Practice Set 7.1 Page 145

1. Find the volume of a cone if the radius of its base is 1.5 cm and its perpendicular height is 5 cm.
Solution:
Given radius of cone ,r = 1.5cm
Height of cone ,h = 5cm
∴Volume of the cone , $V = (1/3)\pi r^2 h$
$\therefore V = (1/3)\times(22/7)\times1.52\times5$
$\therefore V = 11.785\ cm^3$
$= 11.79\ cm^3$
Hence the volume of the cone is $11.79\ cm^3$.

2. Find the volume of a sphere of diameter 6 cm.

Solution:
Given diameter of sphere , d = 6cm
∴Radius r = d/2 = 3
Volume of a sphere, $V = (4/3)\pi r^3$
$\therefore V = (4/3)\times(22/7)\times3^3$
$\therefore V = 113.14cm^3$
Hence the volume of the sphere is $113.14cm^3$.

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

Solution:
Given radius of cylinder , r = 5cm
Height of cylinder, h = 40cm
Total surface area of cylinder $= 2\pi r(r+h)$
$= 2\times(22/7)\times5\times(5+40)$
$= 2\times(22/7)\times5\times45$
$= 1414.28cm^2$
Hence Total surface area of cylinder is $1414.28cm^2$.

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

Solution:
Given radius of sphere , r = 7cm
Surface area, $A = 4\pi r^2$
$\therefore A = 4\times(22/7)\times7^2$
$= 616\ cm^2$
Hence surface area of sphere is $616cm^2$.

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.

Solution:
Given length of cuboid , l = 44 cm
Breadth of cuboid ,b = 21 cm

Height of cuboid , h = 12cm
Volume of the cuboid , V = *l*bh
$\therefore$ V = 44×21×12 = 11088cm^3
Given Height of cone ,h = 24cm
Since cuboid is melted and a cone is made, the volume will be same.
$\therefore$ Volume of cone = Volume of cuboid.
$(1/3)\pi r^2 h = 11088$
$(1/3)\times(22/7)\times r^2\times 24 = 11088$
$r^2 = 11088/8\times(22/7)$
$r^2 = 441$
Taking square root
r = 21
Hence radius of the cone is 21 cm.

6. Observe the measures of pots in figure 7.8 and 7.9. How many jugs of water can the cylindrical pot hold ?

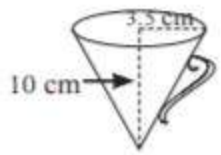


Fig 7.8
conical water jug

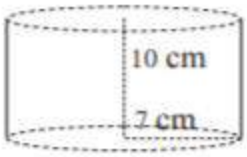


Fig 7.9
cylindrical water pot

Solution:
Given radius of jug , r = 3.5 cm
Height of jug , h = 10 cm
Volume of conical jug, $V = (1/3)\pi r^2 h$
$= (1/3)\times\pi\times 3.5^2\times 10 = (122.5/3)\times\pi$

Given Radius of pot ,R = 7cm
Height of pot, H = 10 cm
Volume of pot = $\pi R^2 H$
$= \pi\times 7^2\times 10 = 490\pi$
Number of jugs of water the cylindrical pot can hold = Volume of pot/Volume of conical jug
$= 490\pi \div (122.5/3)\times\pi$
$= 490\pi\times(3/122.5\pi)$
= 12
Hence the pot can hold 12 jugs of water.

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

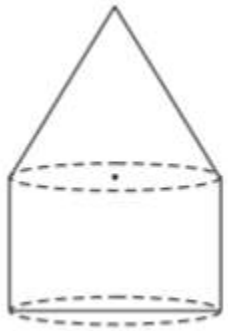
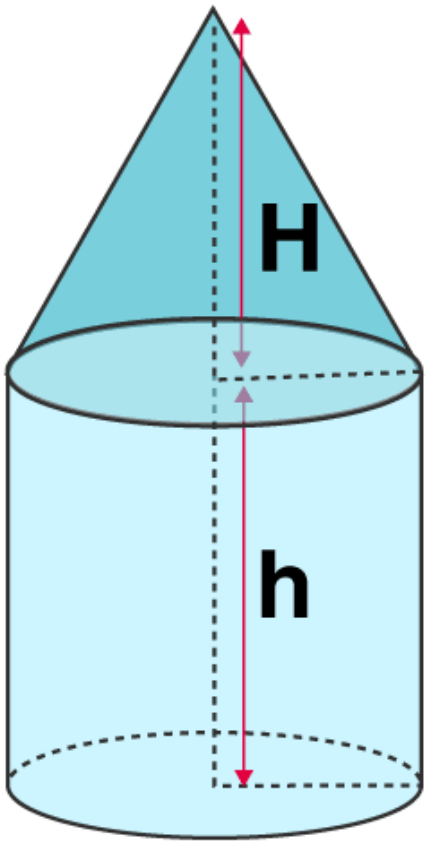


Fig 7.10

Solution:
Given height of cylinder , h = 3cm
Base area of cylinder , $\pi r^2 = 100cm^2$ ……..(i)
Volume of solid = $500cm^3$
Given cylinder and cone have equal bases. ∴ the radii will be equal.
∴ Radius of cone = radius of cylinder = r



Let height of cone be H
Volume of solid = volume of cylinder + volume of cone
$\therefore 500 = \pi r^2 h + (1/3)\, \pi r^2 H$

$\therefore 500 = 100\times3+(1/3)\times100\times H$ [$\because \pi r^2 = 100$, base area of cylinder and cone are equal]

$\therefore 500 = 300+(100/3)H$

$\Rightarrow (100/3)H = 200$

$\Rightarrow H = 3\times200/100 = 6$

Hence height of cone is 6cm.

