

Mensuration-III Surface Area And Volume Of a Right Circular Cylinder Ex-22.1

Exercise 22.1

1. Given diameter of base (d) = 7 cm

$$\Rightarrow \text{radius of base } (r) = \frac{d}{2} = \frac{7}{2} = 3.5 \text{ cm}$$

$$\text{height of cylinder } (h) = 60 \text{ cm}$$

$$\text{Curved Surface area} = 2\pi rh$$

$$= 2\pi (3.5)(60)$$

$$= 2 \times \left(\frac{22}{7}\right) (3.5) (60)$$

$$= (22)(60)$$

$$= 1320 \text{ cm}^2$$

$$\text{Total surface area}$$

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

$$= 2 \times \frac{22}{7} \times 3.5 (60 + 3.5)$$

$$= (22)(63.5)$$

$$= 1397 \text{ cm}^2$$

2. Given curved surface area of cylinder = 132 cm²

$$\text{radius } (r) = 0.35 \text{ cm}$$

$$\text{Length} = ?$$

$$\text{Let length} = h \text{ cm}$$

$$\text{We have curved surface area} = 2\pi rh$$

$$\Rightarrow 132 = 2 \times \frac{22}{7} \times 0.35 \times h$$

$$\Rightarrow 132 = 2 \times \frac{22}{7} \times \frac{35}{100} \times h$$

$$\Rightarrow 132 = \frac{70}{700} (22) h$$

$$\Rightarrow h = \frac{1320}{22} = 60$$

$$\therefore h = 60 \text{ cm}$$

length of cylinder = 60 cm

5. Given

area of base of cylinder = 616 cm²
(a)

height (h) = 2.5 cm

Curved Surface Area (CSA) = ?

We have $a = \pi r^2$, where a is area
 r is radius

$$616 = \pi r^2$$

$$616 = \frac{22}{7} \cdot r^2$$

$$\Rightarrow r^2 = \frac{616 \times 7}{22}$$

$$\Rightarrow r^2 = 28 \times 7$$

$$\Rightarrow r^2 = 7 \times 7 \times 4$$

$$\Rightarrow r = \sqrt{7 \times 7 \times 2 \times 2}$$

$$\Rightarrow r = 7 \times 2$$

$$\Rightarrow r = 14 \text{ cm}$$

$$\therefore \text{C.S.A} = 2\pi r h = 2\pi (14) (2.5)$$

$$C.S.A = 2 \times \frac{22}{7} \times 14^2 \times 2.5$$

$$= 220 \text{ cm}^2$$

$\therefore$ curved surface area of cylinder = 220 cm^2

4. Given

Circumference of the base of cylinder = 88 cm

height (h) = 15 cm

Curved surface area = ?

Total surface area = ?

We have circumference = $2\pi r$ (r is radius of base)

$$\Rightarrow \frac{44^2}{88} = 2 \times \frac{22}{7} \times r$$

$$\Rightarrow r = 14 \text{ cm}$$

Curved surface area = $2\pi r h$

$$= 2 \times \frac{22}{7} \times 14^2 \times 15$$

$$= 1320 \text{ cm}^2$$

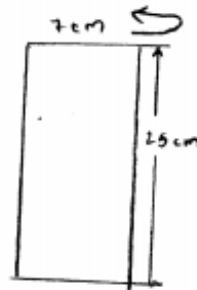
Total surface area = $2\pi r (h + r)$

$$= 2 \times \frac{22}{7} \times 14^2 (15 + 14)$$

$$= 88 (29)$$

$$= 2552 \text{ cm}^2$$

5. Given a rectangular strip of $25\text{ cm} \times 7\text{ cm}$ is rotated about longer side



⇒ height (h) = 25 cm

radius (r) = 7 cm

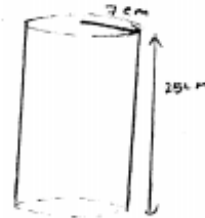
Total surface area = ?

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

= $2 \times \frac{22}{7} \times 7 \times (25+7)$

= $44(32)$

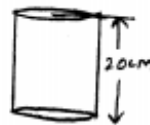
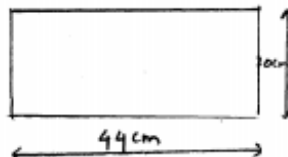
= 1408 cm^2 ✓



6. Given a rectangular sheet of dimensions $44 \times 20\text{ cm}$ is rolled along its length

⇒ Circumference

of base = 44 cm



⇒ $2\pi r = 44\text{ cm}$ [r is radius of base]

⇒ $\frac{1}{2} \times \frac{22}{7} \times r^2 \times 20 = 44 \times 20$

$$\Rightarrow r = 7 \text{ cm}$$

$$\text{height. (h)} = 20 \text{ cm}$$

$$\begin{aligned}\text{we have total surface area} &= 2\pi r(h+r) \\ &= 2 \times \frac{22}{7} \times 7(20+7) \\ &= 44(27) \\ &= 1188 \text{ cm}^2\end{aligned}$$

$\therefore$ Total surface area of cylinder thus generated = 1188 cm^2

7. Given ratio of radii of two cylinders = $2:3$
Ratio of heights of two cylinders = $5:3$

let radius of first cylinder be ' r_1 '
radius of second cylinder be ' r_2 '

from given data $r_1:r_2 = 2:3$

$$\Rightarrow \frac{r_1}{r_2} = \frac{2}{3}$$

let height of first cylinder be ' h_1 '
height of second cylinder be ' h_2 '

from given data $h_1:h_2 = 5:3$

$$\Rightarrow \frac{h_1}{h_2} = \frac{5}{3}$$

Let curved surface area be represented as C.S.A

To find (CSA) of first cylinder

(CSA) of second cylinder

$$\rightarrow \frac{2\pi r_1 h_1}{2\pi r_2 h_2}$$

$$= \left(\frac{r_1}{r_2}\right) \left(\frac{h_1}{h_2}\right)$$

$$= \left(\frac{2}{3}\right) \left(\frac{5}{3}\right)$$

$$= \frac{10}{9}$$

$$= 10:9$$

$\therefore$ ratio of their curved surface areas = 10:9

8. Let 'r' be radius of base of cylinder

'h' be height of the cylinder

Given ratio between the curved surface area
and the total surface area of cylinder = 1:2

