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

Exercise 22.1

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

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

height of cylinder $(h) = 60\,cm$

Curved Surface area $= 2\pi r h$

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

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

$= (22)(60)$

$= 1320\,cm^2$

Total surface area

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

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

$= (22)(63.5)$

$= 1397\,cm^2$

2. Given curved surface area of cylinder $= 132\,cm^2$

radius $(r) = 0.35\,cm$

Length $= ?$

Let length $= h\,cm$

We have curved surface area $= 2\pi r h$

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

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

$\Rightarrow 132 = \frac{\cancel{70}}{\cancel{700}\,10}(22)h$

$\Rightarrow h = \frac{\cancel{1320}^{\cancel{660}\ 60}}{\cancel{22}\ \cancel{11}} = 60$

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

Length of cylinder = 60 cm

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5. Given

area of base of cylinder = 616 cm^2 (a)

height (h) = 2.5 cm

Curved surface Area (CSA) = ?

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

$616 = \pi r^2$

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

$\Rightarrow r^2 = \cancel{616}^{\cancel{308}\ 28} \times \frac{7}{\cancel{22}\ \cancel{11}\ 1}$

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

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

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

$\Rightarrow r = 7 \times 2$

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

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

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

$= 220\ cm^2$

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

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4. Given

Circumference of the base of cylinder $= 88cm$

height $(h) = 16 cm$

Curved surface area $= ?$

Total surface area $= ?$

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

$\Rightarrow \cancel{88}^{\cancel{44}\,2} = \cancel{2} \times \frac{\cancel{22}^{1}}{7} \times r$

$\Rightarrow r = 14\ cm$

Curved surface area $= 2\pi r h$

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

$= 1320\ cm^2$

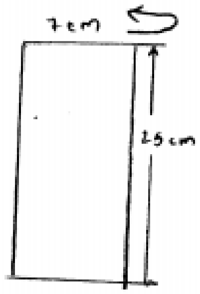
Total surface area $= 2\pi r(h+r)$

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

$= 88\ (29)$

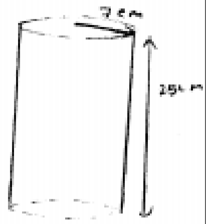
$= 2552\ cm^2$

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



$\Rightarrow$ height $(h) = 25cm$

radius $(r) = 7cm$



Total surface area = ?

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

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

$= 44(32)$

$= 1408cm$ ✓

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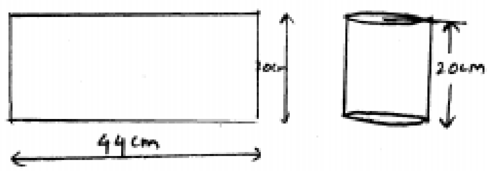
6. Given a rectangular sheet of dimensions 44×20 cm is rolled along its length



$\Rightarrow$ Circumference of base = 44 cm

$\Rightarrow$ $2\pi r = 44$ cm ['r' is radius of base]

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

$\Rightarrow r = 7\,cm$

height $(h) = 20\,cm$

We have total surface area $= 2\pi r(h+r)$

$= 2 \times \frac{22}{\cancel{7}} \times \cancel{7}(20+7)$

$= 44(27)$

$= 1188\,cm^2$

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

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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 $\frac{(CSA) \text{ of first cylinder}}{(CSA) \text{ of second cylinder}}$

$\Rightarrow \frac{\cancel{2\pi} r_1 h_1}{\cancel{2\pi} r_2 h_2}$

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

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

$= \frac{10}{9}$

$= 10:9$

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

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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 $= 1:2$

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

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

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

$\Rightarrow 2h = h+r$

$\Rightarrow h = r$

$\therefore$ Height = Radius

9. Given

curved surface area of cylinder = $1320\ cm^2$

diameter of base (d) = 21 cm

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

height (h) = ?