Total height of figure = h+H

= 3+6 = 9cm

Hence the total height of the figure is 9cm.

8. In figure 7.11, a toy made from a hemisphere, a cylinder and a cone is shown. Find the total area of the toy.

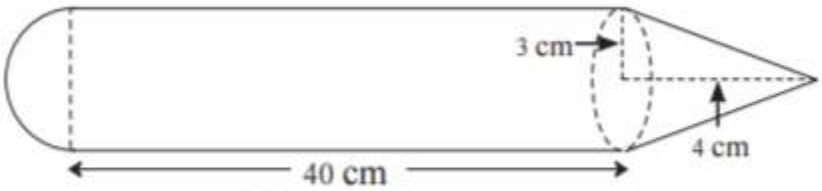


Fig. 7.11

Solution:

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

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 hemisphere = $2\pi r^2$

= $2\times\pi\times3^2$

= 18π cm^2

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

= $2\times\pi\times3\times40$

= 240π cm^2

Curved surface area of cone = πrl

= $\pi\times3\times5$

= 15π cm^2

Total area of the toy

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

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

= $273\ \pi$ cm^2

Hence total area of the toy is 273π cm^2.

9. In the figure 7.12, 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 ?

Fig. 7.12

Solution:
Given radius of tablet, r = 7mm
Thickness of tablet , h = 5mm
∴Volume of tablet =
Radius of cylindrical wrapper , R = 14/2 = 7mm
Height of cylindrical wrapper , H = 10cm = 10×0 = 100mm
Let n be the number of tablets that can be wrapped.
∴n = volume of cylindrical wrapper/volume of tablet
$= \pi R^2 H/\pi r^2 h$
$=\pi\times 7^2\times 100/\pi\times 7^2\times 5$
= 20
Hence number of tablets that can be wrapped in wrapper is 20.

10. Figure 7.13 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)

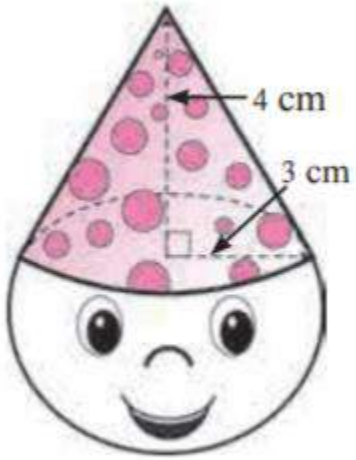


Fig. 7.13

Solution:
Given radius of cone ,r = 3 cm
Height of cone ,h = 4 cm
Radius of hemisphere, r = 3cm
Slant height of cone , $l = \sqrt{(h^2+r^2)}$
$\therefore l = \sqrt{(4^2+3^2)} = \sqrt{(16+9)} = \sqrt{25} = 5$
Curved surface area of cone = $\pi r l$
$= \pi\times 3\times 5 = 15\pi cm^2$
Curved surface area of hemisphere = $(2/3)\pi r^3$
$= (2/3)\pi\times 3^3 = 18\pi cm^2$

∴Surface area of toy = Curved surface area of cone+ Curved surface area of hemisphere
$= 15\pi+18\pi = 33\pi = 33\times3.14 = 103.62cm^2$

Volume of cone $= (1/3)\pi r^2h$
$= (1/3)\pi\times3^2\times4 = 12\pi cm^3$
Volume of hemisphere $= (2/3)\pi r^3$
$= (2/3)\pi\times3^3 = 18\pi cm^3$
∴Volume of toy = Volume of cone+ Volume of hemisphere
$= 12\pi+18\pi = 30\pi = 30\times3.14 = 94.2cm^3$
Hence the surface area and volume of the toy are $103.62cm^2$ and $94.2cm^3$ respectively.

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

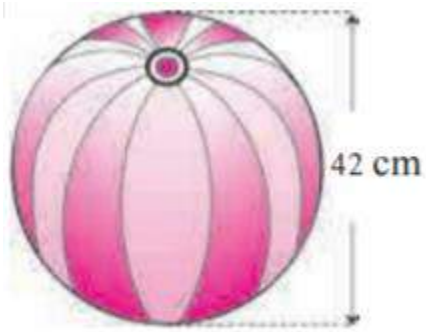


Fig. 7.14

Solution:
Given diameter of ball , d = 42 cm
∴radius of ball , r = 42/2 = 21cm
Surface area of sphere $= 4\pi r^2$
$= 4\times\pi\times21^2 = 4\times3.14\times441 = 5538.96\ cm^2$
Volume of sphere $= (4/3)\pi r^3$
$= (4/3)\times\pi\times21^3 = (4/3)\times3.14\times9261 = 38772.72\ cm^3$
Hence the surface area and volume of ball are $5538.96\ cm^2$ and $38772.72\ cm^3$ respectively.

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.

