VIVEK TUTORIALS

X (English)

(Special Test)

Mathematics Part - II-(7)

DATE: 21-02-19

TIME: 1 Hr

MARKS: 40

SEAT NO:

Q.1 Multiple Choice Questions 1

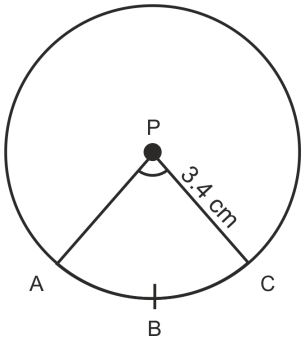
1 Find the ratio of the volumes of a cylinder and a cone having equal radius and equal height.

a. 1 : 2 b. 2 : 1 c. 1 : 3 d. 3 : 1

Ans 3 : 1

Q.2 Attempt the following 4

1



In figure, radius of circle is 3.4 cm and perimeter of sector P-ABC is 12.8 cm. Find A(P-ABC).

Given : Radius of circle = r = 3.4 cm

Perimeter of sector = 12.8 cm

: Perimeter = length of arc + 2 × _____

∴ Length of arc = _____ - 2×radius of circle

= 12.8 - 3.4 - 3.4

length of arc = _____ ... (1)

We know that, area of sector = $\frac{\text{length of arc} \times \text{radius of circle}}{2}$

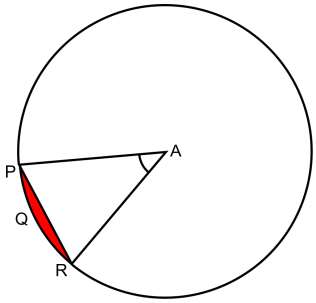
A(P-ABC)= _____

= _____ cm^2

A(P-ABC) is _____ cm^2

Ans 1) radius of circle 2) Perimeter of sector 3) 6 4) $\frac{6 \times 3.4}{2}$ 5) 10.2 6) 10.2

2 In the figure, if A is the centre of the circle. ∠PAR = 30°, AP = 7.5, find the area of the segment PQR ($\pi = 3.14$)



Area of shaded region = $r^2 \left(\frac{\pi\theta}{360} - \frac{\sin\theta}{2}\right)$

$= \_\_\_\_^2 \left[\frac{\pi \times 30}{360} - \frac{\sin 30}{2} \right]$

$= \left(\frac{15}{2} \right)^2 \left(\frac{\pi}{12} - \frac{1}{4} \right)$

$= \frac{225}{4} \times \_\_\_\_$

$= \frac{225 \times 0.14}{4 \times 12}$

$= \_\_\_\_$

$= 9.3 \times \_\_\_\_$

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

Ans 1) (7.5) 2) $\left(\frac{3.14 - 3}{12} \right)$ 3) $\frac{225 \times 0.07}{2 \times 12}$ 4) 0.01 5) 0.651

Q.3 Solve the following 4

1 Diagonal of a square is 20 cm. Find the length and perimeter of the square.

Ans Diagonal of square = 20 cm.

Let side of square = x

$\therefore$ $x^2 + x^2 = 20^2$ ... (By Pythagoras theorem)

$\therefore$ $2x^2 = 400$

$\therefore$ $x^2 = 200$

$\therefore$ $x = 10\sqrt{2}$ cm.

Perimeter of square $= 4 \times 10\sqrt{2} = 40\sqrt{2}$

(i) Side of square $= 10\sqrt{2}$ cm.

(ii) Perimeter of square $= 40\sqrt{2}$ cm.

2 The diameter of a circle is 10 cm. Find the length of the arc, when the corresponding central angle is 144° (π = 3.14).

