Surface Area And Volume

Practice set 16.1

Q. 1. Find the volume of a box if its length, breadth, and height are 20 cm, 10.5 cm and 8 cm respectively.

Answer : Given:

Length = 20 cm

Breadth = 10.5 cm

Height = 8 cm

The box is nothing but a cuboid

Volume of cuboid = l × b × h

= 20 × 10.5 × 8

= 1680 cm^3

∴The volume of the box is 1680 cm^3

Q. 2. A cuboid shape soap bar has volume 150 cc. Find its thickness if its length is 10 cm and breadth is 5 cm.

Answer : Given:

Volume of soap bar = 150 cc

Length = 10 cm

Breadth = 5 cm

Height = ?

The volume of cuboid = l × b × h

150 = 10 × 5 × h

$$h = \frac{150}{10 \times 5}$$

$$h = \frac{150}{50}$$

h = 3 cm

The height of soap bar is 3 cm

Q. 3. How many bricks of length 25 cm, breadth 15 cm, and height 10 cm are required to build a wall of length 6 m, height 2.5 m, and breadth 0.5 m?

Answer : Given:

For one brick,

Length = 25 cm, breadth = 15 cm, height = 10 cm

For wall,

Length = 6 m = 6 × 100 cm = 600 cm

Breadth = 0.5 m = 0.5 × 100 = 50 cm

Height = 2.5 m 2.5 × 100 = 250 cm

Now, the number of bricks required to build a wall is given by,

$$n = \frac{\text{Volume of wall}}{\text{Volume of one brick}}$$

Both wall and brick are cuboidal in shape.

Hence, the volume is given by,

The volume of wall = l × b × h

= 600 × 50 × 250

= 7500000 cm^3

The volume of one brick = l × b × h

= 25 × 15 × 10

= 3750 cm^3

$\therefore n = \frac{7500000}{3750}$ = 2000 bricks

∴ 2000 bricks are required to build a wall of dimensions 6 × 0.5 × 2 m.

Q. 4. For rainwater harvesting, a tank of length 10 m, breadth 6 m, and depth 3m are built. What is the capacity of the tank? How many liters of water can it hold?

Answer : Given:

Length of tank = 10 m

Breadth of tank = 6 m

The height of tank = 3 m

Capacity is nothing but the volume of the tank.

As for length, breadth and height are given, the tank is cuboidal in shape.

The volume of tank = l × b × h

= 10 × 6 × 3

= 180 m^3

The capacity of the tank is 180 m^3

Now,

1 m^3 = 1000 litre

∴180 m^3 = 180 × 1000 = 180,000 litre

∴ The tank can hold 180,000 litres of water

Practice set 16.2

Q. 1. In each example given below, the radius of the base of a cylinder and its height are given. Then find the curved surface area and total surface area.

(1) r = 7 cm, h = 10 cm
(2) r = 1.4 cm, h = 2.1 cm
(3) r = 2.5 cm, h = 7 cm

(4) r = 70 cm, h = 1.4 cm
(5) r = 4.2 cm, h = 14 cm

Answer : Curved surface area of cylinder(CSA) = 2πrh

Total surface area of cylinder(TSA) = 2πr(h+r)

1. r = 7 cm, h = 10 cm

CSA = 2πrh

= 2 × 3.14 × 7 × 10

= 440 cm^2

TSA = 2πr(h+r)

= 2 × 3.14 × 7(10+7)

= 748 cm^2

2. r = 1.4 cm, h = 2.1 cm

CSA = 2πrh

= 2 × 3.14 × 1.4 × 2.1

= 18.48 cm^2

TSA = 2πr(h+r)

= 2 × 3.14 × 1.4(2.1+1.4)

= 30.8 cm^2

3. r = 2.5 cm, h = 7 cm

CSA = 2πrh

= 2 × 3.14 × 2.5 × 7

= 110 cm^2

TSA = 2πr(h + r)

= 2 × 3.14 × 2.5(7+2.5)

= 149.29 cm^2

4. r = 70 cm, h = 1.4 cm

CSA = 2πrh

= 2 × 3.14 × 70 × 1.4

= 616 cm^2

TSA = 2πr(h+r)

= 2 × 3.14 × 70(70+1.4)

= 31416 cm^2

5. r = 4.2 cm, h = 14 cm

CSA = 2πrh

= 2 × 3.14 × 4.2 × 14

= 369.6 cm^2

TSA = 2πr(h + r)

= 2 × 3.14 × 4.2(4.2+14)

= 480.48 cm^2

Q. 2. Find the total surface area of a closed cylindrical drum if its diameter is 50 cm and height is 45 cm. (π = 3.14)

Answer : Total surface area of cylinder(TSA) **=** 2πr(h+r)

Here, $r = \frac{\text{diameter}}{2} = \frac{50}{2} = 25 \text{ cm}$

h = 45 cm

Total Surface Area = 2 × 3.14 × 25(45+25)

= 10990 cm^2

Total Surface Area of Cylinder is 10990 cm^2

Q. 3. Find the area of base and radius of a cylinder if its curved surface area is 660 sq. cm and height is 21 cm

Answer : Area of base of cylinder = $\pi \times r^2$

Curved surface area of cylinder(CSA) = $2\pi \times r \times h$

Here, CSA = 660 sq. cm, h = 21 cm, r =?

