
Exercise – 19.1

1. Curved surface area of a right circular cylinder is 4.4 m^2 . If the radius of the base of the cylinder is 0.7 m , find its height.

Sol:

Given that

Radius of base of the cylinder $r = 0.7 \text{ m}$

Curved surface area of cylinder $= 4.4 \text{ m}^2 = 2\pi rh$

Let h be the height of the cylinder

WKT,

$$2\pi rh = 4.4 \text{ m}^2$$

$$2 \times 3.14 \times 0.7 \times h = 4.4$$

$$(4.4)hm = 4.4 \text{ m}^2$$

$$h = 1 \text{ m}$$

\therefore The height of the cylinder $= 1 \text{ m}$.

2. In a hot water heating system, there is a cylindrical pipe of length 28 m and diameter 5 cm . Find the total radiating surface in the system.

Sol:

Given that

Height of cylinder = length of cylindrical pipe $= 28 \text{ m}$.

$$\text{Radius (r) of circular end of pipe} = \frac{5}{2} \text{ cm} = 2.5 \text{ cm}$$

$$= 0.025 \text{ m}.$$

Curved surface area of cylindrical pipe $= 2\pi rh$

$$= 2 \times 3.14 \times 0.025 \times 28 = 4.4 \text{ cm}$$

\therefore The area of radiation surface of the system is 4.4 m^2 or 44000 cm^2

3. A cylindrical pillar is 50 cm in diameter and 3.5 m in height. Find the cost of painting the curved surface of the pillar at the rate of 12.50 per m^2 .

Sol:

Given that

Height of the pillar $= 3.5 \text{ m}$

$$\text{Radius of the circular end of the pillar} = \frac{50}{2} \text{ cm}.$$

$$= 25 \text{ cm} = 0.25 \text{ m}$$

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

$$= 2 \times \frac{22}{7} \times 0.25 \times 3.5 m^2$$

$$= 5.5 m^2$$

Cost of painting $1 m^2$ area – Rs. 12.50

Cost of painting $5.5 m^2$ area = Rs. (5.5×12.50)

= Rs. 68.75.

Thus, the cost of painting the CSA pillar is Rs. 68.75

4. It is required to make a closed cylindrical tank of height 1 m and base diameter 140 cm from a metal sheet. How many square meters of the sheet are required for the same?

Sol:

Height of the cylindrical tank (h) = 1m.

Base radius of cylindrical tank (r) = $\frac{140}{2} m = 70 cm$

$$= 0.7 m$$

Area of sheet required – total surface area of tank = $2\pi(r + h)$

$$= 2 \times 3.14 \times 0.7(0.7 + 1) m^2$$

$$= 4.4 \times 1.7 m^2$$

$$= 7.48 m^2$$

\therefore So, it will required $7.48 m^2$ of metal sheet.

5. A solid cylinder has total surface area of 462 cm^2 . Its curved surface area is one-third of its total surface area. Find the radius and height of the cylinder.

Sol:

We have

$$\text{Curved surface area} = \frac{1}{3} \times \text{total surface area}$$

$$\Rightarrow 2\pi rh = \frac{1}{3}(2\pi rh + 2\pi r^2)$$

$$\Rightarrow 6\pi rh = 2\pi rh + 2\pi r^2$$

$$\Rightarrow 4\pi rh = 2\pi r^2$$

$$\Rightarrow 2h = r$$

We know that,

$$\text{Total surface area} = 462$$

$$\Rightarrow \text{Curved surface Area} = \frac{1}{3} \times 462$$

$$\Rightarrow 2\pi rh = 154$$

$$\Rightarrow 2 \times 3 \cdot 14 \times 2h^2 = 154$$

$$\Rightarrow h^2 = \frac{154 \times 7}{2 \times 22 \times 2}$$

$$= \frac{49}{4}$$

$$\Rightarrow h = \frac{7}{2} \text{ cm}$$

$$\Rightarrow r = 2h$$

$$\Rightarrow r = 2 \times \frac{7}{2} \text{ cm}$$

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

6. The total surface area of a hollow cylinder which is open from both sides is 4620 sq. cm, area of base ring is 115.5 sq. cm and height 7 cm. Find the thickness of the cylinder.

