^3

Volume of water with sphere in it = $\pi R^2 H$
= π × $(7)^2$ × 30
= 1470π cm^3
Volume of water in the glass
= Volume of water with sphere in it – Volume of sphere

$= 1470\pi - \frac{4}{3}\pi$

$= \frac{4410\pi - 4\pi}{3}$

$= \frac{4406\pi}{3}$ (OR) $= \frac{4406}{3} \times \frac{22}{7}$

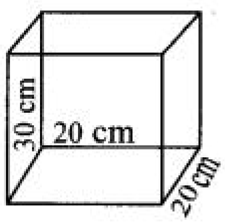
$= 1468.67\pi$ cm^3 | $= \frac{96932}{21}$

$= 4615.80$ cm^3

∴ The volume of the water in the glass is 1468.67 π cm^3 (i.e. 4615.80 cm^3).

Maharashtra Board Class 10 Maths Chapter 7 Mensuration Intext Questions and Activities

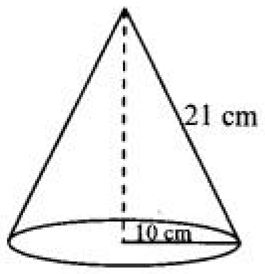
Question 1.
The length, breadth and height of an oil can are 20 cm, 20 cm and 30 cm respectively as shown in the adjacent figure. How much oil will it contain? (1 litre = 1000 cm^3) (Textbook pg. no.141)



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.

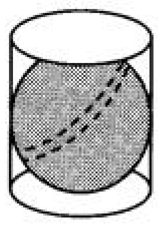
Solution:
Volume of cuboid = l × b × h
= 20 × 20 × 30
= 12000 cm3
= 120001000 litres
= 12 litres
∴ The oil can will contain 12 litres of oil.

Question 2.
The adjoining figure shows the measures of a Joker’s dap. 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
= πrl = 227 × 10 × 21
=22 × 10 × 3
= 660 cm2
∴ 660 cm2 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’,



i. what is the ratio of the radii of the sphere and the cylinder ?
ii. what is the ratio of the curved surface area of the cylinder and the surface area of the sphere?
iii. 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
∴ Radius of sphere = r
Also, height of cylinder = diameter of sphere
∴ h = d
∴ h = 2r ...(i)

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

∴ radius of sphere : radius of cylinder = 1 : 1.

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

∴ curved surface area of cylinder : surface area of sphere = 1:1.

iii. $\frac{\text{Volume of cylinder}}{\text{Volume of sphere}} = \frac{\pi r^2 h}{\frac{4}{3}\pi r^3}$

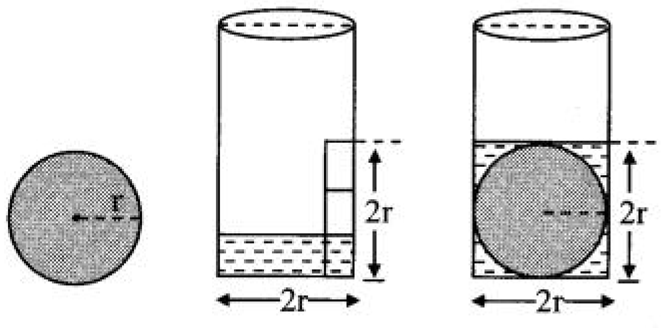
$= \frac{3h}{4r}$

$= \frac{3(2r)}{4r}$ ...[From (i)]

$= \frac{3}{2}$

∴ volume of cylinder : volume of sphere = 3 : 2.

Question 4.
Finding volume of a sphere using cylindrical beaker and water. (Textbook, pg. no. 142)



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.
$V = \pi r^2 h$
∴ $V = \pi r^2(2r)$ ...[∵ h = 2r]
∴ $V = 2\pi r^3$
But, V = volume of the ball + volume of water in the beaker
∴ $2\pi r^3$ = Volume of the ball + $\frac{1}{3} \times 2\pi r^3$
∴ Volume of the ball = $2\pi r^3 - \frac{2}{3}\pi r^3$
$= \frac{6\pi r^3 - 2\pi r^3}{3}$
∴ Volume of the ball = $\frac{4}{3}\pi r^3$
∴ Volume of a sphere = $\frac{4}{3}\pi r^3$

Practice Set 7.2 Geometry 10th Std Maths Part 2 Answers Chapter 7 Mensuration

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

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

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

$= \frac{220}{7} \times 343$

$= 220 \times 49$

$= 10780\ \text{cm}^3$

$= \frac{10780}{1000}$ litres ...[$\because$ 1 litre = 1000 cm^3]

$= 10.78$ litres

∴ 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, (π = 3.14)
Given: Radii (r_1) = 14 cm, and (r_2) = 6 cm,
height (h) = 6 cm
Solution:

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

$= \sqrt{6^2 + (14-6)^2}$

$= \sqrt{6^2 + 8^2}$

$= \sqrt{36 + 64}$

$= \sqrt{100} = 10$ cm

i. Curved surface area of frustum
$= \pi l\ (r_1 + r_2)$
$= 3.14 \times 10(14 + 6)$
$= 3.14 \times 10 \times 20 = 628\ \text{cm}^2$
∴ The curved surface area of the frustum is 628 cm^2.

ii. Total surface area of frustum
$= \pi l\ (r_1 + r_2) + \pi r_1^2 + \pi r_2^2$
$= 628 + 3.14 \times (14)^2 + 3.14 \times (6)^2$
$= 628 + 3.14 \times 196 + 3.14 \times 36$
$= 628 + 3.14(196 + 36)$
$= 628 + 3.14 \times 232$
$= 628 + 728.48$
$= 1356.48\ \text{cm}^2$
∴ The total surface area of the frustum is 1356.48 cm^2.

iii. Volume of frustum
$= \frac{1}{3} \pi h(r_1^2 + r_2^2 + r_1 \times r_2)$
$= \frac{1}{3} \times 3.14 \times 6(14^2 + 6^2 + 14 \times 6)$
$= 3.14 \times 2(196 + 36 + 84)$
$= 3.14 \times 2 \times 316$
$= 1984.48\ \text{cm}^3$
∴ The volume of the frustum is 1984.48 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. ($\pi = \frac{22}{7}$)
Solution:
Circumference1 = $2\pi r_1$ = 132 cm

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

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

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

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

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

Curved surface area of frustum = π (r_1 + r_2) l
= π (21 + 14) × 25
=π × 35 × 35
= 227 × 35 × 25
= 2750 cm^2

Practice Set 7.3 Geometry 10th Std Maths Part 2 Answers Chapter 7 Mensuration

Practice Set 7.3 Geometry Class 10 Question 1.
Radius of a circle is 10 cm. Measure of an arc of the circle is 54°. Find the area of the sector associated with the arc. (π = 3.14)
Given : Radius (r) = 10 cm,
Measure of the arc (θ) = 54°
To find : Area of the sector.
Solution:
Area of sector = θ360×πr2
= 54360 × 3.14 × $(10)^2$
= 320 × 3.14 × 100
= 3 × 3.14 × 5
= 15 × 3.14
= 47.1 cm^2
∴ The area of the sector is 47.1 cm^2.