Curved surface area = $2\pi rh$

$\Rightarrow \cancel{1320}^{\cancel{660}\ 60} = \cancel{2} \times \frac{\cancel{22}^{\cancel{11}\ 1}}{\cancel{7}} \times \frac{\cancel{21}^{3}}{\cancel{2}} \times h$

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

$\Rightarrow h = 20$ 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

$3(A + A) = 2(C.S.A)$ [two base circles areas = A+A]

$3(2A) = 2(CSA)$

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

$\cancel{6}^{3} \cdot \cancel{\pi} r^2 = \cancel{2} \cdot (2\cancel{\pi}\cancel{r}h)$

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

$\Rightarrow r = 7\,cm$

$\therefore$ Radius of cylinder = 7 cm

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11 Given

height of cylinder = 21 m

diameter of cylinder = 6 m

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

curved surface Area = $2\pi rh$

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

$= 396\,m^2$

cost of plastering the inner surface at

Rs $9.50\,m^2$ is 396×9.50

= Rs 3762

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12. Given

diameter of base (d) = 20 cm

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

and height (h) = 14 cm.

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

$= 2 \times \frac{22}{\cancel{7}} \times 10 \times \cancel{14}^{2}\ 19$

~~Curved~~ surface area = ~~880 cm²~~ ~~2660~~ $\frac{8360}{7}$.

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

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

$$= Rs\ 5.97$$

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13. Given

inner diameter of circular well (d) = 3.5 m

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

. height of well (h) = 10 m

curved surface area = $2\pi r h$

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

$$= \frac{22}{\cancel{7}} \times \cancel{35}\ 5$$

$$= 110 m^2$$

∴ Cost of plastering its inner curved surface are at Rs 4 per square meter is 110×4

= Rs 440

14 Given diameter of roller (d) = 84 cm

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

$= 42$ cm

length of roller (h) = 120 cm

curved surface area of roller = $2\pi r h$

$= 2 \times \frac{22}{\cancel{7}} \times \overset{6}{\cancel{42}} \times 120$

$= 31680\ cm^2$

Also given

it takes 500 complete revolutions for roller to level a playground

$\therefore$ Area of play ground = 500 × C.S.A of roller

$= 500 \times 31680\ cm^2$

$= 15840000\ cm^2$

$= 1584\ m^2$

15 Given number of pillars = 20

diameter of pillar (d) = 0.50 m

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

height of pillar (h) = 4 m

Curved Surface Area of each pillar

$= 2\pi r h$

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

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

Curved surface Area of 20 pillars

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

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

$\therefore$ cost of cleaning them at a rate of Rs 2.50 per sq m^2

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

Rs 314.28

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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

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

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

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

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

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

$\dfrac{\cancel{2}\cancel{\pi}\cancel{(R+r)}(h+R-r)}{\cancel{\pi}\cancel{(R+r)}(R-r)} = \dfrac{\overset{2310}{\cancel{4620}}}{115.5}$

$\dfrac{h+t}{t} = \dfrac{\overset{20}{\cancel{2310}}}{\underset{1}{\cancel{115.5}}}$

$h+t = 20t$

$\Rightarrow 19t = h \Rightarrow t = \dfrac{h}{19} = \dfrac{7}{19}$

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

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17. Given

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

$\Rightarrow r + h = 37$ m

Total surface area $= 1628\ m^2$

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

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

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

$\Rightarrow 2\pi r = 44 m$

$\therefore$ Circumference of base = 44 m

18. Given

radius of cylinder = 3.5 cm

height of cylinder = 7.5 cm

Ratio of total surface area to curved surface 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) = 70 cm

height of base (h) = 14 m

= 140 cm

cylindrical vessel has no lid $\Rightarrow$

Area $= 2\pi r\left(h+\frac{r}{2}\right)$

$= 2 \times \frac{22}{\cancel{7}} \times \cancel{70}^{10}\left(140 + \frac{70}{2}\right)$

$= 2 \times 22 \times 10\ (175)$

Tin Coating must be done on both sides

Area $= 2\left(2 \times 22 \times 10 \times 175\right)$

Rate at Rs 3.50 per 1000 cm²

$= \frac{2 \times 2 \times 22 \times 1\cancel{0} \times 17\cancel{5} \times 3.50}{10\cancel{0}\cancel{0}} = \frac{5390}{10}$

$=$ Rs 539

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

Exercise 22.2 ⑤

1.