$$\Rightarrow \frac{C.S.A}{T.S.A} = \frac{1}{2}$$

$$\Rightarrow \frac{2\pi rh}{2\pi r(h+r)} = \frac{1}{2}$$

$$\Rightarrow \frac{h}{h+r} = \frac{1}{2}$$

$$\Rightarrow 2h = h+r$$

$$\Rightarrow h = r$$

$\therefore$ Height = Radius

9. Given

curved surface area of cylinder = 1320 cm^2

diameter of base (d) = 21 cm

radius of base (r) = $\frac{d}{2} = \frac{21}{2} \text{ cm}$

height (h) = ?

Curved surface area = $2\pi rh$

$$\Rightarrow \overset{66060}{1320} = \cancel{2} \times \overset{1}{21} \times \overset{3}{21} \times h$$

$$\Rightarrow h = \frac{60}{3}$$

$$\Rightarrow h = 20 \text{ cm}$$

$\therefore$ Height of cylinder = 20 cm

10. Given

height of cylinder = 10.5 cm

let area of base of cylinder be 'A'

curved surface Area be C.S.A

Also

Given

$$3(A + A) = 2(C.S.A) \quad \left[\begin{array}{l} \text{two base circles} \\ \text{areas} = A + A \end{array} \right]$$

$$3(2A) = 2(C.S.A)$$

$$6A = 2 C.S.A$$

$$6. \pi r^2 = 2 \cdot (2\pi r h)$$

$$\Rightarrow r = \frac{2}{3} (10.5)^{3.5}$$

$$\Rightarrow r = 7 \text{ cm}$$

$\therefore$ Radius of cylinder = 7 cm

11. Given

height of cylinder = 21 m

diameter of cylinder = 6 m

$$\Rightarrow \text{radius of cylinder} = \frac{\text{diameter}}{2} = \frac{6}{2} = 3 \text{ m}$$

curved surface area, $2\pi rh$

$$= 2 \times \frac{22}{7} \times 3 \times 21$$

$$= 396 \text{ m}^2$$

cost of plastering the inner surface at

Rs 9.50 m^2 is 396×9.50

$$= \text{Rs } 3762$$

12. Given

diameter of base (d) = 20 cm

$$\Rightarrow \text{radius} = \frac{\text{diameter}}{2} = \frac{20}{2} = 10 \text{ cm}$$

and height (h) = 14 cm.

curved surface area = $2\pi r(h + \frac{r}{2})$

$$= 2 \times \frac{22}{7} \times 10 \times 19$$

$$\text{curved surface area} = 880 \text{ cm}^2 - 2660 = \frac{8360}{7}$$

Cost of tin plating it on the inside at
50 paise per 100 sq cm is

$$\frac{8360}{7} \times \frac{50}{100} = 597.1 \text{ paise}$$

$$= \text{RS } 5.97$$

13.

Given

inner diameter of circular well (d) = 3.5 m

$$\rightarrow \text{radius of well} = \frac{\text{diameter}}{2} = \frac{3.5}{2} \text{ m}$$

height of well (h) = 10 m

$$\text{curved surface area} = 2\pi rh$$

$$= 2 \times \frac{22}{7} \times \frac{3.5}{2} \times 10$$

$$= \frac{22}{1} \times 35$$

$$= 110 \text{ m}^2$$

$\therefore$ Cost of plastering its inner curved
surface are at RS 4 per square metre
is 110×4

$$= \text{RS } 440$$

14

Given diameter of roller (d) = 84 cm

$$\Rightarrow \text{radius of roller (r)} = \frac{d}{2} = \frac{84}{2} \\ = 42 \text{ cm}$$

$$\text{length of roller (h)} = 120 \text{ cm}$$

$$\begin{aligned} \text{curved surface area of roller} &= 2\pi rh \\ &= 2 \times \frac{22}{7} \times 42 \times 120 \\ &= 31680 \text{ cm}^2 \end{aligned}$$

Also given

it takes 500 complete revolutions
for roller to level a play ground

$$\begin{aligned} \therefore \text{Area of play ground} &= 500 \times \text{C.S.A of roller} \\ &= 500 \times 31680 \text{ cm}^2 \\ &= 15840000 \text{ cm}^2 \\ &= 1584 \text{ m}^2 \end{aligned}$$

15

Given number of pillars = 20

$$\text{diameter of pillar (d)} = 0.50 \text{ m}$$

$$\Rightarrow \text{radius of pillar (r)} = \frac{d}{2} = \frac{0.50}{2} = 0.25 \text{ m}$$

$$\text{height of pillar (h)} = 4 \text{ m}$$

Curved Surface Area of each pillar

$$= 2\pi rh$$

$$= \frac{2 \times 22}{7} \times 0.25 \times 4$$

$$= \frac{44}{7} \text{ m}^2$$

Curved surface area of 20 pillars

$$= \frac{44}{7} \times 20 \text{ m}^2$$

$$= \frac{880}{7} \text{ m}^2$$

$\therefore$ cost of cleaning them at a rate of Rs

2.50 per sq m

$$\text{is } \frac{880}{7} \times 2.5$$

$$\text{Rs } 314.28$$

16. Total Surface area of a hollow cylinder

open from both sides = 4620 cm^2

area of base ring = 115.5 cm^2

height (h) = 7 cm

Area of hollow cylinder

$$= 2\pi(R^2 - r^2) + 2\pi Rh + 2\pi rh$$

$$\Rightarrow 2\pi(R+r)(R-r) + 2\pi h(R+r)$$

$$= 2\pi(R+r)(h+R-r)$$

Area of base = $\pi(R^2 - r^2)$ [R is out radius
 r is inner radius]

$$\therefore \frac{\text{Surface area}}{\text{Area of base}} = \frac{4620}{115.5}$$

$$\frac{2\pi(R+r)(h+R-r)}{\pi(R+r)(R-r)} = \frac{2310}{115.5}$$

$$\frac{h+R}{R-r} = \frac{20}{1}$$

$$h+R = 20r$$

$$\Rightarrow 19r = h \Rightarrow r = \frac{h}{19} = \frac{7}{19}$$

$$\therefore \text{Thickness of cylinder} = \frac{7}{19} \text{ cm}$$

17.