Mensuration Practice Set 7.3 Question 2.
Measure of an arc of a circle is 80° and its radius is 18 cm. Find the length of the arc. (π = 3.14)
Given: Radius (r) = 18 cm,
Measure of the arc (θ) = 80°
To find: Length of the arc.
Solution:
Length of arc = θ360×2πr × 2πr
= 8360 × 2 × 3.14 × 18
= 29 × 2 × 3.14 × 18
= 2 × 2 × 3.14 × 2 = 25.12 cm
∴ The length of the arc is 25.12 cm.

Practice Set 7.3 Geometry 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:
Area of sector = l×r2
= 2.2×3.52
= 1.1 × 3.5 = 3.85 cm^2
∴ The area of the sector is 3.85 cm^2.

Question 4.
Radius of a circle is 10 cm. Area of a sector of the circle is 100 cm^2. Find the area of its corresponding major sector, (π = 3.14)
Given: Radius (r) = 10 cm,
area of minor sector =100 cm^2
To find: Area of maj or sector.
Solution:
Area of circle = πr^2
= 3.14 × $(10)^2$
= 3.14 × 100 = 314 cm^2
Now, area of major sector
= area of circle – area of minor sector
= 314 – 100
= 214 cm^2
∴ The area of the corresponding major sector is 214 cm^2.

Question 5.
Area of a sector of a circle of radius 15 cm is 30 cm^2. Find the length of the arc of the sector.
Given: Radius (r) =15 cm,
area of sector = 30 cm^2
To find: Length of the arc (l).
Solution:

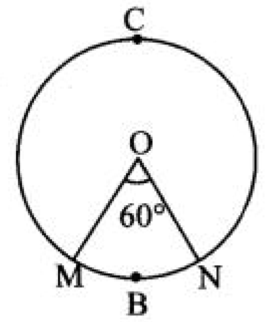
$$\text{Area of sector} = \frac{\text{length of the arc} \times \text{radius}}{2}$$

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

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

∴ The length of the arc is 4 cm.

Practice Set 7.3 Question 6.
In the adjoining figure, radius of the circle is 7 cm and m (arc MBN) = 60°, find
i. Area of the circle.
ii. A(O-MBN).
iii. A(O-MCN).

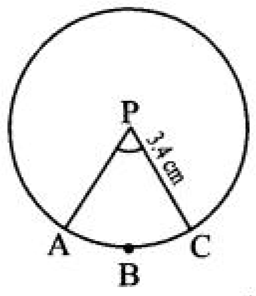


Given: radius (r) = 7 cm,
m(arc MBN) = θ = 60°
Solution:
i. Area of circle = πr^2
= 227 × $(7)^2$
= 22 × 7
= 154 cm^2
∴ The area of the circle is 154 cm^2

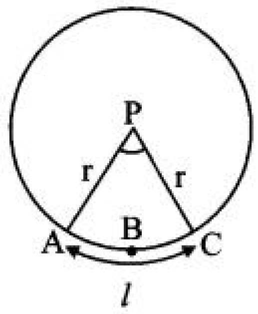
ii. Central angle (θ) = ∠MON = 60°
Area of sector = θ360×πr^2
∴ A(O – MBN) = 60360 × 227 × $(7)^2$
16 × 22 × 7
= 25.67 cm^2
= 25.7 cm^2
∴ A(O-MBN) = 25.7 cm^2

iii. Area of major sector = area of circle – area of minor sector
∴ A(O-MCN) = Area of circle – A(O-MBN)
= 154 – 25.7
∴ A(O-MCN) = 128.3 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(P-ABC).
Given: Radius (r) = 3.4 cm,
perimeter of sector 12.8 cm
To find: A(P-ABC)



Solution:
Perimeter of sector
= length of arc ABC + AP + CP

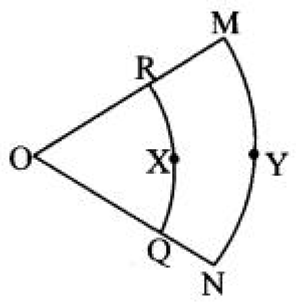


∴ 12.8 = l + 3.4 + 3.4
∴ 12.8 = l + 6.8
∴ l = 12.8 – 6.8 = 6cm

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

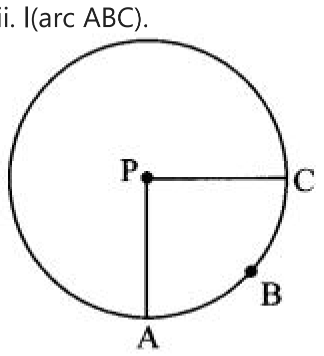
∴ A(P-ABC) = 10.2 cm2

7.3 Class 10 Question 8.
In the adjoining figure, O is the centre of the sector. ∠ROQ = ∠MON = 60°. OR = 7 cm, and OM = 21 cm. Find the lengths of arc RXQ and (π = 227)



Given: ∠ROQ = ∠MON = 60°,
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 = θ360×2πr
= 602 × 2 × 227 × 7
= 16 × 2 × 22
= 7.33 cm
ii. Length of arc MYN = θ360×2πR
= 602 × 2 × 227 × 21
= 16 × 2 × 22 × 3
= 22 cm
∴ 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 cm2, radius of the circle is 14 cm, find
i. ∠APC,
ii. l(arc ABC).