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

Volume of cylinder

$= \pi r^2 h$

$= \frac{22}{\cancel{7}} \times \cancel{3.5}^{0.5} \times 3.5 \times 40$

$= 1540\ cm^3$

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

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

$= \frac{22}{\cancel{7}} \times \cancel{2.8}^{0.4} \times 2.8 \times 15$

$= 369.6\ m^3$

2.

(i) $d = 21\ cm$

$h = 10\ cm$

Volume $= \pi r^2 h$

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

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

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

$= \frac{\cancel{22}^{11} \times \cancel{21}^{3} \times 21 \times \cancel{10}^{5}}{\cancel{4}_2 \times \cancel{7}}$

$= 3465\ cm^3$

(ii) $d = 7\ m$

$h = 24\ m$

Volume $= \pi r^2 h$

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

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

$= \frac{22 \times \cancel{7} \times 7 \times \cancel{24}^{6}}{\cancel{7} \times \cancel{4}}$

$= 924\ m^3$

3. Given

area of base = 616 cm^2

height = 25 cm

$\therefore$ volume of cylinder = area × height

= 616 × 25

= 15400 cm^3

4. Given

circumference of base = 88 cm

$\Rightarrow 2\pi r = 88$

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

$\Rightarrow r = 14$ cm ['r' is radius of base

height (h) = 15 cm

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

$= \frac{22}{\cancel{7}} \times \cancel{14} \times 14 \times 15$

= 9240 cm^3

5. Given Length of cylinder (h) = 21 dm

= 2.1 m

$= 210\ cm$

Outer diameter $(D) = 10\ cm$

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

Inner diameter $(d) = 6\ cm$

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

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

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

$= \pi(25 - 9)$

$= 16.\pi$

$\therefore$ volume of cylinder $=$ Area $\times h$

$= 16\pi \times 210$

$= 16 \times \frac{22}{\cancel{7}} \times \overset{30}{\cancel{210}}$

$= 10560\ cm^3$

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6. Given

height of cylinder $= 15\ cm$

radius of base $= 7\ cm$

i) curved surface area $= 2\pi rh$

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

$= 660\ cm^2$

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

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

$= 44 (22)$

$= 968 cm^2$

iii) volume of cylinder $= \pi r^2 h$

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

$= 2310 \ cm^3$

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7. Given

diameter of base of cylinder $(d) = 42 cm$

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

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

$= \frac{22}{\cancel{7}} \times \overset{3}{\cancel{21}} \times 21 \times 10$

$= 13860 cm^3$

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8. Given

diameter of base $= 7 cm$

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

height of cylinder $(h) = 60 cm$

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

$= \frac{22}{\cancel{7}} \times \overset{0.5}{\cancel{3.5}} \times 3.5 \times 60$

$= 2310\ cm^3$

we have 1 litre $= 1000 cm^3$

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

$= 2.31$ litres.

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9. Given a rectangular strip 25cm x 7cm is rotated about longer side

$\therefore$ radius of base $= 7cm$

height of cylinder $= 25cm$

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

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

$= 3850 cm^3$

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10. A rectangular sheet of dimensions 44cm x 20cm is rolled along its length

$\Rightarrow$ radius of base $= \frac{\text{Length}}{2\pi}$ $[2\pi r = L]$

$= \frac{44}{2 \times \frac{22}{7}}$

$= 7cm$

height of cylinder $(h) = 20$ cm

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

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

$= 8080\ cm^3$.

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11. Given volume of cylinder $= 1650\ cm^3$

curved surface area $= 660\ cm^3$

$\frac{\text{volume}}{\text{surface area}} = \frac{\cancel{1650}}{\cancel{660}} = \frac{5}{2}$

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

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

$\Rightarrow r = 5$ cm

we have surface area $= 660$

$2 \pi r h = 660$

$\cancel{2} \times \frac{\cancel{22}}{7} \times \cancel{5} \times h = \cancel{660}$

