

EXERCISE 22.1

Find the curved surface area and total surface area of a cylinder, the diameter of whose base is 7 cm and height is 60 cm.

Solution:

We have,

Diameter of cylinder = 7 cm

So, Radius of cylinder = $7/2$ cm

Height of cylinder = 60 cm

By using the formula,

$$\begin{aligned}\text{Curved surface area of cylinder} &= 2\pi rh \\ &= 2 \times \frac{22}{7} \times \frac{7}{2} \times 60 \\ &= 1320 \text{ cm}^2\end{aligned}$$

$$\begin{aligned}\text{Total surface area of cylinder} &= 2\pi r(h+r) \\ &= 2 \times \frac{22}{7} \times \frac{7}{2} (60 + \frac{7}{2}) \\ &= 22 (127/2) \\ &= 1397 \text{ cm}^2\end{aligned}$$

1. The curved surface area of a cylindrical road is 132 cm^2 . Find its length if the radius is 0.35 cm .

Solution:

We have,

Curved surface area of cylindrical road = 132 cm^2

Radius of road = 0.35 cm

Let length of road be 'h' cm

By using the formula,

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

So, $2\pi rh = 132$

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

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

$$= \frac{924}{15.4}$$

$$= 60 \text{ cm}$$

\therefore Length of road is 60 cm.

2. The area of the base of a right circular cylinder is 616 cm^2 and its height is 2.5 cm . Find the curved surface area of the cylinder.

Solution:

We have,

Area of base of right circular cylinder = 616 cm^2

Height of cylinder = 2.5 cm

Let the radius of cylinder be 'r' cm

By using the formula,

Area of base of right circular cylinder = πr^2

So, $\pi r^2 = 616$

$22/7 r^2 = 616$

$r^2 = 616 \times 7 / 22$

$= 196$

$r = \sqrt{196}$

$= 14 \text{ cm}$

\therefore Curved surface area of cylinder = $2\pi rh$

$$= 2 \times 22/7 \times 14 \times 2.5$$

$$= 1540/7$$

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

3. The circumference of the base of a cylinder is 88 cm and its height is 15 cm. Find its curved surface area and total surface area.

Solution:

We have,

Circumference of base of cylinder = 88 cm

Height of cylinder = 15 cm

By using the formula,

Circumference of base of cylinder = $2\pi r$

So,

$$2\pi r = 88$$

$$2 \times 22/7 \times r = 88$$

$$r = 88 \times 7 / 44$$

$$= 616/44$$

$$= 14 \text{ cm}$$

Radius of cylinder = 14 cm

\therefore Curved surface area of cylinder = $2\pi rh$

$$= 2 \times 22/7 \times 14 \times 15$$

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

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

$$= 2 \times 22/7 \times 14 (15 + 14)$$

$$= 2 \times 22/7 \times 14 \times 29$$

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

4. A rectangular strip $25\text{ cm} \times 7\text{ cm}$ is rotated about the longer side. Find the total surface area of the solid thus generated.

Solution:

We have,

Dimension of rectangular strip = $25\text{ cm} \times 7\text{ cm}$

When this strip is rotated about its longer side,

Height of cylinder becomes = 25 cm

Radius = 7 cm

$$\begin{aligned}\therefore \text{Total surface area of cylinder} &= 2\pi r (h+r) \\ &= 2 \times \frac{22}{7} \times 7 (25 + 7) \\ &= 2 \times \frac{22}{7} \times 7 \times 32 \\ &= 1408\text{ cm}^2\end{aligned}$$

5. A rectangular sheet of paper, $44\text{ cm} \times 20\text{ cm}$, is rolled along its length to form a cylinder. Find the total surface area of the cylinder thus generated.

Solution:

We have,

Dimensions of rectangular sheet of paper = $44\text{ cm} \times 20\text{ cm}$

When this sheet of paper is rolled along its length,

Circumference of base becomes = 44 cm

By using the formula,

Circumference of base = $2\pi r$

$$\text{So, } 2\pi r = 44$$

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

$$r = \frac{44 \times 7}{44}$$

$$= 7\text{ cm}$$

Radius = 7 cm

Height = 20 cm

$$\begin{aligned}\therefore \text{Total surface area of cylinder} &= 2\pi r (h+r) \\ &= 2 \times \frac{22}{7} \times 7 (20 + 7) \\ &= 2 \times \frac{22}{7} \times 7 \times 27 \\ &= 1188\text{ cm}^2\end{aligned}$$

6. The radii of two cylinders are in the ratio 2:3 and their heights are in the ratio 5:3. Calculate the ratio of their curved surface areas.