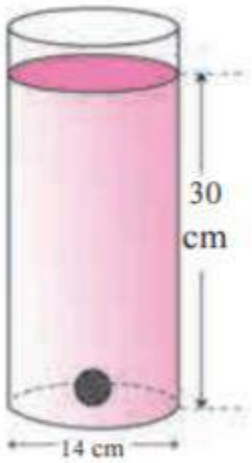


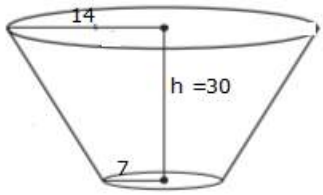
Fig. 7.15

Solution:
Given diameter of cylindrical glass , d = 14cm
∴Radius , R = 14/2 = 7cm
Height of glass in cylindrical glass, H = 30cm
Given diameter of metal sphere = 2cm
∴radius of metal sphere , r = 2/2 = 1cm
Volume of sphere = $(4/3)\pi r^3$
$= (4/3)\times\pi\times1^3$
$= (4/3)\pi$
$= (4/3)\times(22/7)$
$= 4.19cm^3$
Volume of water with sphere in it = πR^2H
$= \pi\times7^2\times30$
$= 1470\pi$
$= 4620cm^3$
Volume of water in glass = Volume of water with sphere in it - Volume of sphere
$= 4620-4.19 = 4615.81cm^3$
Hence the volume of water in glass is $4615.81cm^3$.

Practice Set 7.2 Page 148

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

Solution:



Given height of bucket , h = 30cm
r_1 = 14cm
r_2= 7cm
Volume of a frustum = $(1/3)\pi h(r_1^2+r_2^2+r_1\times r_2)$
$\therefore$ Volume of bucket = $(1/3)\pi\times 30(14^2+7^2+14\times 7)$
= $10\pi\times(196+49+98)$
= 3430π
= 10780cm^3
= 10.78 litres [$\because$ 1 litre = 1000 cm^3]
Hence the bucket can hold 10.78 litres of water.

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)

Solution:
Given r_1 = 14cm
r_2= 6cm
Height , h = 6cm
Slant height of frustum $l = \sqrt{[h^2+(r_1-r_2)^2]}$
$= \sqrt{[6^2+(14-6)^2]}$
$= \sqrt{[36+(8)^2]}$
$= \sqrt{[36+64]}$
$= \sqrt{100} = 10$

(i) Curved surface area of frustum = $\pi l(r_1+r_2)$
= $\pi\times 10(14+6)$
= $\pi\times 10\times 20$
= 3.14×200
= 628cm^2
Hence curved surface area of frustum is 628cm^2.

(ii) Total surface area of frustum = $\pi l\ (r_1+ r_2)+\pi r_1^2+\pi r_2^2$
= $\pi\times 10(14+ 6)+\pi\times 14^2+\pi\times 6^2$

$= \pi\times10\times20+\pi\times196+\pi\times36$
$= 200\pi+196\pi+36\pi$
$= 432\pi$
$= 432\times3.14$
$= 1356.48cm^2$
Hence Total surface area of frustum is $1356.48cm^2$.

(iii)Volume of frustum $= (1/3)\pi h(r_1^2+r_2^2+r_1\times r_2)$
$= (1/3)\pi\times6(14^2+6^2+14\times6)$
$= 2\pi\times(196+36+84)$
$= 2\times3.14\times316$
$= 1984.48cm^3$
Hence volume of frustum is $1984.48cm^3$

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 the frustum complete the following activity. (π = 22/7).

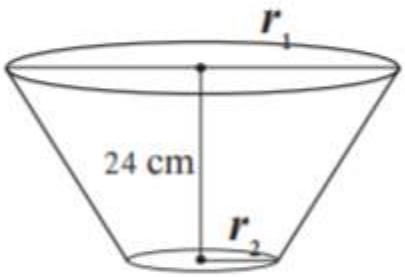


Fig. 7.23

$\text{Circumference}_1 = 2\pi r_1 = 132$
$r_1 = 132/2\pi =$ ____
$\text{Circumference}_2 = 2\pi r_2 = 88$
$r_2 = 88/2\pi =$ ____
Slant height of frustum $l = \sqrt{[h^2+(r_1-r_2)^2]}$
$= \sqrt{[__^2+(___)^2]}$
= ____cm
Curved surface area of frustum $= \pi(r_1+r_2)l$
$= \pi\times$___$\times$___
= ___sq.cm.

Solution:
$\text{Circumference}_1 = 2\pi r_1 = 132$
$r_1 = 132/2\pi =$ 21cm [π=22/7]
$\text{Circumference}_2 = 2\pi r_2 = 88$
$r_2 = 88/2\pi =$ 14cm
Slant height of frustum $l = \sqrt{[h^2+(r_1-r_2)^2]}$
$= \sqrt{[24^2+(21-14)^2]}$ [given h =24]
$= \sqrt{[576+(7)^2]}$
$= \sqrt{[576+49]}$

$= \sqrt{625}$
$= 25$cm

Curved surface area of frustum $= \pi(r_1+r_2)l$
$= \pi\times(21+14)\times25$
$= \pi\times(35)\times25$
$= 2750$sq.cm

Practice set 7.3 Page 154

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)

Solution:
Given radius of circle , r = 10cm
Measure of an arc of the circle ,$\theta = 54^\circ$
$\pi = 3.14$
Area of sector , $A = (\theta/360)\pi r^2$
$\therefore A = (54/360)\times 3.14\times 10^2$
$= (9/60)\times 3.14\times 100$
$= 47.1cm^2$
Hence area of the sector is $47.1cm^2$

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)

Solution:
Given measure of arc, $\theta = 80^\circ$
Radius , r = 18cm
$\pi = 3.14$
Length of arc , $l = (\theta/360)2\pi r$
$l = (80/360)\times 2\times 3.14\times 18$
= 25.12cm
Hence the length of the arc is 25.12cm.