$h = 21$ cm

$\therefore$ radius $= 5$ cm, height $= 21$ cm

12. Given

radii of two cylinders are in ratio 2:3

Let r_1 be radius 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

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

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

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

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

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

$= \frac{20}{27}$

$\therefore$ ratio of their volumes = 20:27

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13. Given ratio b/w curved surface area &

total surface area = 1 : 2

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

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

$\Rightarrow h+r = 2h$

$\Rightarrow h = r$

Also Given Total surface area = $616 cm^2$

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

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

$= \cancel{4}\pi r^2 = \cancel{616}\ 154$

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

$\Rightarrow r^2 = 49$

$\Rightarrow r = 7 cm.$

$\therefore h = 7 cm$

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

$= \dfrac{22}{\cancel{7}} \times \cancel{7} \times 7 \times 7$

$= 1078 cm^3$

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19. Given

curved surface area = $1320 cm^2$

diameter of base(d) = 21 cm

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

we have

Curved surface area = $2\pi r h$

$\Rightarrow 2\pi r h = 1320$

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

$\Rightarrow h = 20$ cm

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

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

$= 6930$ cm^3

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15 Given

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

volume = 1617 cm^3

$\pi r^2 h = 1617$

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

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

$r = 7$ cm

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

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

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

$$= 2 \times \frac{22}{\cancel{7}} \times \cancel{7}(7+10.5)$$

$$= 44(17.5)$$

$$= 770\,cm^2$$

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16 Given curved surface area $= 264\,m^2$

volume $= 924\,m^3$

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

$$\frac{\cancel{\pi} r^{\cancel{2}} \cancel{h}}{2\cancel{\pi} \cancel{r} \cancel{h}} = \frac{\cancel{924}^{\cancel{231}\,21}}{\cancel{264}_{\cancel{66}\,3}}$$

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

$\therefore$ radius $= 7m$

diameter $= 2 \times$ radius $= 2 \times 7$

$= \underline{14\,m}$

we have curved surface area $= 264\,m^2$

$$2\pi rh = 264$$

$$\cancel{2} \times \frac{\cancel{22}}{\cancel{7}} \times \cancel{7} \times h = \cancel{264}^{\cancel{132}\,6}$$

$$h = 6\,m$$

$\therefore$ height of cylinder $= 6m$

17. Given

volume of two cylinders are same

heights of two cylinders in the ratio 1 : 2

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

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

$\Rightarrow \cancel{\pi} r_1^2 h_1 = \cancel{\pi} r_2^2 h_2$

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

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

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

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

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

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16. Given

height of the cylinder = 10.5m

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

where A is circular area of base

C.S.A is curved surface area

3.(2A) = 2 CSA

$\Rightarrow \cancel{6}^{3} \pi r^2 = 2(2\cancel{\pi}\cancel{r} h)$

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

$= \left(\frac{10.5}{3}\right).2$

$= 3.5\,m \times 2 = 7\,m$

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

$= \frac{22}{\cancel{7}} \times \cancel{3.5}^{0.5} \times 3.5 \times 10.5$

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

$= 1617\,m^3$

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19. Given

height of cylinder $= 21m$

diameter of cylinder $= 6m$

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

$\therefore$ volume to be dug out

$= \pi r^2 h$

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

$= 594\,m^3$

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20. Given

Circumference $= 176\,cm$

$\Rightarrow \; 2\pi r = 176$ ['r' is radius]

$\Rightarrow \; \cancel{2}^{1} \times \frac{\cancel{22}^{1}}{7} \times r = \cancel{176}\;\cancel{88}\;4$

$\Rightarrow r = 28\,cm$

length of trunk = 3m = 300cm

∴ volume of timber = $\pi r^2 h$

$= \frac{22}{\cancel{7}} \times \cancel{28}^{4} \times 28 \times 300$

$= 7392 \ cm^3$

$= 0.7392 \ m^3$

$= 0.74 \ m^3$

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21 Given

depth of well (h) = 20 m

diameter of base (d) = 7m

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

volume $= \pi . r^2 h$

$= \frac{\cancel{22}^{11}}{\cancel{7}} \times \frac{7}{\cancel{2}_{1}} \times \frac{7}{\cancel{7}} \times \cancel{20}^{10}$

$= 770 \ m^3$

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

∴ Area = 22 × 14

$= 308 \ m^3$

∴ volume of dug out material

= Area × h

$770 = 308 \times h$

$\Rightarrow h = \dfrac{\cancel{770}^{\cancel{385}^{55}}}{\cancel{308}_{\cancel{154}_{22}}}$

$= 2.5\ m$

22 Given

diameter of well $(d) = 14m$

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

depth of well $(h) = 8m$.