Solution:

We have,

Ratio of radius of two cylinder, $r_1:r_2 = 2:3$

Ratio of their heights, $h_1:h_2 = 5:3$

$$r_1/r_2 = 2/3$$

$$h_1/h_2 = 5/3$$

so,

$$\begin{aligned} \text{Curved surface area of cylinder}_1 / \text{curved surface area of cylinder}_2 &= 2\pi r_1 h_1 / 2\pi r_2 h_2 \\ &= (2 \times 22/7 \times 2 \times 5) / (2 \times 22/7 \times 3 \times 3) \\ &= 10/9 \end{aligned}$$

\therefore Ratio of their curved surface area is 10:9

7. The ratio between the curved surface area and the total surface area of a right circular cylinder is 1:2. Prove that its height and radius are equal.

Solution:

We have,

Let radius of cylinder be 'r'

Let height of cylinder be 'h'

Curved surface area of cylinder / total surface area of cylinder = 1/2

$$2\pi r h / 2\pi r (h+r) = 1/2$$

$$h/(h+r) = 1/2$$

$$2h = h+r$$

$$2h - h = r$$

$$h = r$$

Height = Radius

Hence proved.

8. The curved surface area of a cylinder is 1320 cm² and its base has diameter 21 cm. Find the height of the cylinder.

Solution:

We have,

Diameter of base = 21 cm

Radius of cylinder = 21/2 cm

Let height of cylinder be 'h' cm

Curved surface area of cylinder = 1320 cm²

By using the formula,

Curved surface area of cylinder = $2\pi r h$

So,

$$2\pi r h = 1320$$

$$2 \times 22/7 \times 21/2 \times h = 1320$$

$$66h = 1320$$

$$h = 1320/66 = 20\text{cm}$$

∴ Height of cylinder is 20cm.

9. The height of a right circular cylinder is 10.5 cm. If three times the sum of the areas of its two circular faces is twice the area of the curved surface area. Find the radius of its base.

Solution:

We have,

Height of cylinder = 10.5 cm

Let radius of cylinder be 'r' cm

So,

Area of two bases of cylinder = $2\pi r^2$

Area of curved surface of cylinder = $2\pi rh$

Now,

$$3(2\pi r^2) = 2(2\pi rh)$$

$$6\pi r^2 = 4\pi rh$$

$$\pi r^2 / \pi r = 4/6 h$$

$$r = 2/3 h$$

$$= 2 \times 10.5 / 3$$

$$= 7\text{cm}$$

∴ Radius of base of cylinder is 7cm.

10. Find the cost of plastering the inner surface of a well at Rs 9.50 per m², if it is 21 m deep and diameter of its top is 6 m.

Solution:

We have,

Height of cylinder = 21m

Diameter of cylinder = 6m

Radius of cylinder = $6/2 = 3\text{m}$

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

$$= 2 \times 22/7 \times 3 \times 21$$

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

∴ Cost of plastering the inner surface at the rate of Rs 9.50 per m² = $396 \times 9.50 = \text{Rs } 3762$

11. A cylindrical vessel open at the top has diameter 20 cm and height 14 cm. Find the cost of tin-plating it on the inside at the rate of 50 paise per hundred square centimetre.

Solution:

We have,

Diameter of base of cylinder = 20 cm

Radius of cylinder = $20/2 = 10\text{cm}$

Height of cylinder = 14 cm

$$\begin{aligned}\text{Total surface area of cylinder} &= 2\pi rh + \pi r^2 \\ &= (2 \times 22/7 \times 10 \times 14) + (22/7 \times 10^2) \\ &= 880 + 2200/7 \\ &= (6160+2200)/7 \\ &= 8360/7 \text{ cm}^2\end{aligned}$$

We know that cost per $100\text{cm}^2 = 50\text{paise}$

So, cost per $1\text{cm}^2 = \text{Rs } 0.005$

$$\begin{aligned}\therefore \text{Cost of tin painting the area inside the vessel} &= 8360/7 \times 0.005 \\ &= \text{Rs } 5.97\end{aligned}$$

12. The inner diameter of a circular well is 3.5 m. It is 10 m deep. Find the cost of plastering its inner curved surface at Rs. 4 per square metre.

Solution:

We have,

Inner diameter of circular well = 3.5 m

Radius of well = $3.5/2 \text{ m}$

Height of well = 10 m

So,

$$\begin{aligned}\text{Curved surface area of well} &= 2\pi rh \\ &= 2 \times 22/7 \times 3.5/2 \times 10 \\ &= 110 \text{ m}^2\end{aligned}$$

We know, Cost of plastering $1\text{m}^2 = \text{Rs } 4$

$$\therefore \text{Cost of plastering its inner curved surface of area } 110\text{m}^2 = 110 \times 4 = \text{Rs } 440$$

13. The diameter of a roller is 84 cm and its length is 120 cm. It takes 500 complete revolutions moving once over to level a playground. What is the area of the playground?