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 of sector of a circle , r = 3.5cm
Length of the arc, l = 2.2cm
Area of sector ,$A = lr/2$
$\therefore A = 2.2\times 3.5/2 = 3.85cm^2$
Hence the area of the sector is $3.85cm^2$

4. Radius of a circle is 10 cm. Area of a sector of the sector is 100 cm^2 . Find the area of its corresponding major sector. (π = 3.14)

Solution:
Given radius of circle , r = 10cm
Area of minor sector , $A = 100cm^2$
Area of circle = $\pi r^2 = 3.14\times 10^2 = 3.14\times 100 = 314cm^2$
Area of major sector = Area of circle - Area of minor sector
= 314-100
$= 214cm^2$
Hence the area of the major sector is $214cm^2$

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.

Solution:
Given radius of circle , r = 15cm
Area of the sector of circle , A = 30cm^2
Area of sector = length of arc ×radius/2 = lr/2
∴Length of arc , l = 2A/r = 2×30/15 = 4cm
Hence the length of the arc is 4cm.

6. In the figure 7.31, radius of the circle is 7 cm and m(arc MBN) = 60°, find
(1) Area of the circle .
(2) A(O - MBN) .
(3) A(O - MCN) .

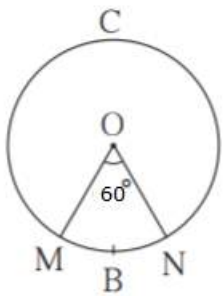


Fig. 7.31

Solution:
Given radius of circle , r = 7cm
(1) Area of the circle , A = πr^2
= $(22/7)\times 7^2$
=(22/7)×49
= 154cm^2
Hence the area of the circle is 154cm^2

(2)Given m(arc MBN),θ = 60°
Area of sector = $(\theta/360)\pi r^2$
∴A(O-MBN) = $(60/360)\times(22/7)\times 7^2$
= (1/6)×22×7
= 25.67cm^2
Hence area of sector O-MBN is 25.67cm^2

(3) Area of major sector = Area of circle -Area of minor sector
∴A(O-MCN) = 154-25.67
= 128.33cm^2
Hence area of sector O-MCN is 128.33cm^2

7. In figure 7.32, radius of circle is 3.4 cm and perimeter of sector P-ABC is 12.8 cm. Find A(P-ABC).

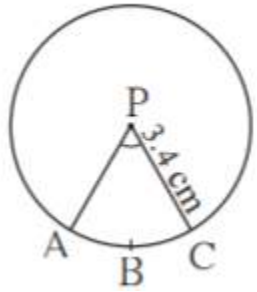


Fig. 7.32

Solution:
Given radius , r = 3.4cm
Perimeter of sector P-ABC = PA+arc ABC +PC
12.8 = 3.4+ length of arc ABC +3.4
∴length of arc ABC , l = 12.8-3.4-3.4 = 6cm
Area of sector P-ABC = lr/2
= 6×3.4/2
= 3×3.4
= 10.2cm^2
Hence A(P-ABC) is 10.2cm^2.

8. In figure 7.33 O is the centre of the sector. ∠ ROQ = ∠ MON = 60°. OR = 7 cm, and OM = 21 cm. Find the lengths of arc RXQ and arc MYN. (π = 22/7)

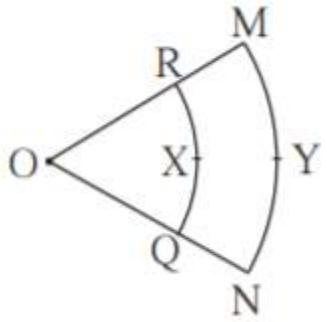


Fig. 7.33

Solution:
Given ∠ ROQ = ∠ MON ,θ= 60°.
Radius OR, r = 7 cm
Radius OM, R = 21 cm
Length of arc RXQ = (θ/360)2πr
= (60/360)×2×(22/7)×7
= (1/6)× 2×22
= 22/3
= 7.33cm
Hence Length of arc RXQ is 7.33cm.
Length of arc MYN = (θ/360)2πR
= (60/360)×2×(22/7)×21
= (1/6)× 2×22×3
= 22cm

Hence Length of arc MYN is 22cm.

9. In figure 7.34, if A(P-ABC) = 154 cm^2 radius of the circle is 14 cm,
find (1) ∠ APC.
(2) l(arc ABC) .

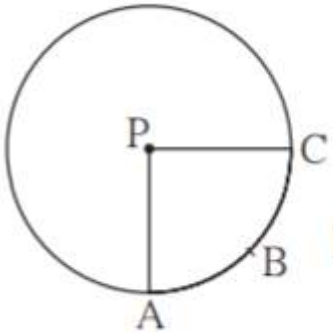


Fig. 7.34

Solution:
Given radius of circle , r = 14cm
Area ,A(P-ABC) = 154cm^2
(1) Let ∠APC = θ
A(P-ABC) = $(\theta/360)\pi r^2$
$\therefore 154 = (\theta/360)\times(22/7)\times 14^2$
$\therefore \theta = (154\times360\times7)/(22\times14\times14)$
$\therefore \theta = 90^\circ$
Hence ∠APC is 90˚.
(2)length of arc, l(arc ABC) = $(\theta/360)2\pi r$
∴ l(arc ABC) = $(90/360)\times2\times(22/7)\times14$
= $(1/4)\times2\times22\times2$
= 22cm.
Hence l(arc ABC) is 22cm.