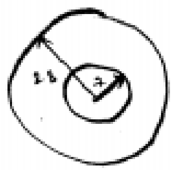
$\therefore$ volume $= \pi r^2 h$

$= \frac{22}{\cancel{7}} \times \cancel{7} \times 7 \times 8$

$= 1232\ m^3$

It is spread out on width of 21m

Area $\times h = 1232$



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

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

$\Rightarrow h = \dfrac{\cancel{1232}^{\cancel{176}^{56}} \times \cancel{7}^{1}}{\cancel{735}_{105} \times \cancel{22}} = \frac{56}{12} = 0.533$

$h = 53.3\ cm$

$\therefore$ Height of embankment $= 53.3cm$

23 Given

diameter of base $= 56cm$

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

Case II

if it is rolled along its breadth

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

$\rightarrow \quad r_2 = \frac{18}{2\pi}$

height = 30 cm

$\therefore \frac{(\text{Volume})_1}{(\text{volume})_2} = \frac{\pi r_1^2 h_1}{\pi r_2^2 h_2}$

$= \frac{\cancel{\pi}\left(\frac{30}{2\pi}\right)^2 18}{\cancel{\pi}\left(\frac{18}{2\pi}\right)^2 30}$

$= \left(\frac{30}{18}\right)^2 \cdot \frac{18}{30}$

$= \frac{30}{18}$

$= \frac{5}{3}$

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

---

25. rains falls on a roof of 18m x 16.5m.

it rains 10 cm a day (h')

diameter of cylinder = 8m

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

Let 'h' be rise in Level of tank

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

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

$\Rightarrow h = \frac{\cancel{18}^{9} \times \cancel{16.5}^{1.5} \times \cancel{0.1}^{0.05} \times \cancel{7}^{3.5}}{\cancel{22} \times 4 \times \cancel{4} \times \cancel{2}}$

$= 0.5906 m$

$= 59.06 cm$

---

26. Case I

diameter of cylinder = 1cm

Length = 5 cm

Case II

diameter = 1 mm = 0.1 cm

length = ?

volumes are equal

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

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

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

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

$\therefore$ Length of wire so formed $= 500\,cm$

$= 5\,m$

---

27 Given

diameter of wire $= 4\,mm = 0.4\,cm$.

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

Let 'l' be length of copper wire

Given mass of copper wire $= 13.2\,kg$

and 1 cubic cm of copper weighs $8.4\,gm$

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

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

$\Rightarrow \frac{\cancel{22}}{28}(0.4 \times 0.4) \times l \times \cancel{8.4}^{0.7} = \cancel{13200}^{\cancel{600}^{50}}$

$l = \frac{50 \times \cancel{28}^{\cancel{40}^{\cancel{100}^{250}}}}{\cancel{0.4 \times 0.4 \times 0.7}}$

$= 12500\,cm$

$= 125\,m$

$\therefore$ Length of wire $= 125\,m$

---

28 Given

volume of brass $= 2.2\,dm^3$

diameter of wire $(d) = 0.25\,cm$

$= 0.25 \times 10^{-2}\,m$

volume $= \pi r^2 L$

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

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

$\overset{0.1}{\cancel{2.2}} \times 10^{-3} = \frac{\cancel{22}}{28}\,(0.25)^2\,10^{-4} \cdot L$

$L = \frac{28}{(0.25)^2}$

$= 448\,m$

$\therefore$ length of wire $= 448\,m$

---

29. Diff betweene inside and outside

surface $= 88\,cm^2$

height $(h) = 14\,cm$

$\Rightarrow \quad 2\pi(R-r)\,h = 88 \rightarrow (1)$ [R is outer radius, r is inner radius]

volume $= 176\,cm^3$

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

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

$\frac{2\cancel{\pi}(\cancel{R-r})\cancel{h}}{\cancel{\pi}(R+r)(\cancel{R-r})\cancel{h}} = \frac{\cancel{88}\,1}{\cancel{176}\,2}$ [$a^2 - b^2 = (a+b)(a-b)$]