Ans Given :Diameter = 10 cm

radius $= \frac{\text{diameter}}{2} = \frac{10}{2} = 5$

$\therefore$ radius (r) = 5 cm

Central angle (θ) = 144

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

length of arc $= \frac{144}{360} \times 3.14 \times 5$

length of arc $= \frac{2}{5} \times 3.14 \times 5$

length of arc = 12.56

$\therefore$ length of arc is 12.56

Q.4 Answer the following 4

1 Measure of an arc of a circle is 80^o cm and its radius is 18 cm. Find the length of the arc. (π = 3.14)

Ans Given :measure of arc = $\theta = 80^o$

radius of circle =r= 18 cm

To find :length of arc

Solution:

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

$= \frac{80}{360} \times 2 \times \frac{22}{7} \times 18$

$= \frac{8}{36} \times 2 \times \frac{22}{7} \times 18$

$= \frac{4 \times 2 \times 22}{7}$

$= 8 \times 3.14$

$= 25.12$ cm

Length of arc is 25.12 cm

2 Find the length of an arc if measure of the arc is 90° and its radius is 14 cm.

Ans Measure of arc = 90°

Radius of circle= 14 cm

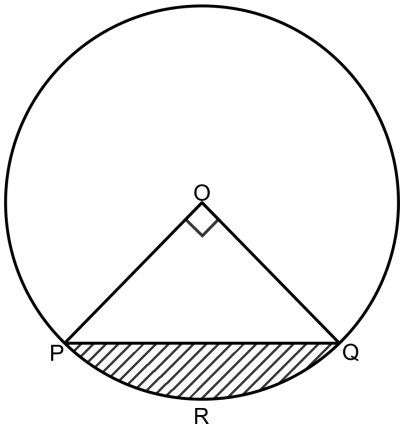
Length of arc $= \frac{\theta}{360} \times 2\pi r$

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

$= 22$ cm

Q.5 Solve the following 6

1 In the figure, O is the centre of the circle. ∠POQ = 90°. The area of the shaded region is 126 cm^2. Find the radius of the circle.



Ans Here, ∠POQ = θ = 90°, area of the shaded region (i.e. area of the segment) = 126 cm^2.

Area of the segment = Area of the minor sector (O-PRQ) - Area of △POQ = $r^2 \left[\frac{\pi\theta}{360} - \frac{\sin\theta}{2}\right]$

∴ $126 = r^2 \left[\frac{22 \times 90}{7 \times 360} - \frac{1}{2}\right]$ ... (sin θ = sin 90° = 1)

∴ $126 = r^2 \left[\frac{11}{14} - \frac{1}{2}\right]$

∴ $126 = r^2 \left[\frac{11 - 7}{14}\right]$

∴ $126 = r^2 \left(\frac{4}{14}\right)$

∴ $r^2 = \frac{126 \times 14}{4}$

$= 441$

∴ $r = 21$ cm

The radius of the circle is 21 cm.

2 The total surface area of a cone is 71.28 cm^2. Find the volume of the cone, if the diameter of the base is 5.6 cm.

Ans Diameter of the base = 5.6 cm.

∴ $r = \frac{d}{2} = \frac{5.6}{2} = 2.8$ cm. $S_t = 71.28$ cm^2

The total surface are (S_t) of a cone = $\pi r (l + r)$

$\therefore \quad 71.28 = \frac{22}{7} \times 2.8 (l + 2.8)$

$\therefore \quad \frac{71.28 \times 7}{22 \times 2.8} = l + 2.8 \qquad \therefore \quad l + 2.8 = 8.1$

$\therefore \quad l = 8.1 - 2.8 \qquad \therefore \quad l = 5.3$ cm

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

$\therefore \quad h^2 = l^2 - r^2$

$\therefore \quad h^2 = (5.3)^2 - (2.8)^2 = 28.09 - 7.84$

$\therefore \quad h^2 = 20.25 \qquad \therefore \quad h = 4.5$ cm

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

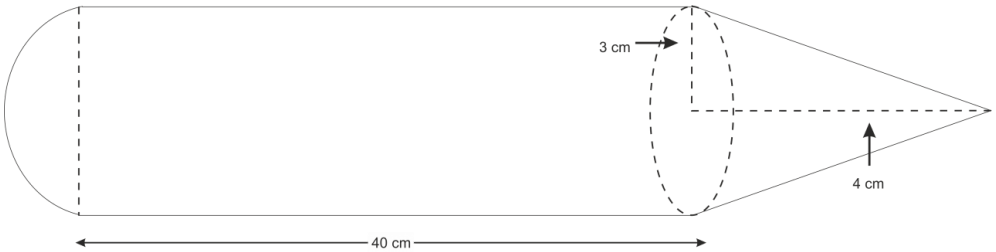
$= \frac{1}{3} \times \frac{22}{7} \times 2.8 \times 2.8 \times 4.5$

$= 36.96$ cm^3

The volume of the cone is 36.96 cm^3

Q.6 Answer the following 12

1



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

Ans Given: radius of cone = radius of cylinder

=radius of hemisphere =3 cm

height of cylinder $= h_{cy} = 40$ cm

height of cone $= h_c = 4$ cm

To find : Total area of toy =?