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

Solution:
Given radius of sector, r = 7cm
(1)Measure of arc, θ = 30˚
∴Area of sector = $(\theta/360)\pi r^2$
= $(30/360)\times(22/7)\times7^2$
= $(1/12)\times(22/7)\times49$
= $(1/12)\times22\times7$
= 12.83cm^2
Hence the area of sector is 12.83cm^2

(2)Measure of arc, $\theta = 210^\circ$
$\therefore$ Area of sector = $(\theta/360)\pi r^2$
$= (210/360)\times(22/7)\times 7^2$
$= (7/12)\times(22/7)\times 49$
$= (7/12)\times 22\times 7$
$= 89.83 cm^2$
Hence the area of sector is $89.83 cm^2$

(3)Measure of arc, θ = 3 right angles = $3\times 90 = 270^\circ$
$\therefore$ Area of sector = $(\theta/360)\pi r^2$
$= (270/360)\times(22/7)\times 7^2$
$= (3/4)\times(22/7)\times 49$
$= (3/4)\times 22\times 7$
$= 115.5 cm^2$
Hence the area of sector is $115.5 cm^2$

11. The area of a minor sector of a circle is 3.85 cm^2 and the measure of its central angle is 36°. Find the radius of the circle.

Solution:
Given area of minor sector = $3.85 cm^2$
Measure of central angle, $\theta = 36^\circ$
Area of sector = $(\theta/360)\pi r^2$
$\therefore 3.85 = (36/360)\times(22/7)\times r^2$
$r^2 = (3.85\times 360\times 7)/(36\times 22)$
$r^2 = (3.85\times 10\times 7)/22$
$r^2 = 12.25$
$\Rightarrow r = 3.5 cm$
Hence the radius of the circle is 3.5cm

12. In figure 7.35, □ PQRS is a rectangle. If PQ = 14 cm, QR = 21 cm, find the areas of the parts x, y and z .

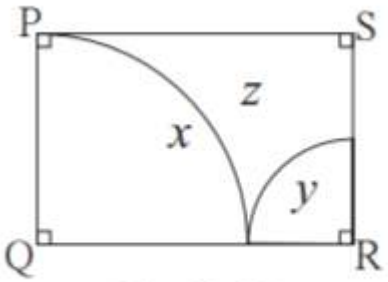
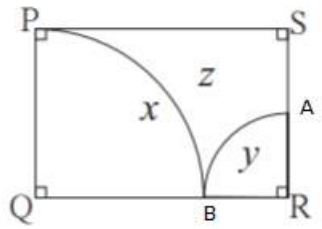


Fig. 7.35

Solution:



Given PQ = 14cm
QR = 21cm
$\angle Q = \theta = 90^\circ$
Area of part x = $(\theta/360)\pi r^2$
Area of part x = $(90/360)\times(22/7)\times 14^2$
= 11×14
= $154cm^2$
Consider sector (R-BYA)
QR = QB+BR
$\therefore$ BR = 21-14 = 7cm
$\therefore$ AR = 7cm [radius of same circle]
Area of part y = $(\theta/360)\pi r^2$
Area of part y = $(90/360)\times(22/7)\times 7^2$
= $11\times 7/2$
= $38.5cm^2$
Area of rectangle PQRS = length $\times$breadth
= QR$\times$PQ
= 21×14
= $294cm^2$
$\therefore$ Area of part z = Area of rectangle PQRS - [Area of part x+ Area of part y]
$\therefore$ Area of part z = 294-(154+38.5)
= 294-192.5
= $101.5cm^2$
Hence area of part x is $154cm^2$, area of part y is $38.5cm^2$ and area of part z is $101.5cm^2$

13. △ LMN is an equilateral triangle. LM = 14 cm. As shown in figure, three sectors are drawn with vertices as centres and radius7 cm. Find,
(1) A (△ LMN)
(2) Area of any one of the sectors.
(3) Total area of all the three sectors.
(4) Area of the shaded region.

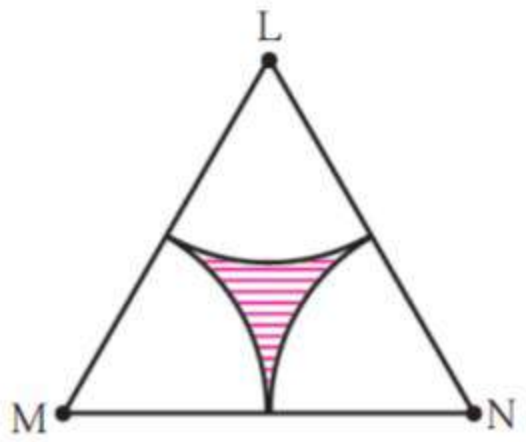


Fig. 7.36

Solution:

(1) Given △LMN is an equilateral triangle .