Given: A(P – ABC) = 154 cm2,
radius (r) = 14 cm

Solution:
i. Let ∠APC = θ

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

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

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

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

$$\therefore \quad \angle \mathbf{APC = 90°}$$

$$\text{ii.} \quad l(\text{arc ABC}) = \frac{\theta}{360} \times 2\pi r$$

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

$$= \frac{1}{4} \times 2 \times 22 \times 2$$

$$\therefore \quad \boldsymbol{l}\,\mathbf{(arc\ ABC) = 22\ cm}$$

Std 10 Geometry Mensuration Question 10.
Radius of a sector of a circle is 7 cm. If measure of arc of the sector is
i. 30°
ii. 210°
iii. three right angles, find the area of the sector in each case.
Given: Radius (r) = 7 cm
To find: Area of the sector.
Solution:
i. Measure of the arc (θ) = 30°

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

$$= \frac{30}{360} \times \frac{22}{7} \times (7)^2$$

$$= \frac{1}{12} \times 22 \times 7$$

$$= 12.83 \text{ cm}^2$$

∴ Area of the sector is 12.83 cm2.
ii. Measure of the arc (θ) = 210°

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

$$= \frac{210}{360} \times \frac{22}{7} \times (7)^2$$

$$= \frac{7}{12} \times 22 \times 7$$

$$= 89.83 \text{ cm}^2$$

∴ Area of the sector is 89.83 cm2.
iii. Measure of the arc (θ) = 3 right angle
= 3 × 90° = 270°

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

$$= \frac{270}{360} \times \frac{22}{7} \times (7)^2$$

$$= \frac{3}{4} \times 22 \times 7$$

$$= 115.50 \text{ cm}^2$$

∴ Area of the sector is 115.50 cm2.

Mensuration Practice Question 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.
Given: Area of minor sector = 3.85 cm2,
central angle (θ) = 36°
To find: Radius of the circle (r).
Solution:

Area of minor sector = θ360×πr2

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

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

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

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

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

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

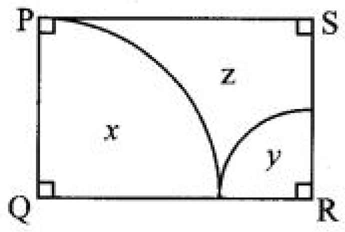
$\therefore \quad r^2 = \frac{7 \times 7}{2 \times 2}$

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

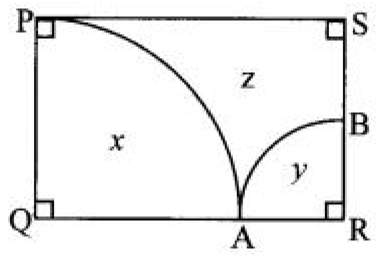
$= 3.5$ cm

∴ The radius of the circle ¡s 3.5 cm.

10th Geometry Practice Set 7.3 Question 12.
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.

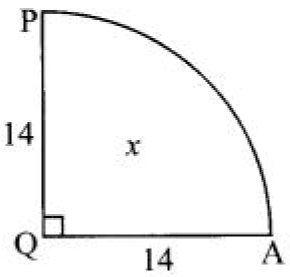


Given: In rectangle PQRS,
PQ = 14 cm, QR = 21 cm
To find: Areas of the parts x, y and z.
Solution:



∠Q = ∠R = θ = 90° …[Angles of a rectangle]

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



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

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

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

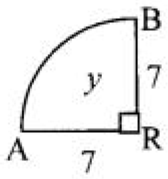
$= \frac{1}{2} \times 11 \times 2 \times 14$

$= 11 \times 14$

$= 154 \text{ cm}^2$

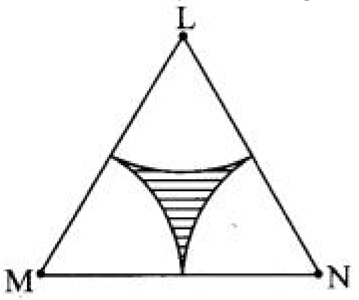
For the sector (Q – PA),
PQ = QA …[Radii of the same circle]
∴ QA = 14 cm
Now, QR = QA + AR … [Q – A – R]
∴ 21 = 14 + AR
∴ AR = 7 cm

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



Area of rectangle = length × breadth
area of □ PQRS = PQ × QR
= 14 × 21
= 294 cm^2
Area of part z = area of □ PQRS
– area of part x – area of part y
= 294 – 154 – 38.5
= 101.5 cm^2
∴ The area of part x is 154 cm^2, the area of part y is 38,5 cm^2 and the area of part z is 101.5 cm^2.

Question 13.
ΔALMN is an equilat triangle. LM = 14 cm. As shown in figure, three sectors are drawn with vertices as centres and radius 7 cm. Find,



i. A (Δ LMN).
ii. Area of any one of the sectors.
iii. Total area of all the three sectors.
iv. Area of the shaded region. ($\sqrt{3}$ = 1.732)
Given: In equilateral triangle LMN, LM =14 cm,
radius of sectors (r) = 7 cm
Solution:
i. ΔLMN is an equilateral triangle.

$$\therefore \quad A(\Delta LMN) = \frac{\sqrt{3}}{4} LM^2$$
$$= \frac{\sqrt{3}}{4} \times 14^2$$
$$= 49 \times 1.732$$
$$= 84.868$$
$$= 84.87 \text{ cm}^2$$

ii. Central angle (θ) = 60° …[Angle of an equilateral triangle]

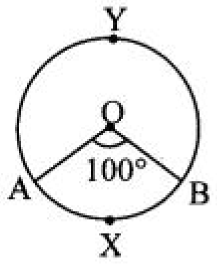
$$\text{Area of sector} = \frac{\theta}{360} \times \pi r^2$$
$$= \frac{60}{360} \times \frac{22}{7} \times 7^2$$
$$= \frac{1}{6} \times 22 \times 7$$
$$= \frac{11 \times 7}{3} = \frac{77}{3}$$
$$= 25.67 \text{ cm}^2$$

∴ Area of one sector = 25.67 cm^2
iii. Total area of all three sectors
= 3 × Area of one sector
= 3 × 25.67
= 77.01 cm^2
∴ Total area of all three sectors = 77.01 cm^2
iv. Area of shaded region
= A(ΔLMN) – total area of all three sectors
= 84.87 – 77.01

= 7.86 cm2
∴ Area of shaded region = 7.86 cm

Maharashtra Board Class 10 Maths Chapter 7 Mensuration Intext Questions and Activities