Solution:

We have,

Diameter of roller = 84 cm

Radius of roller = $84/2 = 42\text{cm}$

Length of roller = 120 cm

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

It takes 500 complete revolutions to level the playground.

$$\begin{aligned}\therefore \text{Area of playground} &= 500 \times 31680 \\ &= 15840000 \text{ cm}^2 \\ &= 1584 \text{ m}^2\end{aligned}$$

14. Twenty one 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?

Solution:

We have,

Number of pillars = 21

Diameter of pillar = 0.50 m

Radius of pillar = $0.50/2 = 0.25\text{m}$

Height of pillar = 4 m

Rate of cleaning = Rs 2.5 per m^2

$$\begin{aligned}\text{Curved surface area of pillar} &= 2\pi rh \\ &= 2 \times \frac{22}{7} \times 0.25 \times 4 \\ &= \frac{44}{7} \text{ m}^2\end{aligned}$$

Curved surface area of 21 pillars = $21 \times \frac{44}{7} = 132\text{m}^2$

$$\therefore \text{Cost of cleaning the pillars at the rate of R 2.50 per m}^2 = 2.50 \times 132 = \text{Rs } 330$$

15. 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.

Solution:

We have,

Total surface area of hollow cylinder = 4620 cm^2

Area of base ring = 115.5 cm^2

Height of cylinder = 7 cm

Let outer radius be 'R' cm , inner radius be 'r' cm

$$\begin{aligned}\text{Area of hollow cylinder} &= 2\pi(R^2 - r^2) + 2\pi Rh + 2\pi rh \\ &= 2\pi(R+r)(R-r) + 2\pi h(R+r) \\ &= 2\pi(R+r) (h+R-r)\end{aligned}$$

$$\begin{aligned}\text{Area of base} &= \pi R^2 - \pi r^2 \\ &= \pi (R^2 - r^2) \\ &= \pi (R+r) (R-r)\end{aligned}$$

$$\text{Surface area / area of base} = 4620/115.5$$

$$\{2\pi(R+r)(h+R-r)\} / \{\pi(R+r)(R-r)\} = 4620/115.5$$

$$2(h+R-r) / (R-r) = 4620/115.5$$

Let us consider $(R-r) = t$

$$2(h+t)/t = 40$$

$$2h + 2t = 40t$$

$$2h = 38t$$

$$2(7) = 38t$$

$$14 = 38t$$

$$t = 14/38$$

$$= 7/19 \text{ cm}$$

\therefore Thickness of cylinder is $7/19$ cm

16. The sum of the radius of the base and height of a solid cylinder is 37 m. If the total surface area of the solid cylinder is 1628 m^2 , find the circumference of its base.

Solution:

We have,

Sum of base radius and height of cylinder = 37m

$$(r + h) = 37\text{m}$$

$$\text{Total surface area} = 1628 \text{ m}^2$$

By using the formula,

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

So,

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

$$2 \times 22/7 \times r(37) = 1628$$

$$r = 1628 \times 7 / 2 \times 22 \times 37$$

$$= 11396 / 1628$$

$$= 7\text{m}$$

\therefore Circumference of its base = $2\pi r$

$$= 2 \times 22/7 \times 7$$

$$= 44\text{m}$$

17. 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.

Solution:

We have,

Radius of cylinder = 3.5 cm

Height of cylinder = 7.5 cm

By using the formulas,

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

Curved surface area = $2\pi rh$

So, from the question,

$$\begin{aligned}\text{Total surface area} / \text{Curved surface area} &= 2\pi r (h+r) / 2\pi rh \\ &= (h+r)/h \\ &= (3.5+7.5)/7.5 \\ &= 11/7.5 \\ &= 110/75 \\ &= 22/15\end{aligned}$$

\therefore Ratio between the two areas is 22:15

18. 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 cm².

Solution:

We have,

Radius of base = 70 cm

Height of base = 1.4 m = 140 cm

Rate of tin plating = Rs 3.50 per cm²

So,

Total surface area of vessel = Area of outer side of base + Area of inner and outer curved surface

$$\begin{aligned}&= 2 (\pi r^2 + 2 \pi rh) \\ &= 2\pi r (r + 2h) \\ &= 2 \times 22/7 \times 70 (70 + 2(140)) \\ &= 2 \times 22/7 \times 70 (350) \\ &= 154000 \text{ cm}^2\end{aligned}$$

\therefore Cost of tin coating at the rate of Rs 3.50 per 1000 cm² = $3.50/1000 \times 154000$
= Rs 539