LM = 14 cm

∴Area of △LMN = $(\sqrt{3}/4)a^2$

Here a represents the side of equilateral triangle.

a = 14∴

∴Area of △LMN = $(\sqrt{3}/4)\times 14^2$

$= 49\sqrt{3}$

$= 84.87cm^2$

Hence area of △LMN is $84.87cm^2$

(2) Since △LMN is equilateral, ∠L = ∠M = ∠N = 60˚

∴ θ = 60˚

Given r = 7

Area of sector = $(\theta/360)\pi r^2$

∴Area of sector = $(60/360)\times 22/7\times 7^2$

$= 11\times 7/3$

$= 25.67cm^2$

Hence area of one sector = $25.67cm^2$

(3)Total area of 3 sectors = 3×area of one sector

= 3×25.67

$= 77.01cm^2$

Hence total area of 3 sectors is $77.01cm^2$.

(4)Area of shaded region = Area of △LMN - Area of 3 sectors

= 84.87 - 77.01

$= 7.86cm^2$

Hence area of shaded region is $7.86cm^2$.

Problem Set 7.4 Page 159

1. In figure 7.43, A is the centre of the circle. ∠ ABC = 45° and AC = 7√2 cm. Find the area of segment BXC.

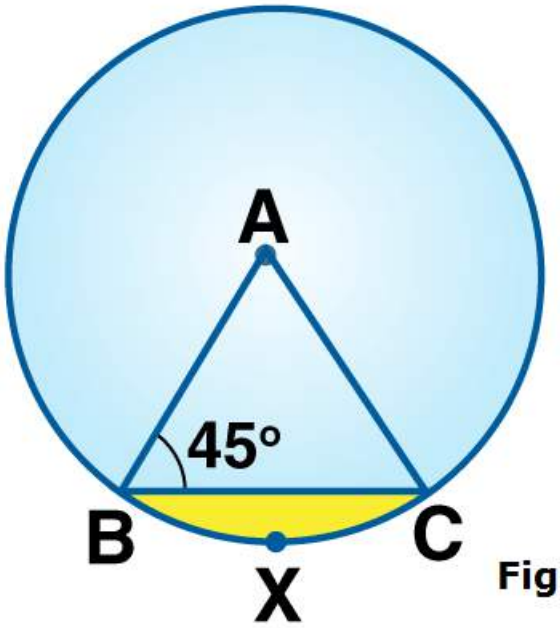


Fig 7.43

Solution:

Given radius of circle, r = 7√2cm

AB = AC [radii of same circle]

∴∠ ABC = ∠ACB = 45° [isosceles triangle theorem]

In△ABC,

∠A = θ = 90˚ [Angle sum property of triangle]

Area of segment BXC = $r^2[(\pi\theta/360) - (\sin\theta/2)]$

$= (7\sqrt{2})^2[3.14\times90/360 - (\sin90^\circ)/2]$

$= 98\times[(3.14/4)-(1/2)]$

$= 98\times[0.785-0.5]$

$= 27.93cm^2$

Hence area of segment BXC is $27.93cm^2$.

2. In the figure 7.44, 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)

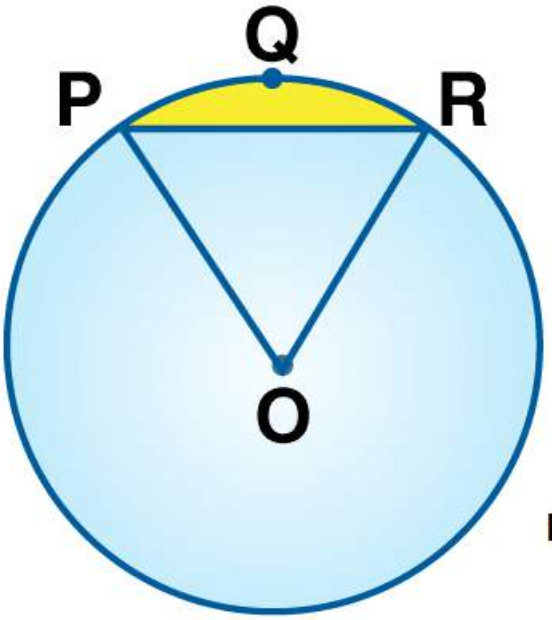


Fig.7.44

Solution:
Given radius OP , r = 10cm
m(arc PQR) , θ = 60°
Area of segment PQR = $r^2[(\pi\theta/360) - (\sin\theta/2)]$
$= 10^2[3.14\times(60/360)- \sin60^\circ/2]$
$= 100[3.14\times(1/6)- \sqrt{3}/4]$
$= 100[(3.14/6)- 1.73/4]$
$= (314/6)-(173/4)$
$= 52.33- 43.25$
$= 9.08cm^2$
Hence area of shaded region is $9.08cm^2$.

3. In the figure 7.45, if A is the centre of the circle. ∠ PAR = 30°, AP = 7.5, find the area of the segment PQR (π = 3.14)

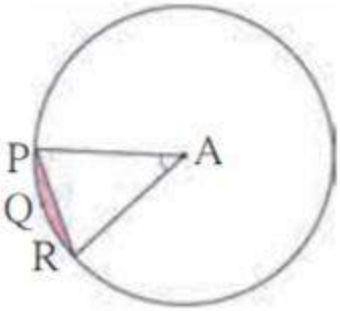


Fig. 7.45

Solution:
Given radius AP , r = 7.5

Central angle $\angle PAR = \theta = 30^\circ$
Area of segment PQR = $r^2[(\pi\theta/360) - (\sin\theta/2)]$
$= 7.5^2[3.14\times(30/360)- \sin30^\circ/2]$
$= 56.25[3.14\times(1/12)- 1/4]$
$= 56.25[(3.14/12)- (3/12)]$
$= 56.25\times0.14/12$
$= 0.65625cm^2$
Hence area of segment PQR is $0.65625cm^2$.