Given

Sum of radius of base and height
 of solid cylinder = 37 m

$$\Rightarrow r+h = 37 \text{ m}$$

Total surface area = 1628 m^2

$$\Rightarrow 2\pi r(h+r) = 1628$$

$$\Rightarrow 2\pi r (37) = 1628$$

$$\Rightarrow 2\pi r = \frac{1628}{37}$$

$$\Rightarrow 2\pi r = 44\text{m}$$

$\therefore$ Circumference of base = 44m

18. Given

radius of cylinder = 3.5cm

height of cylinder = 7.5cm

Ratio of Total surface area to Curved Surface

$$\text{area} = \cancel{2\pi r} (h+r) : \cancel{2\pi r} h$$

$$= h+r : h$$

$$= 3.5 + 7.5 : 7.5$$

$$= 11 : 7.5 = 11 : \frac{15}{2}$$

$$= 22 : 15$$

19. Given

radius of base (r) = 70cm

height of base (h) = 14m

= 140cm

cylindrical vessel has no lid:

$$\begin{aligned}
 \text{Area} &= 2\pi r \left(h + \frac{r}{2} \right) \\
 &= 2 \times \frac{22}{7} \times 10 \left(140 + \frac{10}{2} \right) \\
 &= 2 \times 22 \times 10 (175)
 \end{aligned}$$

Tin coating must be done on both sides

$$\text{Area} = 2 (2 \times 22 \times 10 \times 175)$$

Rate at RS 3.50 per 1000 cm²

$$\begin{aligned}
 &= \frac{2 \times 2 \times 22 \times 10 \times 175 \times 3.50}{1000} = \frac{5390}{10} \\
 &= \text{RS } 539
 \end{aligned}$$

Mensuration-III Surface Area And Volume Of a Right Circular Cylinder Ex-22.2

Exercise 22.2

⑤

1.

(i) $r = 3.5 \text{ cm}, h = 40 \text{ cm}$

Volume of cylinder

$$= \pi r^2 h$$

$$= \frac{22}{7} \times 3.5^2 \times 40$$

$$= 1540 \text{ cm}^3$$

(ii) $r = 2.8 \text{ m}, h = 15 \text{ m}$

Volume of cylinder = $\pi r^2 h$

$$= \frac{22}{7} \times 2.8^2 \times 15$$

$$= 369.6 \text{ m}^3$$

2.

(i) $d = 21 \text{ cm}$

$h = 10 \text{ cm}$

Volume = $\pi r^2 h$

$$= \pi \left(\frac{d}{2}\right)^2 h$$

$$= \frac{\pi}{4} d^2 h$$

$$= \frac{\pi}{4} \times 21 \times 21 \times 10$$

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

$$= 3645 \text{ cm}^3$$

(ii) $d = 7 \text{ m}$

$h = 24 \text{ m}$

Volume = $\pi r^2 h$

$$= \pi \left(\frac{d}{2}\right)^2 h$$

$$= \frac{\pi}{4} d^2 h$$

$$= \frac{22}{7} \times 7 \times 7 \times 24$$

$$= 924 \text{ m}^3$$

3. Given

$$\text{area of base} = 616 \text{ cm}^2$$

$$\text{height} = 25 \text{ cm}$$

$$\therefore \text{volume of cylinder} = \text{area} \times \text{height}$$

$$= 616 \times 25$$

$$= 15400 \text{ cm}^3$$

4. Given

$$\text{circumference of base} = 88 \text{ cm}$$

$$\Rightarrow 2\pi r = 88$$

$$\Rightarrow \frac{2 \times 22}{7} \times r = 88$$

$$\Rightarrow r = 14 \text{ cm} \quad [r \text{ is radius of base}]$$

$$\text{height (h)} = 15 \text{ cm}$$

$$\therefore \text{volume of cylinder} = \pi r^2 h$$

$$= \frac{22}{7} \times 14^2 \times 15$$

$$= 9240 \text{ cm}^3$$

5. Given

$$\text{Length of cylinder (h)} = 21 \text{ dm}$$

$$= 2.1 \text{ m}$$

$$= 210 \text{ cm}$$

$$\text{Outer diameter (D)} = 10 \text{ cm}$$

$$\Rightarrow \text{Outer radius (R)} = \frac{D}{2} = 5 \text{ cm}$$

$$\text{Inner diameter (d)} = 6 \text{ cm}$$

$$\Rightarrow \text{Inner radius (r)} = \frac{d}{2} = 3 \text{ cm}$$

$$\therefore \text{Area of base} = \pi(R^2 - r^2)$$

$$= \pi(5^2 - 3^2)$$

$$= \pi(25 - 9)$$

$$= 16\pi$$

$$\therefore \text{Volume of cylinder} = \text{Area} \times h$$

$$= 16\pi \times 210$$

$$= 16 \times \frac{22}{7} \times 210$$

$$= 10560 \text{ cm}^3$$

6.