Mensuration Practice Set 7.3 Question 1.
Complete the following table with the help of given figure. (Textbook pg. no. 149)

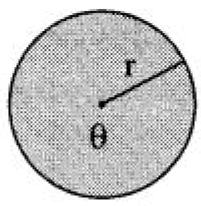
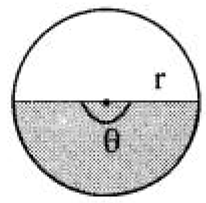
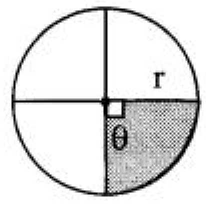
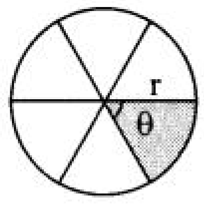


Type of arc	Name of the arc	Measure of the arc
Minor arc	arc AXB	
Major arc	arc AYB	

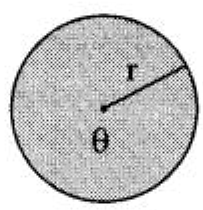
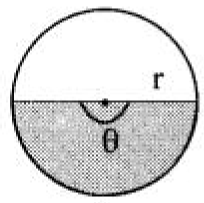
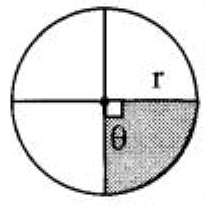
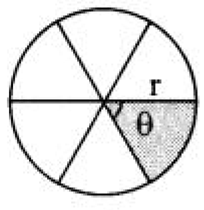
Solution:

Type of arc	Name of the arc	Measure of the arc
Minor arc	arc AXB	**100°**
Major arc	arc AYB	**360° – 100° = 260°**

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)

Central angle of a circle = 360°, Area of a circle = πr^2					
Sector of circle	 $A_1 = \pi r^2$	 $A_2 = \frac{1}{2}\pi r^2$	 $A_3 = \frac{1}{4}\pi r^2$	 $A_4 = \frac{1}{6}\pi r^2$	A
Measure of arc of the sector (θ)					
$\frac{\theta}{360}$					
Area of the sector (A)					

Solution:

Central angle of a circle = 360°, Area of a circle = πr^2					
Sector of circle	 $A_1 = \pi r^2$	 $A_2 = \frac{1}{2}\pi r^2$	 $A_3 = \frac{1}{4}\pi r^2$	 $A_4 = \frac{1}{6}\pi r^2$	A
Measure of arc of the sector (θ)	360°	180°	90°	60°	θ
$\frac{\theta}{360}$	$\frac{360}{360} = 1$	$\frac{180}{360} = \frac{1}{2}$	$\frac{90}{360} = \frac{1}{4}$	$\mathbf{\frac{60}{360} = \frac{1}{6}}$	$\frac{\theta}{360}$
Area of the sector (A)	$1 \times \pi r^2$	$\frac{1}{2} \times \pi r^2$	$\frac{1}{4} \times \pi r^2$	$\mathbf{\frac{1}{6} \times \pi r^2}$	$\frac{\theta}{360} \times \pi r^2$

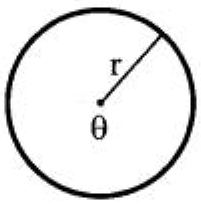
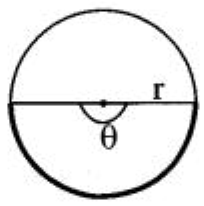
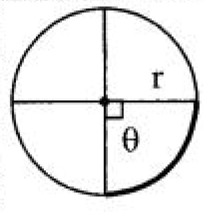
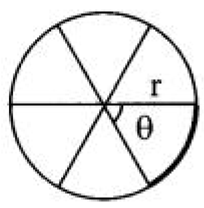
Thus, if measure of an arc of a circle is θ, then
Area of sector (A) = $\frac{\theta}{360}$ × Area of circle

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

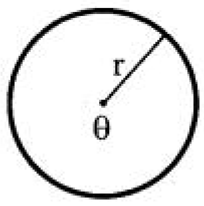
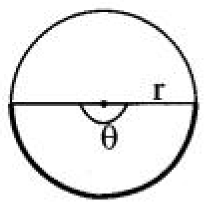
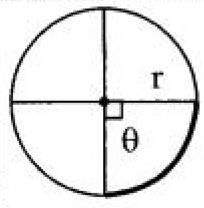
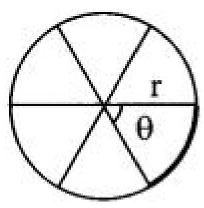
$$\therefore \quad \frac{A}{\pi r^2} = \frac{\theta}{360}$$

$$\text{i.e., } \frac{\textbf{Area of the sector}}{\textbf{Area of the circle}} = \frac{\mathbf{\theta}}{\mathbf{360}}$$

Mensuration In Maths Question 3.
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 = 2πr					
Length of the arc	 $l_1 = 2\pi r$	 $l_2 = \frac{1}{2} \times 2\pi r$	 $l_3 = \frac{1}{4} \times 2\pi r$	 $l_4 = \frac{1}{6} \times 2\pi r$	l
Measure of the arc (θ)					
$\frac{\theta}{360}$					
Length of the arc (l)					

Solution:

Circumference of a circle = 2πr					
Length of the arc	 $l_1 = 2\pi r$	 $l_2 = \frac{1}{2} \times 2\pi r$	 $l_3 = \frac{1}{4} \times 2\pi r$	 $l_4 = \frac{1}{6} \times 2\pi r$	l
Measure of the arc (θ)	360°	180°	90°	60°	θ
$\frac{\theta}{360}$	$\frac{360}{360} = 1$	$\frac{180}{360} = \frac{1}{2}$	$\frac{90}{360} = \frac{1}{4}$	$\frac{60}{360} = \frac{1}{6}$	$\frac{\theta}{360}$
Length of the arc (l)	$1 \times 2\pi r$	$\frac{1}{2} \times 2\pi r$	$\frac{1}{4} \times 2\pi r$	$\frac{1}{6} \times 2\pi r$	$\frac{\theta}{360} \times 2\pi r$