4. In the figure 7.46, if O is the centre of the circle, PQ is a chord. $\angle POQ = 90°$, area of shaded region is 114 cm^2 , find the radius of the circle. ($\pi = 3.14$)

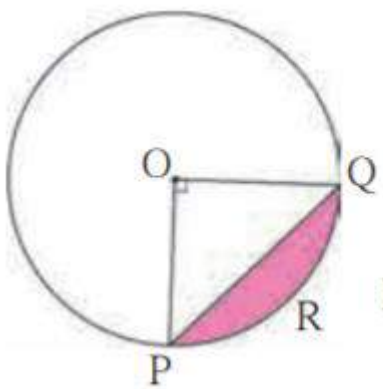
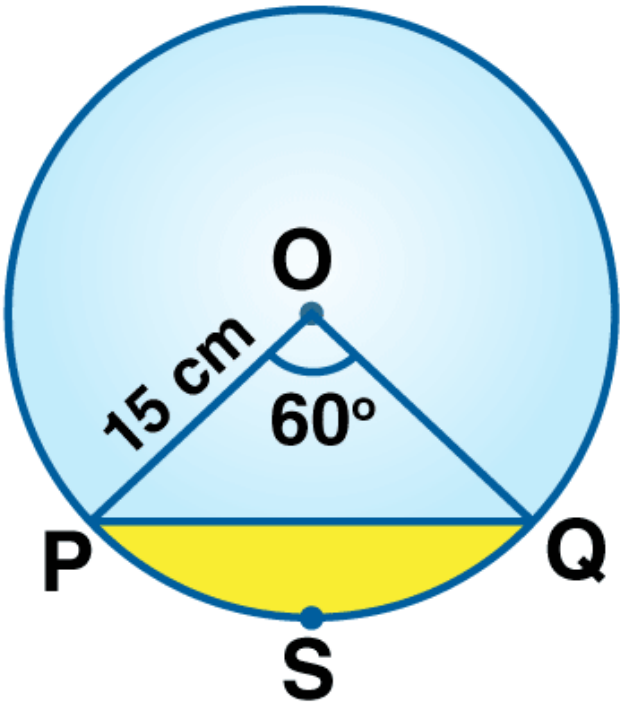


Fig. 7.46

Solution:
Given $\angle POQ = \theta = 90°$,
area of shaded region PRQ = $114cm^2$
Area of segment PRQ = $r^2[(\pi\theta/360) - (\sin\theta/2)]$
$\therefore 114 = r^2[3.14\times90/360 - \sin90^\circ/2]$
$\therefore 114 = r^2[3.14\times(1/4) - 1/2]$
$\therefore 114 = r^2[0.785-0.5]$
$\therefore 114 = r^2\times0.285$
$\Rightarrow r^2 = 114/0.285 = 400$
Taking square root on both sides
r = 20cm
Hence the radius of the circle is 20cm.

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

Solution:



Given central angle $\theta = 60^\circ$
Radius ,r = 15cm
Let chord PQ subtend $\angle POQ = 60°$ at centre.
$\therefore \theta = 60°$

Area of minor segment $= r^2[(\pi\theta/360) - (\sin\theta/2)]$
$= 15^2[3.14\times(60/360) - \sin 60^\circ/2]$
$= 225[3.14\times(1/6) - \sqrt{3}/4]$
$= 225[(3.14/6) - 1.73/4]$
$= 225[(6.28- 5.19)/12]$
$= 20.44$

Hence area of minor segment is $20.44cm^2$.

Area of circle $= \pi r^2$
$= 3.14\times15^2$
$= 3.14\times225$
$= 706.5cm^2$

Area of major segment = Area of circle - area of minor segment
$= 706.5 - 20.44$
$= 686.06cm^2$

Hence area of major segment is $686.06cm^2$.

Problem Set 7 Page 160

1. Choose the correct alternative answer for each of the following questions.
(1) The ratio of circumference and area of a circle is 2:7. Find its circumference.
(A) 14π (B) 7/π (C) 7π (D) 14/π

Solution:
Circumference of circle = $2\pi r$
Area of circle = πr^2
Given ratio of circumference and area = 2:7
$\therefore 2\pi r/\pi r^2 = 2/7$
$\Rightarrow 2/r = 2/7$
$\Rightarrow r = 7cm$
$\therefore$ Circumference = $2\pi r = 2\pi\times7 = 14\pi$.
Hence option A is the answer.

(2) 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

Solution:
Given measure of arc $\theta = 160^\circ$
Length of arc = 44cm
$\therefore$ Length of arc = $(\theta/360)2\pi r$
$44 = (160/360)\times2\pi r$
$\Rightarrow 2\pi r = 44\times360/160 = 99$
Circumference = $2\pi r$
Hence circumference is 99cm
So option D is the answer.

(3) Find the perimeter of a sector of a circle if its measure is 90 ° and radius is 7 cm.
(A) 44 cm (B) 25 cm (C) 36 cm (D) 56 cm

Solution:
Given radius , r = 7cm
$\theta = 90^\circ$
Perimeter of a sector = 2r + length of arc
$= 2r + (\theta/360)2\pi r$
$= 2\times7 + (90/360)\times2\times(22/7)\times7$
$= 14+11$
$= 25cm$
Hence option B is the answer.