Given

$$\text{height of cylinder} = 15 \text{ cm}$$

$$\text{radius of base} = 7 \text{ cm}$$

$$\text{i) curved surface area} = 2\pi rh$$

$$= 2 \times \frac{22}{7} \times 7 \times 15$$

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

$$\text{ii) Total surface area} = 2\pi r(h+r)$$

$$\begin{aligned}
 &= \frac{2 \times 22}{\cancel{7}} \times \cancel{7} (15+7) \\
 &= 44 (22) \\
 &= 968 \text{ cm}^3
 \end{aligned}$$

$$\begin{aligned}
 \text{iii) volume of cylinder} &= \pi r^2 h \\
 &= \frac{22}{\cancel{7}} \times \cancel{7} \times \cancel{7} \times 15 \\
 &= 2310 \text{ cm}^3
 \end{aligned}$$

7. Given

diameter of base of cylinder (d) = 42 cm

$$\Rightarrow \text{radius of base} = \frac{d}{2} = \frac{42}{2} = 21 \text{ cm}$$

$$\begin{aligned}
 \therefore \text{volume of cylinder} &= \pi r^2 h \\
 &= \frac{22}{\cancel{7}} \times \cancel{7}^3 \times 21 \times 16 \\
 &= 18860 \text{ cm}^3
 \end{aligned}$$

8.

Given

diameter of base = 7 cm

$$\therefore \text{radius of base (r)} = \frac{7}{2} = 3.5 \text{ cm}$$

height of cylinder (h) = 60 cm

$$\begin{aligned}
 \therefore \text{volume of cylinder} &= \pi r^2 h \\
 &= \frac{22}{\cancel{7}} \times \overset{0.5}{\cancel{3.5}} \times 3.5 \times 60
 \end{aligned}$$

$$= 2310 \text{ cm}^3$$

we have 1 litre = 1000 cm^3

$$\therefore \text{capacity in litres} = \frac{2310}{1000}$$

$$= 2.31 \text{ litres.}$$

9. Given a rectangular strip $25 \text{ cm} \times 7 \text{ cm}$
is rotated about longer side

$$\therefore \text{radius of base} = 7 \text{ cm}$$

$$\text{height of cylinder} = 25 \text{ cm}$$

$$\begin{aligned} \therefore \text{volume of cylinder} &= \pi r^2 h \\ &= \frac{22}{7} \times 7 \times 7 \times 25 \\ &= 3850 \text{ cm}^3 \end{aligned}$$

10. A rectangular sheet of dimensions $44 \text{ cm} \times 20 \text{ cm}$ is rolled along its length

$$\begin{aligned} \Rightarrow \text{radius of base} &= \frac{\text{Length}}{2\pi} [2\pi r = L] \\ &= \frac{44}{2 \times \frac{22}{7}} \\ &= 7 \text{ cm} \end{aligned}$$

height of cylinder (h) = 20 cm

∴ volume of cylinder = $\pi r^2 h$

$$= \frac{22}{7} \times 7 \times 7 \times 20$$

$$= 8080 \text{ cm}^3$$

11.

Given volume of cylinder = 1650 cm³

curved surface area = 660 cm²

$$\frac{\text{volume}}{\text{surface area}} = \frac{1650}{660}$$

$$\frac{\pi r^2 h}{2\pi r h} = \frac{5}{2}$$

$$\frac{r}{2} = \frac{5}{2}$$

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

we have surface area = 660

$$2\pi r h = 660$$

$$2 \times \frac{1}{7} \times 5 \times h = 660$$

$$h = 21 \text{ cm}$$

∴ radius = 5 cm, height = 21 cm

12.

Given

radii of two cylinders are in ratio 2:3

let r_1 be radius of first cylinder r_2 be radius of second cylinder

$$\Rightarrow \frac{r_1}{r_2} = \frac{2}{3}$$

let h_1 be height of first cylinder h_2 be height of second cylinder

$$\text{Given } \frac{h_1}{h_2} = \frac{5}{3}$$

$$\therefore \frac{\text{Volume of first cylinder}}{\text{Volume of second cylinder}} = \frac{\pi r_1^2 h_1}{\pi r_2^2 h_2}$$

$$= \left(\frac{r_1}{r_2}\right)^2 \left(\frac{h_1}{h_2}\right)$$

$$= \left(\frac{2}{3}\right)^2 \left(\frac{5}{3}\right)$$

$$= \frac{4 \cdot 5}{9 \cdot 3}$$

$$= \frac{20}{27}$$

$$\therefore \text{ratio of their volumes} = 20:27$$

13.

Given ratio b/w curved surface area &

total surface area $\sim 1:2$

$$\therefore \frac{2\pi rh}{2\pi r(h+r)} = \frac{1}{2}$$

$$\frac{h}{h+r} = \frac{1}{2}$$

$$\Rightarrow h+r=2h$$

$$\Rightarrow h=r$$

Also Given Total surface area $= 616 \text{ cm}^2$

$$\Rightarrow 2\pi r(h+r) = 616$$

$$\Rightarrow 2\pi r(2r) = 616 \quad [\because r=h]$$

$$= 4\pi r^2 = 616$$

$$= \frac{22}{7} r^2 = 154$$

$$\Rightarrow r^2 = 49$$

$$\Rightarrow r = 7 \text{ cm}$$

$$\therefore h = 7 \text{ cm}$$

$\therefore$ volume of cylinder $= \pi r^2 h$

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

$$= 1078 \text{ cm}^3$$

19. Given curved surface area $= 1520 \text{ cm}^2$

diameter of base (d) = 21 cm

$\therefore$ radius of base (r) = $\frac{21}{2}$ cm

we have

curved surface area = $2\pi rh$

$$\Rightarrow 2\pi rh = 1320$$

$$\Rightarrow \frac{22}{7} \times \frac{21}{2} \times \frac{21}{2} \times h = 1320$$

$$\Rightarrow h = 20 \text{ cm}$$

$\therefore$ volume of cylinder = $\pi r^2 h$

$$= \frac{22}{7} \times \frac{21}{2} \times \frac{21}{2} \times 20$$

$$= 6930 \text{ cm}^3$$

15

Given

$$\frac{\text{radius}}{\text{height}} = \frac{2}{3} \Rightarrow \frac{r}{h} = \frac{2}{3} \Rightarrow h = \frac{3}{2}r$$

$$\text{volume} = 1617 \text{ cm}^3$$

$$\pi r^2 h = 1617$$

$$\frac{22}{7} \times r^2 \times \frac{3}{2}r = 1617$$

$$r^3 = 7 \times 7 \times 7$$

$$r = 7 \text{ cm}$$

$$\therefore h = \frac{3 \times 7}{2}$$

$$= \frac{21}{2} \text{ cm} = 10.5 \text{ cm}$$

$$\begin{aligned}
 \therefore \text{Total surface area} &= 2\pi r(r+h) \\
 &= 2 \times \frac{22}{7} \times 7(7+10.5) \\
 &= 44(17.5) \\
 &= 770 \text{ cm}^2
 \end{aligned}$$