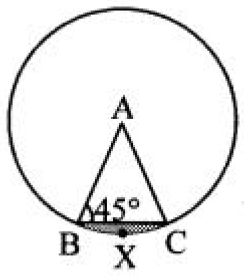
Thus, if the measure of an arc of a circle is 0, then
Length of arc (l) = $\frac{\theta}{360}$ × circumference of circle
∴ Length of arc (l) = $\frac{\theta}{360} \times 2\pi r$

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

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

Practice Set 7.4 Geometry 10th Std Maths Part 2 Answers Chapter 7 Mensuration

Practice Set 7.4 Geometry Class 10 Question 1. In the adjoining figure, A is the centre of the circle. ∠ABC = 45° and AC = $7\sqrt{2}$ cm. Find the area of segment BXC, (π = 3.14)

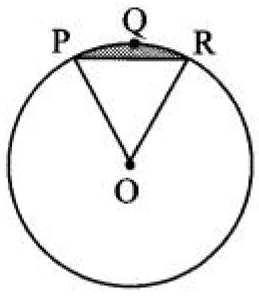


Solution:
In ΔABC,
AC = AB … [Radii of same circle]
∴ ∠ABC = ∠ACB …[Isosceles triangle theorem]
∴ ∠ABC = ∠ACB = 45°
In ΔABC,
∠ABC + ∠ACB + ∠BAC = 180° … [Sum of the measures of angles of a triangle is 180°]
∴ 45° + 45° + ∠BAC = 180°
∴ 90° + ∠BAC = 180°
∴ ∠BAC = 90°
Let ∠BAC = θ = 90°

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

∴ The area of segment BXC is 27.93 cm2.

10th Class Geometry Practice Set 7.4 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)



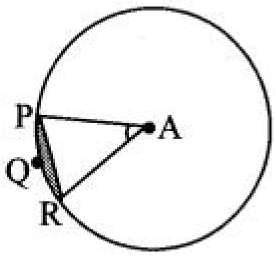
Given: m(arc PQR) = 60°, radius (r) = OP = 10 cm
To find: Area of shaded region.
Solution:
∠POR = m (arc PQR) …[Measure of central angle]
∴ ∠POR = θ = 60°

$$\text{A(segment PQR)} = r^2\left[\frac{\pi\theta}{360} - \frac{\sin\theta}{2}\right]$$
$$= 10^2\left[\frac{3.14\times 60}{360} - \frac{\sin 60^\circ}{2}\right]$$
$$= 100\left[\frac{3.14}{6} - \frac{\sqrt{3}}{2}\times\frac{1}{2}\right]$$
$$= 100\left[\frac{3.14}{6} - \frac{1.73}{4}\right]$$
$$= 100\left[\frac{3.14\times 2}{6\times 2} - \frac{1.73\times 3}{4\times 3}\right]$$

$$= 100\left[\frac{6.28}{12} - \frac{5.19}{12}\right]$$
$$= 100\left[\frac{6.28 - 5.19}{12}\right]$$
$$= 100\left[\frac{1.09}{12}\right]$$
$$= 100\ [0.0908]$$
$$= 9.08\ \text{cm}^2$$

∴ The area of the shaded region is 9.08 cm^2.

7.4 Class 10 Question 3. In the adjoining figure, if A is the centre of the circle, ∠PAR = 30°, AP = 7.5, find the area of the segment PQR. (π = 3.14)

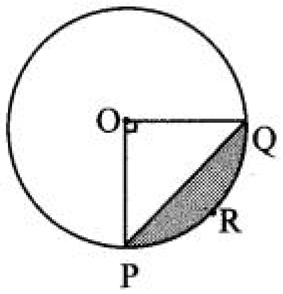


Given: Central angle (θ) = ∠PAR = 30°,
radius (r) = AP = 7.5
To find: Area of segment PQR.
Solution:
Let ∠PAR = θ = 30°

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

∴ The area of segment PQR is 0.65625 sq. units.

Chapter 7 Maths Class 10 Question 4. In the adjoining figure, if O is the centre of the circle, PQ is a chord, ∠POQ = 90°, area of shaded region is 114 cm2, find the radius of the circle, (π = 3.14)



Given: Central angle (θ) = ∠POQ= 90°,
A (segment PRQ) = 114 cm^2
To find: Radius (r).
Solution:

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

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

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

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

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

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

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

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

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

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

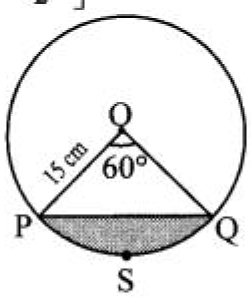
$$\therefore \quad r = 10 \times 2$$

...[Taking square root of both sides]
∴ r = 20 cm
∴ The radius of the circle is 20 cm.

Mensuration Questions for Class 10 Question 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. (π = 3.14, $\sqrt{3}$ = 1.73)
Given: Radius (r) =15 cm, central angle (θ) = 60°
To find: Areas of major and minor segments.
Solution:
Let chord PQ subtend ∠POQ = 60° at centre.
∴ θ = 60°

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

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



$$= 225\left[\frac{3.14}{6} - \frac{\sqrt{3}}{2} \times \frac{1}{2}\right]$$

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

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

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

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

$$= 225\left[\frac{1.09}{12}\right]$$

= 225 [0.0908]
= 20.43 cm^2
∴ area of minor segment = 20.43 cm^2
Area of circle = πr^2
= 3.14 × 15 × 15
= 3.14 × 225
= 706.5 cm^2
Area of major segment
= Area of circle – area of minor segment
= 706.5 – 20.43
= 686.07 cm^2
Area of major segment 686.07 cm^2
∴ The area of minor segment Is 20.43 cm^2 and the area of major segment is 686.07 cm^2.