(4) Find the curved surface area of a cone of radius 7 cm and height 24 cm.
(A) 440 cm^2 (B) 550 cm^2 (C) 330 cm^2 (D) 110 cm^2

Solution:
Given height , h = 24cm
Radius , r = 7cm
Slant height $l = \sqrt{(h^2+r^2)}$

$= \sqrt{(24^2+7^2)}$
$= \sqrt{(576+49)}$
$=\sqrt{625}$
$= 25cm$

Curved surface area of a cone = πrl
$= 22/7)\times7\times25$
$= 22\times25$
$=550cm^2$

Hence option B is the answer.

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

Solution:
Given radius , r = 5cm
Curved surface area = $440cm^2$
Curved surface area = $2\pi rh$
$\therefore 440 = 2\pi rh$
$\Rightarrow h = 440/2\pi r$
$= 440/(2\pi\times5)$
$= 440/10\pi$
$= 44\pi$
Hence option C is the answer.

(6) A cone was melted and cast into a cylinder of the same radius as that of the base of the cone. If the height of the cylinder is 5 cm, find the height of the cone.
(A) 15 cm (B) 10 cm (C) 18 cm (D) 5 cm

Solution:
Given radius of both cone and cylinder are equal.
Height of cylinder,H = 5cm
Let height of cone be h.
Since cone is melted and cast into a cylinder, volume of cone is equal to volume of cylinder.
$\therefore (1/3)\pi r^2h = \pi r^2H$
$\Rightarrow h = 5\times3 = 15cm$
Hence option A is the answer.

(7) Find the volume of a cube of side 0.01 cm.
(A) 1 cm^3 (B) 0.001 cm^3 (C) 0.0001 cm^3 (D) 0.000001 cm^3

Solution:
Volume of a cube ,V= a^3
Given side , a = 0.01
$\therefore V = 0.01^3 = 0.000001cm^3$
Hence option D is the answer.

(8) Find the side of a cube of volume 1 m^3 .
(A) 1 cm (B) 10 cm (C) 100 cm (D)1000 cm
Solution:

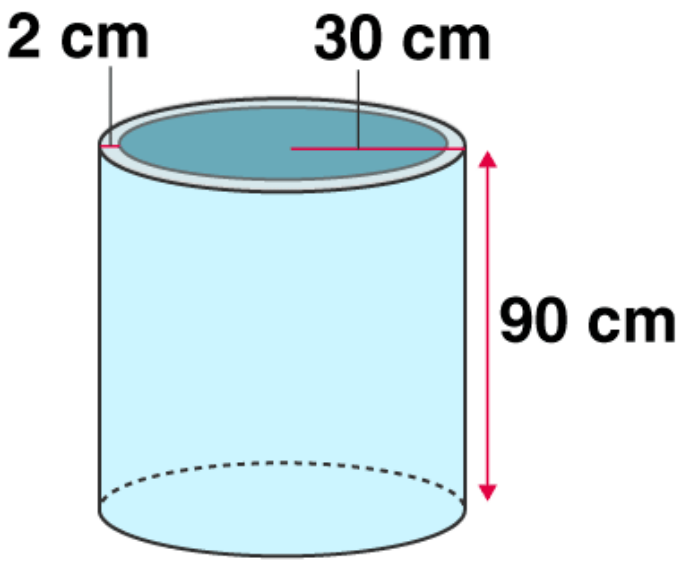
Given volume , V = $1m^3$
Volume of cube of side a = a^3
$\therefore a^3 = 1m^3$
$\Rightarrow$ a =1m = 100cm
Hence option C is the answer.

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 = 22/7)

Solution:
Given r_1 = 20cm
r_2 = 15cm
Height , h = 21cm
Volume of frustum ,V = $(1/3)\pi h(r_1^2+r_2^2+r_1\times r_2)$
$\therefore V = (1/3)\times(22/7)\times21\times(20^2+15^2+20\times15)$
$\therefore V = 22\times(400+225+300)$
$\therefore V = 22\times925$
$\therefore V = 22\times925$
$= 20350cm^3$
$= 20.34$litres [$\because$ 1 litre = $1000cm^3$]
Hence the capacity of the tub is 20.34 litres.

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 ?

Solution:



Given radius of plastic ball, r = 1cm
Thickness of tube = 2cm
Height of tube, h = 90cm

Outer radius, R = 30cm
Inner radius of tube ,r_1 = outer radius - thickness
= 30-2 = 28cm
Volume of plastic needed for tube = volume of outer tube - volume of inner tube
$= \pi R^2 h - \pi r_1^2 h$
$= \pi h(R^2 - r_1^2)$
$= \pi \times 90(30^2 - 28^2)$
$= \pi \times 90(900-784)$
$= \pi \times 90 \times 116$
$= 10440\pi cm^3$
Volume of a plastic ball = $(4/3)\pi r^3$
$= (4/3)\pi \times 1^3$
$= (4/3)\pi cm^3$
Number of balls melted to make tube = Volume of plastic needed for tube/ Volume of a plastic ball
$= 10440\pi \div (4/3)\pi$
$= 10440\pi \times 3/4\pi$
= 7830
Hence the number of balls needed to make tube is 7830.