16 Given

$$\begin{aligned}
 \text{curved surface area} &= 264 \text{ m}^2 \\
 \text{volume} &= 924 \text{ m}^3
 \end{aligned}$$

Consider

$$\frac{\text{volume}}{\text{curved surface area}} = \frac{924}{264}$$

$$\frac{\pi r^2 h}{2\pi r h} = \frac{23+21}{264}$$

$$\frac{r}{2} = \frac{44}{264}$$

$$\frac{r}{2} = \frac{1}{6}$$

$$\Rightarrow r = \frac{21}{3} = 7 \text{ m}$$

$$\therefore \text{radius} = 7 \text{ m}$$

$$\begin{aligned}
 \text{diameter} &= 2 \times \text{radius} = 2 \times 7 \\
 &= \underline{14 \text{ m}}
 \end{aligned}$$

we have curved surface area = 264 m²

$$\begin{aligned}
 2\pi r h &= 264 \\
 2 \times \frac{22}{7} \times 7 \times h &= 264
 \end{aligned}$$

$$h = 6 \text{ m}$$

$$\therefore \text{height of cylinder} = 6 \text{ m}$$

17. Given

volume of two cylinders are same
heights of two cylinders in the
ratio 1:2

$$\Rightarrow \frac{h_1}{h_2} = \frac{1}{2}$$

$$\therefore (\text{Volume})_1 = (\text{Volume})_2$$

$$\Rightarrow \pi r_1^2 h_1 = \pi r_2^2 h_2$$

$$\Rightarrow \left(\frac{r_1}{r_2}\right)^2 \left(\frac{h_1}{h_2}\right) = 1$$

$$\Rightarrow \left(\frac{r_1}{r_2}\right)^2 \left(\frac{1}{2}\right) = 1$$

$$\Rightarrow \left(\frac{r_1}{r_2}\right)^2 = 2$$

$$\Rightarrow \frac{r_1}{r_2} = \frac{\sqrt{2}}{1}$$

$\therefore$ radii are in the ratio $\sqrt{2}:1$

18. Given

height of the cylinder = 10.5m

$$3(A + A) = 2 \text{ C.S.A}$$

where A is circular area of base

C.S.A is curved surface area

$$3(A + A) = 2 \text{ CSA}$$

$$\Rightarrow 3 \times \pi r^2 = 2(2\pi r h)$$

$$\Rightarrow r = \frac{2h}{3}$$

$$= \frac{(10.5) \cdot 2}{3}$$

$$= 3.5 \text{ m} \times 2 = 7 \text{ m}$$

$\therefore$ volume of the cylinder = $\pi r^2 h$

$$= \frac{22}{7} \times 7 \times 7 \times 10.5$$

$$= \frac{22}{7} \times 7 \times 7 \times 10.5$$

$$= 1617 \text{ m}^3$$

19. Given

height of cylinder = 21 m

diameter of cylinder = 6 m

$$\Rightarrow \text{radius} = \frac{\text{diameter}}{2} = \frac{6}{2} = 3 \text{ m}$$

$\therefore$ volume to be dug out

$$= \pi r^2 h$$

$$= \frac{22}{7} \times 3 \times 3 \times 21$$

$$= 694 \text{ m}^3$$

20. Given

Circumference = 176 cm

$$\Rightarrow 2\pi r = 176 \quad [r \text{ is radius}]$$

$$\Rightarrow \frac{2 \times 22}{7} \times r = 176$$

$$\Rightarrow r = 28 \text{ cm}$$

$$\text{length of trunk} = 8 \text{ m} = 300 \text{ cm}$$

$$\therefore \text{volume of timber} = \pi r^2 h$$

$$= \frac{22}{7} \times 28 \times 28 \times 300$$

$$= 7392 \text{ cm}^3$$

$$= 0.7392 \text{ m}^3$$

$$= 0.74 \text{ m}^3$$

21

Given

$$\text{depth of well (h)} = 20 \text{ m}$$

$$\text{diameter of base (d)} = 7 \text{ m}$$

$$\Rightarrow \text{radius} = \frac{d}{2} = \frac{7}{2} \text{ m}$$

$$\text{volume} = \pi r^2 h$$

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

$$= 770 \text{ m}^3$$

It is spread out on rectangular plate
of 22m long and 14m broad

$$\therefore \text{area} = 22 \times 14$$

$$= 308 \text{ m}^2$$

$$\therefore \text{volume of dug out material}$$

$$= \text{Area} \times h$$

$$770 = 308 \times h$$

$$\Rightarrow h = \frac{770}{308} = \frac{385}{154} = \frac{5}{2} = 2.5 \text{ m}$$

22 Given

diameter of well (d) = 14 m

radius of well (r) = $\frac{d}{2} = \frac{14}{2} = 7 \text{ m}$

depth of well (h) = 8 m.