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

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

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

$\pi (R+r)(R-r)h = 176$

$\frac{22}{7} \times 4 (R-r) \times 14 = 176$

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

solving (3) & (4)

(3) + (4)

$2R = 5$

$R = 2.5 cm$

sub $R = 2.5$ in (3)

$\Rightarrow r = 4 - 2.5 = 1.5 cm$

$\therefore$ outer radius = 2.5 cm

Inner radius = 1.5 cm

---

30 Pipe

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

height = 6m / second = 600cm/second

cylinder

radius of base = 60cm

Let rise be h_c

$\Rightarrow \cancel{\pi} r_p^2 h_p = \cancel{\pi} r_c^2 h_c$ [subbix p- pipe c- cylindr]

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

$\Rightarrow h_c = \frac{\overset{10}{\cancel{600}}}{60 \times \cancel{60}} = \frac{1}{6}$ cm per sec

for 30 minutes

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

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

$= 300$ cm

$= 3$ m

---

31) inner diameter of tube = 10.4 cm

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

thickness of metal = 8mm = 0.8 cm

$R = r + t$

$= 5.2 + 0.8$

$= 6$ cm

length = 25cm

$\therefore$ volume of metal $= \pi(R^2 - r^2)L$

$= \frac{22}{7}(6^2 - 5.2^2)(25)$

$= 704\ cm^3$

32 Given

inner radius of pipe / tap $= 0.75cm$

flow rate $(L) = 7\ m/sec = 700\ cm/sec$

$\therefore$ volume of water per sec

$= \pi r^2 L$

$= \frac{22}{\cancel{7}} \times (0.75)^2 \times \cancel{700}^{100}$

$= \cancel{1650}\ cm^3$ $1237.5\ cm^3$

volume of water delivered by pipe in hour

$= \cancel{1650}^{1237.5} \times 3600\ cm^3$

$= \frac{\cancel{1650}^{1237.5 \times 0.75} \times 36\cancel{00}}{1\cancel{000}}$ Litres

$= 4455$ litres

33 . ~~Cylinder~~ Cylinder

diameter $(d) = 1.4\ m$

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

height $(h) = 2.1 m$

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

$$= \frac{22}{7} \times \overset{0.1}{\cancel{0.7}} \times 0.7 \times 2.1 \ m^3$$

Pipe

diameter (d) = 3.5 cm

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

$$\text{flow rate } (L) = 2m/\text{sec}$$

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

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

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

$$= \frac{\cancel{\frac{22}{7}} \times \overset{1}{\cancel{0.7}} \times \overset{1}{\cancel{0.7}} \times 2.1}{\cancel{\frac{22}{7}} \times \frac{\overset{5}{\cancel{3.5}}}{2} \times 10^{-2} \times \frac{\overset{5}{\cancel{3.5}}}{\cancel{2}} \times 10^{-2} \times \cancel{2}}$$

$$= \frac{2 \cdot \overset{4}{\cancel{10^2}} \cdot 10^2 \cdot 2.1}{\cancel{25}}$$

= 1680 seconds

= 28 minutes

34 A rectangular paper of 30 cm × 18 cm can be rolled in two ways,

Case I

along length

$\Rightarrow 2\pi r_1 = 30$

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

height $(h_1) = 18$ cm

Case II

along breadth

$\Rightarrow 2\pi r_2 = 18$

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

height $(h_2) = 30$ cm

$$\frac{(\text{volume})_1}{(\text{volume})_2} = \frac{\pi r_1^2 h_1}{\pi r_2^2 h_2} = \left(\frac{r_1}{r_2}\right)^2 \left(\frac{h_1}{h_2}\right)$$

$$= \left(\frac{\frac{30}{\cancel{2\pi}}}{\frac{18}{\cancel{2\pi}}}\right)^2 \left(\frac{18}{30}\right)$$

$$= \frac{30}{18}$$

$$= \frac{5}{3}$$

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

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

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

volume = Area $\times$ length

$= (\text{Area} \times t) \times \frac{\text{length}}{t}$ [Divide & multiply t]