Sol:

Let the inner radii of hollow cylinder $\Rightarrow r \text{ cm}$

Outer radii of hollow cylinder $\Rightarrow R \text{ cm}$

Then,

$$2\pi rh + 2\pi Rh + 2\pi R^2 - 2\pi r^2 = 4620 \rightarrow (1)$$

$$\pi R^2 - \pi r^2 = 115.5 \rightarrow (2)$$

$$\Rightarrow 2\pi h(R+r) + 2(\pi R^2 - \pi r^2) = 4620 \text{ and } \pi R^2 - \pi r^2 = 115.5$$

$$\Rightarrow 2\pi h(R+r) + 231 = 4620 \text{ and } \pi(R^2 - r^2) = 115.5$$

$$\Rightarrow 2\pi \times 7(r+R) = 4389 \text{ and } \pi(R^2 - r^2) = 115.5$$

$$\Rightarrow \pi(R+r) = 313.5 \text{ and } \pi(R+r)(R-r) = 115.5$$

$$\Rightarrow \frac{\pi(R+r)(R-r)}{\pi(R+r)} = \frac{115.5}{313.5}$$

$$\Rightarrow R-r = \frac{7}{19} \text{ cm.}$$

7. Find the ratio between the total surface area of a cylinder to its curved surface area, given that its height and radius are 7.5 cm and 3.5 cm.

Sol:

For cylinder, total surface Area = $2\pi r(h+r)$

Curved surface area = $2\pi rh$

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

$$\therefore \frac{\text{Total surface area}}{\text{curved surface area}} = \frac{7 \cdot 5 + 3 \cdot 5}{7 \cdot 5} = \frac{11}{7 \cdot 5}$$

$$= \frac{11 \times 10}{7 \cdot 5} = \frac{22}{15} = 22:15.$$

8. The total surface area of a hollow metal cylinder, open at both ends of external radius 8 cm and height 10 cm is $338\pi \text{ cm}^2$. Taking r to be inner radius, obtain an equation in r and use it to obtain the thickness of the metal in the cylinder.

Sol:

Given that,

External radius (R) = 8cm

Height (h) = 10cm

The total surface area of a hollow metal cylinder = $338\pi \text{ cm}^2$

We know that

$$2\pi Rh + 2\pi rh + 2\pi R^2 - 2\pi r^2 = 338\pi.$$

$$\Rightarrow h(R+r) + (R+r)(R-r) = 169$$

$$\Rightarrow 10(8+r) + (8+r)(8-r) = 169$$

$$\Rightarrow 80 + 10r + 64 - r^2 = 169$$

$$\Rightarrow x^2 - 10r + 25 = 0$$

$$\Rightarrow r = 5$$

$$\therefore R - r = 8 - 5\text{cm} = 3\text{cm}$$

9. A cylindrical vessel, without lid, has to be tin-coated on its both sides. If the radius of the base is 70 cm and its height is 1.4 m, calculate the cost of tin-coating at the rate of Rs. 3.50 per 1000 cm^2 .

Sol:

Given that

$r = 70\text{cm}$, $h = 1.4\text{m} = 140\text{cm}$

$$\therefore \text{Area to be tin coated} = 2(2\pi rh + \pi r^2) = 2\pi r(2h + r)$$

$$= 2 \times \frac{22}{7} \times 70(280 + 70)$$

$$= 154000 \text{ cm}^2$$

$$\text{Required cost} = \frac{154000 \times 3.50}{1000} = \text{Rs. } 539.$$

10. The inner diameter of a circular well is 3.5 m. It is 10 m deep Find:

- (i) inner curved surface area.
- (ii) the cost of plastering this curved surface at the rate of Rs. 40 per m^2 .

Sol:

Inner radius (r) of circular well = $1.75m$

Depth (n) of circular well = $10m$

- (i) Inner curved surface area = $2\pi rh$

$$= 2 \times \frac{22}{7} \times 1.75 \times 10 m^2$$

$$= (144 \times 0.25 \times 10) m^2$$

$$= 110 m^2$$

- (ii) Cost of plastering $1m^2$ area = Rs. 40.

$$\text{Cost of plastering } 110m^2 \text{ area} = \text{Rs.}(110 \times 40)$$

$$= \text{Rs. } 4400$$

11. Find the lateral curved surface area of a cylindrical petrol storage tank that is 4.2 m in diameter and 4.5 m high. How much steel was actually used, if $\frac{1}{12}$ of steel actually used was wasted in making the closed tank?