$$\therefore \text{volume} = \pi r^2 h$$

$$= \frac{22}{7} \times 7^2 \times 8$$

$$= 1232 \text{ m}^3$$

It is spread out on width of 21 m

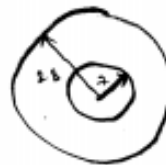
$$\text{Area} \times h = 1232$$

$$\pi (28^2 - 7^2) \times h = 1232$$

$$\pi (735) \times h = 1232$$

$$\Rightarrow h = \frac{1232 \times 7}{735 \times 22} = \frac{56}{105} = \frac{8}{15} = 0.533$$

$$h = 53.3 \text{ cm}$$



$\therefore$ Height of embankment = 53.3 cm

23

Given

diameter of base = 56 cm

$$\Rightarrow \text{radius (r)} = \frac{56}{2} \text{ cm}$$

Case II

if it is rolled along its breadth

$$\Rightarrow 2\pi r = 18$$

$$\Rightarrow r = \frac{18}{2\pi}$$

$$\text{height} = 30 \text{ cm}$$

$$\begin{aligned}\therefore \frac{(\text{Volume})_1}{(\text{Volume})_2} &= \frac{\pi r_1^2 h_1}{\pi r_2^2 h_2} \\ &= \frac{\pi \left(\frac{30}{2\pi}\right)^2 \cdot 18}{\pi \left(\frac{18}{2\pi}\right)^2 \cdot 36} \\ &= \frac{\left(\frac{30}{18}\right)^2 \cdot 18}{36} \\ &= \frac{30}{18} \\ &= \frac{5}{3}\end{aligned}$$

$\therefore$ volumes formed are in the ratio
5:3

25. rains falls on a roof of $18 \text{ m} \times 16.5 \text{ m}$.

it rains 10 cm a day (h')

diameter of cylinder = 8 m

$\therefore$ radius of cylinder (r) = $\frac{8}{2} = 4 \text{ m}$

Let 'h' be rise in level of tank

$$\Rightarrow \pi r^2 h = L \times b \times h'$$

$$\Rightarrow \frac{22}{7} \times 4 \times 4 \times h = 18 \times 16.5 \times 0.1$$

$$\Rightarrow h = \frac{9 \times 1.5 \times 0.05}{18 \times 16.5 \times 0.1 \times 2}$$

$$= \frac{22 \times 4 \times 4 \times 7}{18 \times 16.5 \times 0.1 \times 2}$$

$$= 0.5906 \text{ m}$$

$$= 59.06 \text{ cm}$$

26

Case I

diameter of cylinder = 1 cm

Length = 5 cm

Case II

diameter = 1 mm = 0.1 cm

length = ?

volumes are equal

$$\Rightarrow \pi r_1^2 L_1 = \pi r_2^2 L_2$$

$$\Rightarrow \frac{\pi}{4} d_1^2 L_1 = \frac{\pi}{4} d_2^2 L_2$$

$$\Rightarrow L_2 = L_1 \left(\frac{d_1}{d_2} \right)^2$$

$$= 5 \left(\frac{1}{0.1} \right)^2 = 5 \times 100 = 500 \text{ cm}$$

$$\therefore \text{Length of wire so formed} = 500 \text{ cm} \\ = 5 \text{ m}$$

27

Given

$$\text{diameter of wire} = 4 \text{ mm} = 0.4 \text{ cm}$$

$$\therefore \text{radius} = \frac{0.4}{2} = 0.2 \text{ cm}$$

Let 'L' be length of copper wire

$$\text{Given mass of copper wire} = 13.2 \text{ kg}$$

$$\text{and 1 cubic cm of copper weighs } 8.4 \text{ gm}$$

$$\Rightarrow \frac{\pi}{4} d^2 L \times 8.4 = 13200 \text{ [in grams]} \quad \text{cm}$$

$$\Rightarrow \frac{\pi}{4} (0.4 \times 0.4) L \times 8.4 = 13200$$

$$\Rightarrow \frac{2\pi}{28} (0.4 \times 0.4) \times L \times 8.4 = 13200$$

$$L = \frac{50 \times 28 \times 40}{0.4 \times 0.4 \times 8.4}$$

$$= 12500 \text{ cm}$$

$$= 125 \text{ m}$$

$$\therefore \text{Length of wire} = 125 \text{ m}$$

28

Given

$$\text{volume of brass} = 2.2 \text{ dm}^3$$

$$\text{diameter of wire (d)} = 0.25 \text{ cm} \\ = 0.25 \times 10^{-2} \text{ m}$$

$$\text{volume} = \pi r^2 L$$

$$2.2 \text{ dm}^3 = \pi \left(\frac{d}{2}\right)^2 L$$

$$2.2 (10^{-1})^3 = \frac{\pi}{4} (0.25 \times 10^{-2})^2 \cdot L$$

$$\frac{0.1}{2.2} \times 10^{-3} = \frac{2.2}{28} (0.25)^2 10^{-4} \cdot L$$

$$L = \frac{2.8}{(0.25)^2}$$

$$= 448 \text{ m}$$

$$\therefore \text{length of wire} = 448 \text{ m}$$

29. Diff between inside and outside

$$\text{surface} = 88 \text{ cm}^2$$

$$\text{height (h)} = 14 \text{ cm}$$

$$\Rightarrow 2\pi(R-r)h = 88 \quad \left[\begin{array}{l} R \text{ is outer radius} \\ r \text{ is inner radius} \end{array} \right] \rightarrow (1)$$

$$\text{volume} = 176 \text{ cm}^3$$

$$\pi(R^2 - r^2) \cdot h = 176 \rightarrow (2)$$

$$\frac{(1)}{(2)}$$

$$\frac{2\pi(R-r)h}{\pi(R^2-r^2)h} = \frac{88}{176} \quad \left[\begin{array}{l} a^2 - b^2 \\ = (a+b)(a-b) \end{array} \right]$$

$$\frac{2}{R+r} = \frac{1}{2}$$

$$\boxed{R+r=4} \rightarrow (3)$$

Sub $R+r=4$ in (2)

$$\pi (R+r) (R-r) h = 176 \quad 38 \sim 22$$

$$\frac{22}{7} \times 4 (R-r) \times \frac{1}{4} = 176$$

$$\Rightarrow R-r=1 \rightarrow (4)$$

solving (3) & (4)

$$(3) + (4)$$

$$2R=5$$

$$R=2.5 \text{ cm}$$

Sub $R=2.5$ in (3)