Solution :

Total area of toy =

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

$= \frac{2}{3}\pi r^3 + 2\pi r h_{cy} + \pi r l$

$= \pi \left(\frac{2}{3} \times 3^3 + 2 \times 3 \times 40 + 3 \times l \right)$

$= (2 \times 3^2 + 240 + 3 \times l)$

$= \pi(18 + 240 + 3 \times l)$

$= \pi\left(18 + 240 + 3 \times \sqrt{h^2 + l^2}\right)$

$\left(\therefore l = \sqrt{h^2 + r^2}\right)$

$= \pi \left(18 + 240 + 3\sqrt{4^2 + 3^2}\right)$

$= \pi (18 + 240 + 15)$

$= \pi \times 273$

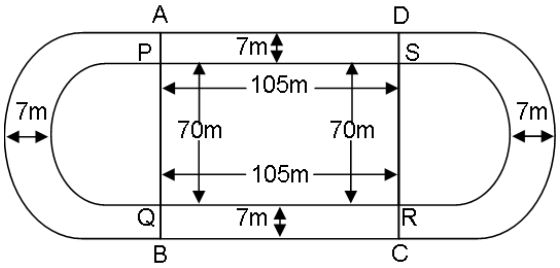
$= \frac{22}{7} \times 273$

$= 22 \times 39$

$= 858$ cm^2

Total area of toy is 858 cm^2

2 The given figure depicts a racing track whose left and right ends are semicircular. The distance between two inner parallel line segemnts is 70 m and they are 105 m long. if the track is 7 m wide, find the difference in the lengths of the inner edge and outer edge of the track



Ans For the inner edge of the track :

Seg PQ and Seg SR are the diameter ofthe semicircles with arc PQ and SR respectively.

∴ radius = $\frac{\text{diameter}}{2}=\frac{70}{2}$ = 35m

Length of arc PQ = $\pi r=\frac{22}{7}\times 35$ = 110m

Length of inner edge = l(arc PQ) + l(arc SR) +PS +QR

= 110 + 110 +105 +105 = 430 m

For the outer edge of the track:

Seg AB and Seg DC are the diameter of the semicircles with arc AB and Arc DC respectively.

Diameter = 70 + 7 +7 = 84m

radius = $\frac{\text{diameter}}{2}=\frac{84}{2}$ = 42 m

Length of arc AB = $\pi r=\frac{22}{7}\times 42$ = 132

Length of arc DC = $\pi r=\frac{22}{7}\times 42$ = 132

Length of inner edge = l(arc AB) + l(arc DC) +AD +BC

= 132 + 132 +105 +105 = 474 m

Difference in the length of the inner edge and outer edge of the track

= length of outer edge - length of inner edge

= 474 - 430 = 44m

∴ The required difference is 44 m.

3 A tin maker converts a cubical metallic box into 10 cylindrical tins. Side of the cube is 50 cm and radius of the cylinder is 7 cm. Find the height of each cylinder so made, if the wastage of 12% is incurred in the process.

Ans Here, l (side of cube) = 50 cm;

radius (r) of the cylinder = 7 cm.

Area of the metal sheet of the cubical box = $6l^2 = 6 \times 50 \times 50$

= 15000 cm^2

12% of the sheet is wasted.

∴ the sheet wasted = $15000 \times \frac{12}{100}$ = 1800 cm^2

the sheet used to prepare cylindrical tins = (15000 - 1800) cm^2

= 13200 cm^2

the sheet used to make 1 cylindrical tin = $\frac{13200}{10}$= 1320 cm^2

The sheet required to make 1 cylindrical tin

= the total surface are of the cylinder = $2\pi r\ (r + h)$

∴ $2\pi r\ (r + h) = 1320$

∴

$2 \times \frac{12}{100} \times 7\ (7 + h) = 1320$

$\therefore \quad 7 + h = \frac{13200}{2 \times 22}$

$\therefore \quad 7 + h = 30 \qquad \therefore \quad h = 30 - 7 = 23\text{cm}$

The height of the cylindrical tin is 23 cm

Q.7 Answer the following 9

1 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.