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

$= 9000$ cm^3

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

$= 9$ litres

36 Given

Total surface area of cylinder = 231 cm^2

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

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

$3h = 2h + 2r$

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

we have total surface area = 231

$2\pi r(h+r) = 231$

$2 \times \frac{22}{7} r(2r+r) = 231$

$3r^2 = \frac{21 \times 7}{4}$

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

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

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

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

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

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

$= \frac{22}{\cancel{7}} \times 3.5 \times 3.5 \times \cancel{7}$

$= 269.5cm^3$

---

37 Given

diameter of tube $= \cancel{280}\ 3\,m$

radius of tube $= \frac{\text{diameter}}{2} = \frac{\cancel{280}\ 3}{2}$

$= \cancel{140m}\ 1.5\,m$

depth (h) = 280 m

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

$= \frac{22}{\cancel{7}} \times 1.5 \times 1.5 \times \cancel{280}\ 40$

$= 1980m^3$

Cost of sinking $= 1980 \times 3.6$

$= Rs\ 7128$

Cost of cementing its inner curved surface

$= 2\pi rh \times 2.5$

$= 2 \times \frac{22}{\cancel{7}} \times 1.5 \times \cancel{280}\ 40 \times 2.5$

= Rs 600

38. Ref problem no. 27

39. Ref problem no 28.

40. Given

diameter of well = 10 m

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

$= 5\,m$

depth of well (d) = 8.4 m

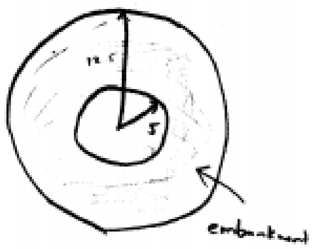
volume of well $= \pi r^2 d$

$= \frac{22}{\cancel{7}} \times 5 \times 5 \times \cancel{8.4}^{1.2}$

Area of embankment

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

$= 20625\pi$



$\therefore$ height of embankment

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

$= \frac{\cancel{22} \times \cancel{5} \times 5 \times 1.2}{\cancel{206.25}_{29.43} \times \frac{\cancel{22}}{\cancel{7}_{1}}}$

$= 1.6\,m$.

41. Given

width of roller (L) = 63 cm

girth = 440 cm

$\Rightarrow 2\pi R = 440$ cm [R is outer radius]

$\Rightarrow \cancel{2} \times \frac{22}{7} \times R = \overset{10}{\cancel{\overset{20}{\cancel{440}}}}$ cm

$\Rightarrow R = 70$ cm

thickness of roller = 4 cm

$\therefore$ inner radius (r) = R − 4

= 70 − 4

= 66 cm

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

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

$= \frac{22}{\cancel{7}} (544) \cancel{63}^{9}$

$= 107712 \text{ cm}^3$

42. Let

length of solid cylinder = L

diameter of cylinder = 2 cm

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

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

$= \pi \times 1 \times 1 \times L \rightarrow ①$

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

volume = $\pi \times (R^2 - r^2) \times L$

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

$\therefore$ ① = ②

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

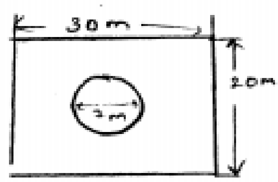
L = 79 cm

---

43 Given

diameter of well

(d) = 7m



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

depth (h) = 10 m

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

$= \frac{22}{7} \times 3.5 \times 3.5 \times 10 \ m^3$

Area of the spread out

$$= 30 \times 20 - \frac{\cancel{22}^{11}}{\cancel{7}} \times \frac{\cancel{7}}{\cancel{2}} \times \frac{7}{2}$$

$$= \frac{1123}{2} m^2$$

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

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

$$\frac{22 \times \cancel{35} \times 3.5 \times 10 \times \cancel{2}}{\cancel{7} \times 1123} = h$$

$$\Rightarrow h = \frac{22 \times 35}{1123}$$

$$= 0.6856 \, m$$

$h = 68.56$ cm

∴ Height of embankment = 68.56 cm

≈ 68.6 cm