$$\Rightarrow r=4-2.5=1.5 \text{ cm}$$

$\therefore$ Outer radius = 2.5 cm

Inner radius = 1.5 cm

30

Pipe

diameter = 2 cm $\Rightarrow$ radius = 1 cm

height = 6 m / second = 600 cm / second

cylinder

radius of base = 60 cm

Let rise be h_c

$$\Rightarrow \cancel{\pi} r_p^2 h_p = \cancel{\pi} r_c^2 h_c \quad \left[\begin{array}{l} \text{subbix } p - \text{pipe} \\ c - \text{cylinder} \end{array} \right]$$

$$\Rightarrow 1 \times 1 \times 600 = 60 \times 60 \times h_c$$

$$\Rightarrow h_c = \frac{10}{60 \times 60} = \frac{1}{6} \text{ cm per sec}$$

for 30 minutes

the rise is $30 \times 60 \times h_c$

$$\Rightarrow \frac{1800}{6} \text{ cm}$$

$$= 300 \text{ cm}$$

$$= \underline{\underline{3 \text{ m}}}$$

81

inner diameter of tube = 10.4 cm

$$\therefore \text{inner radius } (r) = \frac{10.4}{2} = 5.2 \text{ cm}$$

thickness of metal = 8 mm = 0.8 cm

$$R = r + t$$

$$= 5.2 + 0.8$$

$$= 6 \text{ cm}$$

length = 26 cm

$$\begin{aligned}
 \therefore \text{volume of metal} &= \pi (R^2 - r^2) L \\
 &= \frac{22}{7} (6^2 - 5.2^2) (25) \\
 &= 704 \text{ cm}^3
 \end{aligned}$$

32

Given

inner radius of pipe / lap = 0.75 cm

flow rate (l) = 7 m/sec = 700 cm/sec

$$\begin{aligned}
 \therefore \text{volume of water per sec} &= \pi r^2 l \\
 &= \frac{22}{7} \times (0.75)^2 \times 700 \\
 &= 1650 \text{ cm}^3 \quad 1237.5 \text{ cm}^3
 \end{aligned}$$

volume of water delivered by pipe in

$$\begin{aligned}
 \text{hour} &= 1237.5 \\
 &= 1650 \times 3600 \text{ cm}^3 \\
 &= \frac{1237.5 \times 0.75}{1000} \times 3600 \text{ Litres} \\
 &= 4455 \text{ litres}
 \end{aligned}$$

33

Cylinder

diameter (d) = 1.4 m

radius (r) = $\frac{d}{2}$ = 0.7 m

height (h) = 2.1 m

$$\text{volume} = \pi r^2 h$$

$$= \frac{22}{7} \times 0.1^2 \times 0.7 \times 2.1 \text{ m}^3$$

Pipe

$$\text{diameter (d)} = 3.5 \text{ cm}$$

$$\text{radius (r)} = \frac{d}{2} = \frac{3.5}{2} = \frac{3.5}{2} \times 10^{-2} \text{ m}$$

$$\text{flow rate} = \frac{2 \text{ m}}{\text{sec}}$$

$$\text{volume per sec} = \pi r^2 L$$

$$= \frac{22}{7} \times \left(\frac{3.5}{2} \times 10^{-2}\right)^2 \times 2 \text{ m}^3/\text{sec}$$

$$\therefore \text{Time taken to fill the tank} = \frac{\text{volume of tank}}{\text{volume filled per sec}}$$

$$= \frac{\frac{22}{7} \times 0.1^2 \times 0.7 \times 2.1}{\frac{22}{7} \times \frac{3.5^2}{4} \times 10^{-4} \times 2}$$

$$= \frac{2 \cdot 10^2 \cdot 10^2 \cdot 2 \cdot 1}{25}$$

$$= 1680 \text{ seconds}$$

$$= 28 \text{ minutes}$$

84

A rectangular paper of $30 \text{ cm} \times 18 \text{ cm}$ can be rolled in two ways,

Case I

along length, h

$$\Rightarrow 2\pi r_1 = 30$$

$$\Rightarrow r_1 = \frac{30}{2\pi} \text{ cm}$$

$$\text{height } (h_1) = 18 \text{ cm}$$

Case II

along breadth

$$\Rightarrow 2\pi r_2 = 18$$

$$r_2 = \frac{18}{2\pi} \text{ cm}$$

$$\text{height } (h_2) = 30 \text{ cm}$$

$$\begin{aligned} \frac{(\text{Volume})_1}{(\text{Volume})_2} &= \frac{\pi r_1^2 h_1}{\pi r_2^2 h_2} = \left(\frac{r_1}{r_2}\right)^2 \left(\frac{h_1}{h_2}\right) \\ &= \left(\frac{\frac{30}{2\pi}}{\frac{18}{2\pi}}\right)^2 \left(\frac{18}{30}\right) \\ &= \frac{30}{18} \\ &= \frac{5}{3} \end{aligned}$$

$\therefore$ volumes so formed are in the
ratio 5:3

35.

Area of cross section = 5 cm^2 in one minute

$$\text{speed of water } \left(\frac{L}{t}\right) = 30 \text{ cm/sec}$$

$$\text{volume} = \text{Area} \times \text{length}$$

$$= (\text{Area} \times t) \times \frac{\text{length}}{t} \quad \left[\begin{array}{l} \text{Divide } t \\ \text{multiply } t \end{array} \right]$$

$$= 5 \times 60 \times \frac{30}{1} \text{ cm}^3$$

$$= 9000 \text{ cm}^3$$

$$= \frac{9000}{1000} \text{ litres}$$

$$= 9 \text{ litres}$$

36

Given

$$\text{Total surface area of cylinder} = 231 \text{ cm}^2$$

$$\text{Curved surface area} = \frac{2}{3} \text{ total surface area}$$

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

$$3h = 2h + 2r$$

$$\Rightarrow \boxed{h = 2r}$$

$$\text{we have total surface area} = 231$$

$$2\pi r(h+r) = 231 \quad \boxed{21}$$

$$2 \times \frac{21}{7} \times (2r+r) = 231$$

$$3r^2 = \frac{21 \times 7}{2}$$

$$r^2 = \frac{77}{6}$$

$$\cancel{3}r^2 = \frac{7 \times 7 \times 3}{2 \times 2}$$

$$r = \sqrt{\frac{7 \times 7}{2 \times 2}}$$

$$r = \frac{7}{2} = 3.5 \text{ cm}$$

$$\therefore h = 2r = 2(3.5) = 7 \text{ cm}$$

$$\begin{aligned} \therefore \text{volume of cylinder} &= \pi r^2 h \\ &= \frac{22}{7} \times 3.5 \times 3.5 \times 7 \\ &= 269.5 \text{ cm}^3 \end{aligned}$$