Problem Set 7 Geometry 10th Std Maths Part 2 Answers Chapter 7 Mensuration

Problem Set 7 Question 1. Choose the correct alternative answer for each of the following questions.

i. The ratio of circumference and area of a circle is 2 : 7. Find its circumference.
(A) 14 π
(B) 7π
(C) 7π
(D) 14π
Answer:

$$\frac{\text{Circumference}}{\text{Area of circle}} = \frac{2}{7}$$

$$\therefore \quad \frac{2\pi r}{\pi r^2} = \frac{2}{7}$$

$$\therefore \quad r = 7$$

$$\therefore \quad \text{Circumference} = 2\pi r = 2 \times \pi \times 7 = 14\pi$$

(A)

ii. If measure of an arc of a 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
Answer:

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

$$\therefore \quad 44 = \frac{160}{360} \times 2\pi r$$

$$\therefore \quad 2\pi r = \frac{44 \times 360}{160} = 99 \text{ cm}$$

$$\text{Circumference} = 99 \text{ cm}$$

(D)

iii. 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
Answer:

$$\begin{aligned}\text{Perimeter of sector} &= \text{Length of arc} + 2r \\ &= \frac{\theta}{360} \times 2\pi r + 2r \\ &= \frac{90}{360} \times 2 \times \frac{22}{7} \times 7 + 2 \times 7 \\ &= 11 + 14 \\ &= 25 \text{ cm}\end{aligned}$$

(B)

iv. 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
Answer:

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

$= \sqrt{7^2 + 24^2}$

$= \sqrt{625} = 25$ cm

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

$= \frac{22}{7} \times 7 \times 25$

$= 550$ cm^2

(B)

v. The curved surface area of a cylinder is 440 cm^2 and its radius is 5 cm. Find its height.
(A) 44π cm
(B) 22π cm
(C) 44π cm
(D) 22π
Answer:

Curved surface area of cylinder = $2\pi rh$

∴ $440 = 2 \times \pi \times 5 \times h$

∴ $h = \frac{440}{10\pi} = \frac{44}{\pi}$ cm

(A)

vi. 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
Answer:

Volume of cone = Volume of cylinder

∴ $\frac{1}{3}\pi r^2 h = \pi r^2 H$

∴ $\frac{h}{3} = 5$

∴ $h = 15$ cm

(A)

vii. Find the volume of a cube of side 0.01 cm.
(A) 1 cm
(B) 0.001 cm^3
(C) 0.0001 cm^3
(D) 0.000001 cm^3
Answer:
Volume of cube = (side)^3
= (0.01)^3 = 0.000001 cm^3
(D)

viii. Find the side of a cube of volume 1 m^3
(A) 1 cm
(B) 10 cm
(C) 100 cm
(D) 1000 cm
Answer:
Volume of cube = (side)^3
∴ 1 = (side)^3
∴ Side = 1 m
= 100 cm
(C)

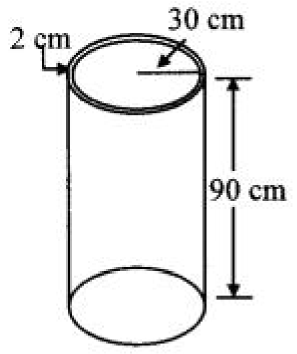
Problem Set 7 Geometry Class 10 Question 2. A washing tub in the shape of a frustum of a cone has height 21 cm. The radii of the circular top and bottom are 20 cm and 15 cm respectively. What is the capacity of the tub? = (π = 227)
Given: For the frustum shaped tub,
height (h) = 21 cm,
radii (r_1) = 20 cm, and (r_2) = 15 cm
To find: Capacity (volume) of the tub.
Solution:
Volume of frustum = 13 πh ($r_1^2 + r_2^2 + r_1 \times r_2$)

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

$= \frac{1}{3} \times \frac{22}{7} \times 21\ (20^2 + 15^2 + 20 \times 15)$
$= 22\ (400 + 225 + 300)$
$= 22 \times 925$
$= 20350\ cm^3$
$= \frac{20350}{1000}$ litres ...[1litre = 1000 cm^3]
$= 20.35$ litres

∴ The capacity of the tub is 20.35 litres.

10th Geometry Problem Set 7 Question 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?
Given: For the cylindrical tube,
height (h) = 90 cm,
outer radius (R) = 30 cm,
thickness = 2 cm
For the plastic spherical ball,
radius (r_1) = 1 cm
To find: Number of balls melted.
Solution:



Inner radius of tube (r)
= outer radius – thickness of tube
= 30 – 2
= 28 cm
Volume of plastic required for the tube = Outer volume of tube – Inner volume of hollow tube
= $\pi R^2 h - \pi r^2 h$
= $\pi h(R^2 - r^2)$
= $\pi \times 90\ (30^2 - 28^2)$
= $\pi \times 90\ (30 + 28)\ (30 - 28)$ ...[∵ $a^2 - b^2 = (a + b)(a - b)$]
= $90 \times 58 \times 2\pi\ cm^3$

Volume of one plastic ball $= \frac{4}{3}\pi r_1^3$
$= \frac{4}{3}\pi \times 1^3$
$= \frac{4}{3}\pi\ cm^3$

Number of balls to be melted
$= \frac{\text{Volume of plastic required for the tube}}{\text{Volume of one plastic ball}}$

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

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

$= 7830$

∴ 7830 plastic balls were melted to make the tube.

Problem Set 7 Geometry Question 4.
A metal parallelopiped of measures 16 cm × 11cm × 10cm 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?
Given: For the parallelopiped.,
length (l) = 16 cm, breadth (b) = 11 cm,
height (h) = 10 cm
For the cylindrical coin,
thickness (H) = 2 mm,
diameter (D) 2 cm

To find: Number of coins made.
Solution:
Volume of parallelopiped = l × b × h
= 16 × 11 × 10
= 1760 cm^3
Thickness of coin (H) = 2 mm
= 0.2 cm …[∵ 1 cm = 10 mm]
Diameter of coin (D) = 2 cm

$$\therefore \quad \text{Radius of coin (R)} = \frac{D}{2} = \frac{2}{2} = 1 \text{ cm}$$

$$\therefore \quad \text{Volume of one coin} = \pi R^2 H = \frac{22}{7} \times 1^2 \times 0.2 = \frac{4.4}{7} \text{ cm}^3$$

Number of coins that were made

$$= \frac{\text{Volume of parallelopiped}}{\text{Volume of one coin}} = \frac{1760}{\left(\frac{4.4}{7}\right)} = \frac{1760 \times 7}{4.4} = \frac{1760 \times 7 \times 10}{44} = 2800$$

∴ 2800 coins were made by melting the parallelopiped.