Ans Given : radius of metallic sphere = 9cm

diameter of wire = 4mm

radius of wire = 2mm = $\frac{2}{10}$cm

To find : Length of wire

Solution: Since the wire is melted to make wire, the volume of sphere and wire will be same

volume of sphere = volume of wire

$\frac{4}{3} \times \pi \times r_s^3 = \pi r_w^2 h_w$ ... {By formula}

$\frac{4}{3} \times 9^3 = \frac{2}{10} \times \frac{2}{10} \times h_w$

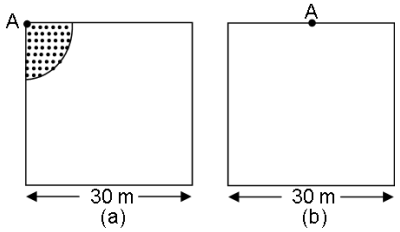
$\frac{4 \times 3 \times 9 \times 10 \times 10 \times 9}{2 \times 2} = h_w$

$\therefore \quad \boxed{h_w = 24300 \text{ cm}}$

$\therefore \quad \boxed{h_w = 243 \text{ cm}}$

Length of wire is 243cm

2 A horse is tied to a pole fixed at one corner of a 30 m × 30 m square field of grass by a 10m long rope.
(i) Find the area of that part of the field in which the horse can graze.
(ii) What will be the area of the field in which the horse can graze, if the pole was fixed at the middle of the side ?
($\hat{I} = 3.14$)



Ans i) □ABCD is the square field of dimension 30 m × 30 m sector A-PQR represent the area in which the horse can graze.

For sector A-PQR:

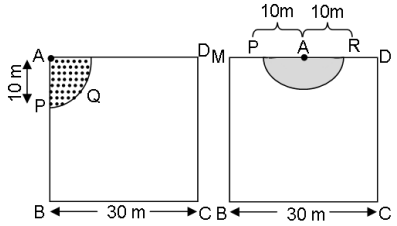
Central angle (θ) = $\angle A = 90$ ...(Angle of square)

radius (r) = AP = length of rope = 10 m

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

$\therefore \quad A(\text{A-PQR}) = \frac{90}{360} \times 3.14 \times 10 \times 10$

$= \frac{314}{4} = 78.5 \text{ m}^2$



ii) □MBCD is the square field of dimension 30 m × 30 m

semicircle on seg PR (As the diameter) represent the area in which the horse can graze.

For semicircle

radius (r) = AP = 10 m

Area of semicircle = $\frac{\pi r^2}{2}$

$= \frac{3.14\times10\times10}{2}$

$= \frac{3.14}{2} = 157\ m^2$

$\therefore$ The area of the field in which the horse can graze is 157 m^2

3 A chord PQ of a circle with radius 15cm^2 subtends an angle of 60° with the centre of the circle. Find the area of the minor as well as the major segment.
($\pi = 3.14$, $\sqrt{3} = 1.73$)

Ans Given : radius = 15 cm

measure of arc = 60°

To find : Area of minor and major segment

Solution:

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

$= 15^2\left(\frac{\pi\times60}{360} - \frac{\sin 60}{2}\right)$

$= 15^2\left(\frac{\pi}{6} - \frac{\sqrt{3}}{4}\right)$

$= 15^2\left(\frac{4\pi - 6\sqrt{3}}{24}\right)$

$= \frac{225}{24}\times2.16$

$= 9.375\times 2.16$

$= 20.25\ cm^2$

Area of major segment = Area of circle - Area of minor segment

$= \pi r^2$ - 20.25

$= 3.14\times(15)^2$ - 20.25

$= 3.14\times225$ - 20.25

= 706.85 - 20.25

= 686.6

Area of minor segment is 20.25cm^2.

Area of major segment is 686.6cm^2.