37

Given

$$\text{diameter of tube} = \frac{3}{200} \text{ m}$$

$$\begin{aligned} \text{radius of tube} &= \frac{\text{diameter}}{2} = \frac{\frac{3}{200}}{2} \\ &= \frac{3}{400} \text{ m} = 1.5 \text{ m} \end{aligned}$$

$$\text{depth (h)} = 280 \text{ m}$$

$$\begin{aligned} \therefore \text{volume} &= \pi r^2 h \\ &= \frac{22}{7} \times 1.5 \times 1.5 \times 280 \\ &= 1980 \text{ m}^3 \end{aligned}$$

$$\begin{aligned} \text{Cost of sinking} &= 1980 \times 3.6 \\ &= \text{RS } 7128 \end{aligned}$$

Cost of cementing its inner curved surface

$$\begin{aligned} &= 2\pi r h \times 2.5 \\ &= 2 \times \frac{22}{7} \times 1.5 \times 280 \times 2.5 \end{aligned}$$

$$= \text{RS } 600$$

38. Ref problem no. 27

39. Ref problem no 28.

40. Given

diameter of well = 10 m

$$\Rightarrow \text{radius of well} = \frac{\text{diameter}}{2} = \frac{10}{2} \\ = 5 \text{ m}$$

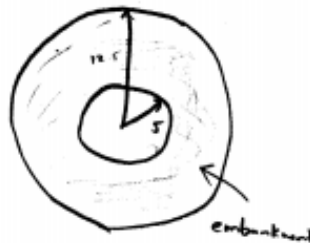
depth of well (d) = 8.4 m

$$\text{volume of well} = \pi r^2 d \\ = \frac{22}{7} \times 5 \times 5 \times 8.4$$

Area of embankment

$$= \pi (17.5^2 - 10^2)$$

$$= 20625 \pi$$



$\therefore$ height of embankment

$$= \frac{\text{volume of well}}{\text{Area of embankment}}$$

$$= \frac{22 \times 5 \times 5 \times 8.4}{20625 \pi}$$

$$= \frac{22 \times 5 \times 5 \times 8.4}{20625 \times \frac{22}{7}} \\ = 1.6 \text{ m}$$

41. Given

$$\text{width of roller (L)} = 63 \text{ cm}$$

$$\text{girth} = 440 \text{ cm}$$

$$\rightarrow 2\pi R = 440 \text{ cm} \quad [R \text{ is outer radius}]$$

$$\rightarrow \cancel{2} \times \frac{\cancel{2} \times 22}{7} \times R = \overset{20}{440} \text{ cm}$$

$$\Rightarrow R = 70 \text{ cm}$$

$$\text{thickness of roller} = 4 \text{ cm}$$

$$\therefore \text{inner radius (r)} = R - 4$$

$$= 70 - 4$$

$$= 66 \text{ cm}$$

$$\therefore \text{volume of cylinder} = \pi(R^2 - r^2)L$$

$$= \pi(70^2 - 66^2)63$$

$$= \frac{22}{7} (594) 63$$

$$= 107712 \text{ cm}^3$$

42. Let

$$\text{length of solid cylinder} = L$$

$$\text{diameter of cylinder} = 2 \text{ cm}$$

$$\text{radius of cylinder} = \frac{2}{2} = 1 \text{ cm}$$

$$\therefore \text{volume of cylinder} = \pi r^2 L$$

$$= \pi \times 1 \times 1 \times L \rightarrow \textcircled{1}$$

Given

Length of hollow cylinder = 16 cm

external diameter (D) = 20 cm

$\therefore$ external radius (R) = 10 cm

thickness (t) = 2.5 mm = 0.25 cm

$\therefore$ internal radius (r) = R - t = 10 - 0.25
= 9.75 cm

$$\begin{aligned} \text{volume} &= \pi \times (R^2 - r^2) \times L \\ &= \pi \times (10^2 - 9.75^2) \times 16 \rightarrow \textcircled{2} \end{aligned}$$

$$\therefore \textcircled{1} = \textcircled{2}$$

$$\pi \times 1 \times 1 \times L = \pi \times (10^2 - 9.75^2) \times 16$$

$$L = 79 \text{ cm}$$

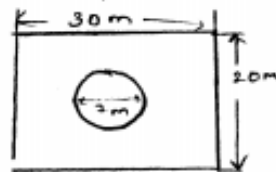
43

Given

diameter of well
(d) = 7 m

radius (r) = $\frac{d}{2} = \frac{7}{2} = 3.5 \text{ m}$

depth (h) = 10 m



$$\begin{aligned} \therefore \text{volume of well} &= \pi r^2 h \\ &= \frac{22}{7} \times 3.5 \times 3.5 \times 10 \text{ m}^3 \end{aligned}$$

Area of the spread out

$$\begin{aligned} &= 30 \times 20 - \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} \\ &= \frac{1123}{2} \text{ m}^2 \end{aligned}$$

Volume of well = Area of spread out
× height of embankment

$$\frac{22}{7} \times 3.5 \times 3.5 \times 10 = \frac{1123}{2} \times h$$

$$\frac{22 \times 35 \times 35 \times 10 \times 2}{1123} = h$$

$$\begin{aligned} \Rightarrow h &= \frac{22 \times 35}{1123} \\ &= 0.6856 \text{ m} \end{aligned}$$

$$h = 68.56 \text{ cm}$$

$$\begin{aligned} \therefore \text{Height of embankment} &= 68.56 \text{ cm} \\ &\approx 68.6 \text{ cm} \end{aligned}$$