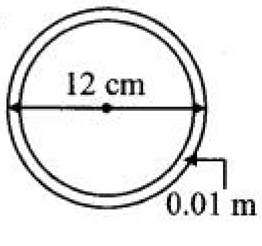
Mensuration Problem Question 5. The diameter and length of a roller is 120 cm and 84 cm respectively. To level the ground, 200 rotations of the roller are required. Find the expenditure to level the ground at the rate of ₹ 10 per sq.m.
Given: For the cylindrical roller,
diameter (d) =120 cm,
length = height (h) = 84 cm
To find: Expenditure of levelling the ground.
Solution:
Diameter of roller (d) = 120 cm

$$\therefore \quad \text{Radius of roller (r)} = \frac{d}{2} = \frac{120}{2} = 60 \text{ cm}$$

$$\therefore \quad \text{Curved surface area of roller} = 2\pi rh$$
$$= 2 \times \frac{22}{7} \times 60 \times 84$$
$$= 2 \times 22 \times 60 \times 12$$
$$= 31680 \text{ cm}^2$$
$$= \frac{31680}{100 \times 100} \text{ m}^2 \qquad \ldots[\because 1 \text{ m} = 100 \text{ cm}]$$
$$= 3.168 \text{ m}^2$$

Now, area of ground levelled in one rotation = curved surface area of roller
= 3.168 m^2
∴ Area of ground levelled in 200 rotations
= 3.168 × 200 =
633.6 m^2
Rate of levelling = ₹ 10 per m^2
∴ Expenditure of levelling the ground
= 633.6 × 10 = ₹ 6336
∴ The expenditure of levelling the ground is ₹ 6336.

Question 6.
The diameter and thickness of a hollow metal sphere are 12 cm and 0.01 m respectively. The density of the metal is 8.88 gm per cm3. Find the outer surface area and mass of the sphere, [π = 3.14]
Given: For the hollow sphere,
diameter (D) =12 cm, thickness = 0.01 m
density of the metal = 8.88 gm per cm^3
To find: i. Outer surface area of the sphere
ii. Mass of the sphere.



Solution:
Diameter of the sphere (D)
= 12 cm
∴ Radius of sphere (R)

= $\frac{d}{2}$ = $\frac{12}{2}$ = 6 cm
∴ Surface area of sphere = $4\pi R^2$
= 4 × 3.14 × 6^2
= 452.16 cm^2
Thickness of sphere = 0.01 m
= 0.01 × 100 cm …[∵ 1 m = 100 cm]
= 1 cm
∴ Inner radius of the sphere (r)
= Outer radius – thickness of sphere
= 6 – 1 = 5 cm
∴ Volume of hollow sphere
= Volume of outer sphere – Volume of inner sphere

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

$$= \frac{4}{3}\pi (R^3 - r^3)$$

$$= \frac{4}{3} \times 3.14 \times (6^3 - 5^3)$$

$$= \frac{4}{3} \times 3.14 \times (216 - 125)$$

$$= \frac{4}{3} \times 3.14 \times 91 = \frac{1142.96}{3} = 380.986$$

$$= 380.99 \text{ cm}^3$$

Now, density of metal = $\frac{\text{Mass of sphere}}{\text{Volume of sphere}}$

∴ $8.88 = \frac{\text{Mass of sphere}}{380.99}$

∴ Mass of sphere = 8.88 × 380.99
= 3383.19 gm

∴ The outer surface area and the mass of the sphere are 452.16 cm^2 and 3383.19 gm respectively.

Question 7.
A cylindrical 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?
Given: For the cylindrical bucket,
diameter (d) = 28 cm, height (h) = 20 cm
For the conical heap of sand,
height (H) = 14 cm
To find: Base area of the cone (πR^2).
Solution:
Diameter of the bucket (d) = 28 cm

∴ Radius of bucket (r) = $\frac{d}{2} = \frac{28}{2}$ = 14 cm

∴ Volume of bucket = $\pi r^2 h$

$$= \frac{22}{7} \times 14^2 \times 20$$

$$= 22 \times 14 \times 2 \times 20$$

$$= 12320 \text{ cm}^3$$

Volume of conical heap = $\frac{1}{3}\pi R^2 H$

$$= \frac{1}{3} \times \pi R^2 \times 14$$

$$= \frac{14}{3}\pi R^2 \text{ cm}^2$$

But, volume of bucket = volume of conical heap

∴ $12320 = \frac{14}{3}\pi R^2$

∴ $\pi R^2 = \frac{12320 \times 3}{14}$

$$= 2640 \text{ cm}^2$$

The base area of the cone is 2640 cm^2.

Question 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.
Given: For metallic sphere,
radius (R) = 9 cm
For the cylindrical wire,

diameter (d) = 4 mm
To find: Length of wire (h).
Solution:

$$\text{Volume of sphere} = \frac{4}{3}\pi R^3$$
$$= \frac{4}{3} \times \pi \times 9^3$$
$$= 972\pi \text{ cm}^3$$
$$\text{Diameter of wire (d)} = 4 \text{ mm}$$
$$= \frac{4}{10} \text{ cm}$$
$$\text{...}[\because 1 \text{ cm} = 10 \text{ mm}]$$
$$= 0.4 \text{ cm}$$
$$\therefore \quad \text{Radius of wire (r)} = \frac{d}{2} = \frac{0.4}{2} = 0.2 \text{ cm}$$
$$\text{Volume of wire} = \pi r^2 h$$
$$= \pi (0.2)^2 h = 0.04\pi h \text{ cm}^3$$
$$\text{But, volume of wire} = \text{volume of sphere}$$
$$\therefore \quad 0.04\,\pi h = 972\pi$$
$$\therefore \quad h = \frac{972}{0.04}$$
$$= \frac{97200}{4}$$
$$= 24300 \text{ cm}$$
$$= \frac{24300}{100} \text{ m} \qquad \text{...}[\because 1 \text{ m} = 100 \text{ cm}]$$
$$\therefore \quad h = 243 \text{ m}$$

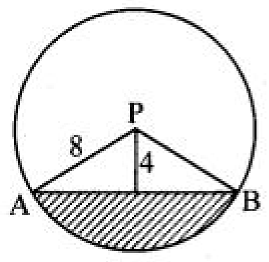
∴ The length of the wire is 243 m.