CSA = $2\pi \times r \times h$

660 = $2\pi \times r \times 21$ $r = \frac{660}{2\pi \times 21}$

$$r = \frac{660}{2 \times 3.14 \times 21}$$

r = 5 cm

Area of base = $\pi \times r^2$

= $3.14 \times 25 \times 25$

= 78.5 cm^2

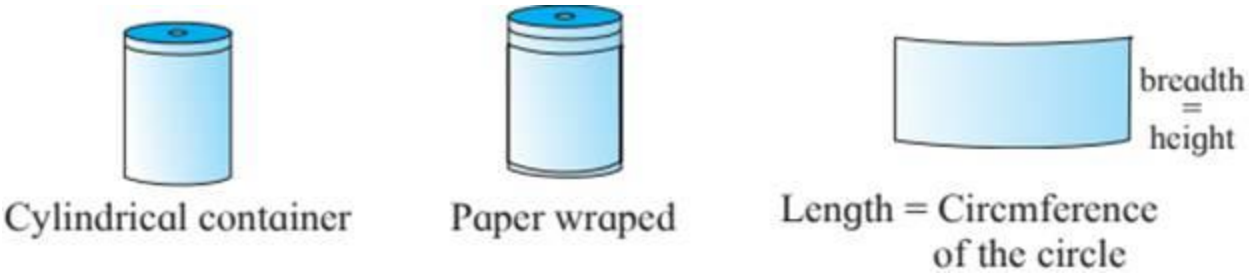
Area of the base is 78.5 cm^2 and radius is 5 cm

Q. 4. Find the area of the sheet required to make a cylindrical container which is open at one side and whose diameter is 28 cm and height is 20 cm. Find the approximate area of the sheet required to make a lid of height 2 cm for this container.

Answer : Given:

Diameter = 28 cm

$$\text{Radius} = \frac{\text{diameter}}{2} = \frac{28}{2} = 14 \text{ cm} \quad \text{height} = 2 \text{ cm}$$



As the cylindrical container is open at one side, Total area of a cylinder is given as,

Area of Cylinder = area of the base + curved surface area

Area of base **=** $\pi \times r^2$

Curved surface area = $2\pi \times r \times h$

∴ Area of Cylinder = $\pi \times r^2 + 2\pi \times r \times h$

$= 3.14 \times 14^2 + 2 \times 3.14 \times 14 \times 20$

$= 615.44 + 1759.3$

$= 2376\ cm^2$

Now, the area of the sheet required to make a cylindrical container is nothing but an area of the cylinder.

∴ Area of Sheet = $2376\ cm^2$

Now, we need to make a lid for the open cylinder. Given the height of the lid is 2 cm.

As the lid is for the cylinder, it's radius will be the radius of the cylinder.

Hence, For lid,

Radius = 14 cm

Height = 2 cm

Area of lid = area of the base of the lead + curved surface area

$= \pi \times r^2 + 2\pi \times r \times h$

$= 3.14 \times 14^2 + 2 \times 3.14 \times 14 \times 2$

$= 615.44 + 175.84$

$= 792\ cm^2$

$\therefore$ Area of Sheet $= 2376\ cm^2$

$\therefore$ Area of Lid $= 792\ cm^2$

Practice set 16.3

Q. 1. Find the volume of the cylinder if height (h) and radius of the base (r) are as given below.

(1) r = 10.5 cm, h = 8 cm
(2) r = 2.5 m, h = 7 m
(3) r = 4.2 cm, h = 5 cm
(4) r = 5.6 cm, h = 5 cm

Answer : Volume of cylinder = $\pi \times r^2 \times h$

1. r = 10.5 cm, h = 8 cm

Volume $= \pi \times r^2 \times h$

$= 3.14 \times 10.5^2 \times 8$

$= 2772\ cm^3$

2. r = 2.5 m, h = 7 m

Volume $= \pi \times r^2 \times h$

$= 3.14 \times 2.5^2 \times 7$

$= 137.5\ cm^3$

3. r = 4.2 cm, h = 5 cm

Volume $= \pi \times r^2 \times h$

$= 3.14 \times 4.2^2 \times 5$

$= 277.2\ cm^3$

4. r = 5.6 cm, h = 5 cm

Volume $= \pi \times r^2 \times h$

$= 3.14 \times 5.6^2 \times 5$

$= 492.8\ cm^3$

Q. 2. How much iron is needed to make a rod of length 90 cm and diameter 1.4 cm?

Answer : Given,

length/height of the cylindrical rod = 90 cm

The radius of rod $= \frac{\text{diameter}}{2} = \frac{1.4}{2} = 0.7\ \text{cm}$

Here, we need to calculate the amount of iron required to make a rod.

That mean, we need to calculate the volume of the rod.

Volume of rod = $\pi \times r^2 \times h$

$= 3.14 \times 0.7^2 \times 90$

$= 138.6\ cm^3$

∴ Amount of iron required is $138.6\ cm^3$

Q. 3. How much water will a tank hold if the interior diameter of the tank is 1.6 m and its depth is 0.7 m?

Answer : Given,

Radius $= \frac{\text{diameter}}{2} = \frac{1.6}{2} = 0.8\ \text{m}$

Height = 0.7 m

The volume of tank = $\pi \times r^2 \times h$

$= 3.14 \times 0.8^2 \times 0.7$

$= 1.408\ m^3$

Now, $1m^3 = 1000$ litre

$1.408\ m^3 = 1408$ litre

∴ The tank can hold 1408 liter of water

Q. 4. Find the volume of the cylinder if the circumference of the cylinder is 132 cm and height is 25 cm.

Answer : Given,

Circumference = 132 cm

Height = 25 cm

Volume = ?

The circumference of cylinder = 2 × π × r

132 = 2 × π × r

$$r = \frac{132}{2 \times 3.14} = 21\ m$$

The volume of cylinder = π × r^2 × h

= 3.14 × 21^2 × 25

= 34650 cm^3

∴ The volume of the cylinder is 34650 cm^3