Sol:

Height (h) cylindrical tank = $4.5m$

Radius (r) of circular end of cylindrical tank = $\frac{4.2}{2} m = 2.1m$.

- (i) Lateral or curved surface area of tank = $2\pi rh$

$$\Rightarrow 2 \times 3.14 \times 2.1 \times 4.5 m^2$$

$$= 59.4 m^2$$

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

$$= 2 \left[\frac{22}{7} \right] \times 2.1 (2.1 + 4.5) m^2$$

$$= 87.12 m^2$$

Let $A m^2$ steel sheet be actually used in making the tank

$$\therefore A \left(1 - \frac{1}{12} \right) = 87.12 m^2$$

$$\Rightarrow A = \left(\frac{12}{11} \times 87.12 \right) m^2$$

$$\Rightarrow A = 95.04 m^2$$

Thus, $95.04 m^2$ steel was used in actual while making the tank.

12. The students of a Vidyalaya were asked to participate in a competition for making and decorating pen holders in the shape of a cylinder with a base, using cardboard. Each pen holder was to be of radius 3 cm and height 10.5 cm. The Vidyalaya was to supply the competitors with cardboard. If there were 35 competitors, how much cardboard was required to be bought for the competition?

Sol:

Radius of circular end of cylinder pen holder = 3cm

Height of pen holder = 10.5cm

Surface area of 1 pen holder = CSA of penholder + Area of base of SA of 1 penholder =

$$2\pi rh + \pi r^2$$

$$= 2 \times 3.14 \times 3 \times 10.5 + 3.14138$$

$$= 132 \times 1.5 + \frac{198}{7} \text{ cm}^2$$

$$= 198 + \frac{198}{7} \text{ cm}^2$$

$$= \frac{1584}{7} \text{ cm}^2$$

$$\text{Area of cardboard sheet used by 1 competitor} = \frac{1584}{7} \text{ cm}^2$$

$$\text{Area of cardboard sheet used by 35 competitors} = \frac{1584}{7} \times 35 \text{ cm}^2 = 7920 \text{ cm}^2.$$

13. The diameter of roller 1.5 m long is 84 cm. If it takes 100 revolutions to level a playground, find the cost of levelling this ground at the rate of 50 paise per square metre.

Sol:

Given that,

Diameter of the roller = 84cm = 0.84m.

Length of the roller = 1.5m.

$$\text{Radius of the roller} = \frac{D}{2} = \frac{0.84}{2} = 0.42.$$

Area covered by the roller on one revolution = covered surface area of roller

$$\text{Curved surface of roller} = 2\pi rh = 2 \times \frac{22}{7} \times 0.42 \times 1.5$$

$$= 0.12 \times 22 \times 1.5 \text{ m}^2$$

Area of the playground = 100 × Area covered by roller in one revolution

$$= (100 \times 0.12 \times 22 \times 1.5) \text{ m}^2$$

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

Now,

$$\text{Cost of leveling } 1m^2 = 50P = \frac{50}{100} \Rightarrow \text{Rs} = \frac{1}{2} rs$$

$$\text{Cost of leveling } 396m^2 = \frac{1}{2} \times 396 = \text{Rs} \cdot 198$$

Hence, cost of leveling $396m^2$ is 198

- 14.** Twenty cylindrical pillars of the Parliament House are to be cleaned. If the diameter of each pillar is 0.50 m and height is 4 m. What will be the cost of cleaning them at the rate of Rs. 2.50 per square metre?

Sol:

$$\text{Diameter of each pillar} = 0.5m$$

$$\text{Radius of each pillar } (r) = \frac{0.5}{2} = 0.25m.$$

$$\text{Height of each pillar} = 4m.$$

$$\text{Curved surface area of each pillar} = 2\pi rh$$

$$= 2 \times 3.14 \times 0.25 \times 4m^2$$

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

$$\text{Curved surface area of 20 pillars} = 20 \times \frac{44}{7} m^2$$

$$\text{Given, cost of cleaning} = \text{Rs. } 2.50 \text{ per square meter}$$

$$\therefore \text{Cost of cleaning 20 pillars} = \text{Rs. } 2.50 \times 20 \times \frac{44}{7}$$

$$= \text{Rs. } 314.28.$$