Question 9.
The area of a sector of a circle of 6 cm radius is 157t sq.cm. Find the measure of the arc and length of the arc corresponding to the sector.
Given: Radius (r) = 6 cm,
area of sector = 15 π cm^2
To find: i. Measure of the arc (θ),
ii. Length of the arc (l)
Solution:

$$\text{Area of sector} = \frac{\theta}{360} \times \pi r^2$$
$$\therefore \quad 15\pi = \frac{\theta}{360} \times \pi \times 6^2$$
$$\therefore \quad 15\pi = \frac{\theta}{360} \times \pi \times 36$$
$$\therefore \quad 15 = \frac{\theta}{10} \qquad \therefore \quad \theta = 150^\circ$$
$$\text{Also, area of sector} = \frac{\text{length of the arc} \times \text{radius}}{2}$$
$$\therefore \quad 15\pi = \frac{l \times 6}{2}$$
$$\therefore \quad l = \frac{15\pi \times 2}{6} = 5\pi \text{ cm}$$

∴ The measure of the arc and the length of the arc are 150° and 5π cm respectively.

Question 10.
In the adjoining figure, seg AB is a chord of a circle with centre P. If PA = 8 cm and distance of chord AB from the centre P is 4 cm, find the area of the shaded portion.



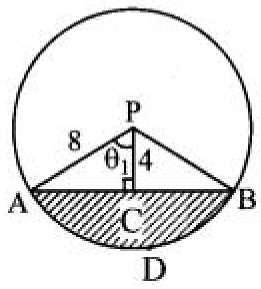
(π = 3.14, $\sqrt{3}$ = 1.73)
Given: Radius (r) = PA = 8 cm,
PC = 4 cm
To find: Area of shaded region.
Solution:

Let $\angle APC = \theta_1$

In ΔACP, $\angle ACP = 90°$

$\cos \theta_1 = \frac{PC}{AP} = \frac{4}{8} = \frac{1}{2}$

But, $\cos 60° = \frac{1}{2}$



$\therefore \quad \theta_1 = 60°$

Similarly, we can show that, $\angle BPC = 60°$

$\angle APB = \angle APC + \angle BPC$ ...[Angle sum property]

$\therefore \theta = 60° + 60° = 120°$

$$A(\text{P-ADB}) = \frac{\theta}{360} \times \pi r^2$$
$$= \frac{120}{360} \times 3.14 \times 8^2$$
$$= \frac{1}{3} \times 3.14 \times 64$$
$$= 66.98 \text{ cm}^2$$

In ΔAPC,

$$\sin \theta_1 = \frac{AC}{AP}$$

$\therefore \quad \sin 60° = \frac{AC}{8} \qquad \therefore \quad \frac{\sqrt{3}}{2} = \frac{AC}{8}$

$\therefore \quad AC = 4\sqrt{3}$ cm

Now, $AB = 2\, AC$

...[Perpendicular drawn from the centre of the circle to the chord bisects the chord]

$$= 2 \times 4\sqrt{3}$$
$$= 8\sqrt{3} \text{ cm}$$

$\therefore \quad A(\Delta APB) = \frac{1}{2} \times AB \times PC$

$$= \frac{1}{2} \times 8\sqrt{3} \times 4$$
$$= 16\sqrt{3}$$
$$= 16 \times 1.73$$
$$= 27.68 \text{ cm}^2$$

Area of shaded region = A(P-ADB) – A(ΔAPB)

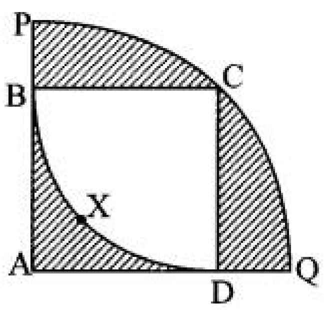
= 66.98 – 27.68

= 39.30 cm^2

∴ The area of the shaded region is 39.30 cm^2.

Question 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.



Solution:

Side of square ABCD

= radius of sector C-BXD = [20] cm

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

Area of shaded region inside the square = Area of square ABCD – Area of sector C-BXD

= Area of square ABCD

– Area of sector C-BXD

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

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

$= \boxed{400} - 314$

$= \boxed{86\ cm^2}$

Radius of bigger sector
= Length of diagonal of square ABCD
= $\sqrt{2}$ × side
= 20 $\sqrt{2}$ cm
Area of the shaded regions outside the square
= Area of sector A-PCQ – Area of square ABCD
= A(A – PCQ) – A(□ ABCD)

$= \left(\frac{\theta}{360} \times \pi \times r^2\right) - \boxed{AB}^2$

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

$= \boxed{628} - \boxed{400}$

$= \boxed{228\ cm^2}$

∴ Total area of the shaded region = 86 + 228
= 314 cm²

Alternate method:

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

$= \frac{90}{360} \times 3.14 \times 20 \times 20$

$= 3.14 \times 5 \times 20$

$= 314\ cm^2$

□ABCD is a square. … [Given]
Side of □ABCD = radius of sector (C-BXD)
= 20 cm
Radius of sector (A-PCQ) = Diagonal
= $\sqrt{2}$ × side
= $\sqrt{2}$ × 20
= 20 $\sqrt{2}$ cm

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

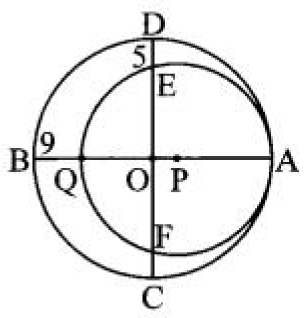
$= \frac{90}{360} \times 3.14 \times \left(20\sqrt{2}\right)^2$

$= \frac{1}{4} \times 3.14 \times 20 \times 20 \times 2$

$= 628\ cm^2$

Now, Area of shaded region
= A(A-PCQ) – A(C-BXD)
= 628 – 314
= 314 cm^2
∴ The area of the shaded region is 314 cm^2.

Question 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.



Solution:
Let the radius of the bigger circle be R and that of smaller circle be r.

OA, OB, OC and OD are the radii of the bigger circle.
∴ OA = OB = OC = OD = R
PQ = PA = r
OQ + BQ = OB … [B – Q – O]
OQ = OB – BQ = R – 9
OE + DE = OD ….[D – E – O]
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 × OA = OE × OF
∴ (R – 9) × R = (R – 5) × (R – 5) …[∵ OE = OF]
∴ R^2 – 9R = R^2 – 10R + 25
∴ -9R + 10R = 25
∴ R = [25units]
AQ = AB – BQ = 2r ….[B-Q-A]
∴ 2r = 50 – 9 = 41
∴ r = 412 = 20.5 units