

**Exercise**

**Question 1.**

Find the volume and the total surface area of a cuboid, whose:

(i) Length = 15cm, breadth = 10cm and height = 8cm.

**Solution:-**

We know that

$$\text{Volume of a cuboid} = \text{Length} \times \text{Breadth} \times \text{Height} = 15 \times 10 \times 8 = 1200\text{cm}^3$$

Here

$$\text{Total surface area of a cuboid} = 2(l \times b + b \times h + h \times l) = 2(15 \times 10 + 10 \times 8 + 8 \times 15)$$

By further calculation

$$= 2(150 + 80 + 120) = 2 \times 350 = 700\text{cm}^2$$

(ii)  $l = 3.5\text{m}$ ,  $b = 2.6\text{m}$  and  $h = 90\text{cm}$ ,

**Solution:-**

$$\text{Length} = 3.5\text{m}, \text{breadth} = 2.6\text{m}, \text{height} = 90\text{cm} = \frac{90}{100}\text{m} = 0.9\text{m}.$$

We know that

$$\text{Volume of a cuboid} = l \times b \times h = 3.5 \times 2.6 \times 0.9 = 8.19\text{m}^3$$

Here

$$\text{Total surface area of a cuboid} = 2(l \times b + b \times h + h \times l) = 2(3.5 \times 2.6 + 2.6 \times 0.9 + 3.5 \times 0.9)$$

By further calculation

$$= 2(9.10 + 2.34 + 3.15) = 2(14.59) = 29.18\text{m}^2$$

**Question 2.**

(i) The volume of a cuboid is  $3456 \text{ cm}^3$ . If its length = 24 cm and breadth = 18 cm; find its height.

**Solution:**

Volume of the given cuboid =  $3456 \text{ cm}^3$ .

Length of the given cuboid = 24 cm

Breadth of the given cuboid = 18 cm

Here

Length  $\times$  Breadth  $\times$  Height = Volume of a cuboid

Substituting the values

$$24 \times 18 \times \text{Height} = 3456$$

By further calculation

$$\text{Height} = \frac{3456}{24 \times 18}$$

So we get

$$\text{Height} = \frac{3456}{432}$$

Height = 8 cm

(ii) The volume of a cuboid is  $7.68 \text{ m}^3$ . If its length = 3.2 m and height = 1.0 m; find its breadth.

**Solution:-**

Volume of a cuboid =  $7.68 \text{ m}^3$

Length of a cuboid = 3.2 m

Height of a cuboid = 1.0 m

Here

Length  $\times$  Breadth  $\times$  Height = Volume of a cuboid

Substituting the values

$$3.2 \times \text{Breadth} \times 1.0 = 7.68$$

By further calculation

$$\Rightarrow \text{Breadth} = \frac{7.68}{3.2 \times 1.0}$$

So we get

$$\Rightarrow \text{Breadth} = \frac{7.68}{3.2}$$

$$\Rightarrow \text{Breadth} = 2.4 \text{ m}$$

(iii) The breadth and height of a rectangular solid are 1.20 m and 80 cm respectively. If the volume of the cuboid is  $1.92 \text{ m}^3$ ; find its length.

**Solution:-**

Volume of a rectangular solid =  $1.92 \text{ m}^3$

Breadth of a rectangular solid = 1.20 m

Height of a rectangular solid = 80 cm = 0.8 m

Here

Length  $\times$  Breadth  $\times$  Height = Volume of a rectangular solid (cubical)

Substituting the values

$$\text{Length} \times 1.20 \times 0.8 = 1.92$$

By further calculation

$$\text{Length} \times 0.96 = 1.92$$

$$= \frac{1.92}{0.96}$$

So we get

$$= \frac{192}{96}$$

$$\text{Length} = 2 \text{ m}$$

### Question 3.

The length, breadth and height of a cuboid are in the ratio 5:3:2. If its volume is  $240\text{cm}^3$ , find its dimensions. (Dimensions means: its length, breadth and height). Also find the total surface area of the cuboid.

**Solution:-**

Consider length of the given cuboid =  $5x$

Breadth of the given cuboid =  $3x$

Height of the given cuboid =  $2x$

We know that

Volume of the given cuboid = Length  $\times$  Breadth  $\times$  height

Substituting the values

$$= 5x \times 3x \times 2x = 30x^3$$

It is given that

$$\text{Volume} = 240\text{cm}^3$$

Substituting the values

$$30x^3 = 240\text{cm}^3$$

By further calculation

$$x^3 = \frac{240}{30} \quad x^3 = 8$$

So we get

$$x = 8^{\frac{1}{3}} \quad x = (2 \times 2 \times 2)^{\frac{1}{3}}$$

$$x = 2 \text{ cm}$$

Here

$$\text{Length of the given cube} = 5x = 5 \times 2 = 10 \text{ cm}$$

$$\text{Breadth of the given cube} = 3x = 3 \times 2 = 6 \text{ cm}$$

$$\text{Height of the given cube} = 2x = 2 \times 2 = 4 \text{ cm}$$

We know that

$$\text{Total surface area of the given cuboid} = 2(l \times b + b \times h + h \times l)$$

Substituting the values

$$= 2(10 \times 6 + 6 \times 4 + 4 \times 10) = 2(60 + 24 + 40) = 2 \times 124 = 248 \text{ cm}^2$$

#### Question 4.

The length, breadth and height of a cuboid are in the ratio 6:5:3. If its total surface area is  $504 \text{ cm}^2$ ; find its dimensions. Also, find the volume of the cuboid.

**Solution:-**

$$\text{Consider length of the cuboid} = 6x$$

$$\text{Breadth of the cuboid} = 5x$$

$$\text{Height of the cuboid} = 3x$$

We know that

$$\text{Total surface area of the given cuboid} = 2(l \times b + b \times h + h \times l)$$

Substituting the values

$$= 2(6x \times 5x + 5x \times 3x + 3x \times 6x) = 2(30x^2 + 15x^2 + 18x^2)$$

We get

$$= 2 \times 63x^2 = 126x^2$$

It is given that

$$\text{Total surface area of the given cuboid} = 504 \text{ cm}^2$$

Substituting the values

$$126x^2 = 504 \text{ cm}^2$$

By further calculation

$$\Rightarrow x^2 = \frac{504}{126}$$

So we get

$$\Rightarrow x^2 = 4 \Rightarrow x = \sqrt{4}$$

$$x=2 \text{ cm}$$

Here

$$\text{Length of the cuboid} = 6x = 6 \times 2 = 12 \text{ cm}$$

$$\text{Breadth of the cuboid} = 5x = 5 \times 2 = 10 \text{ cm}$$

$$\text{Height of the cuboid} = 3x = 3 \times 2 = 6 \text{ cm}$$

We get

$$\text{Volume of the cuboid} = l \times b \times h = 12 \times 10 \times 6 = 720 \text{ cm}^3$$

### Question 5.

Find the volume and total surface area of a cube whose edge is:

(i) 8 cm

**Solution:-**

$$\text{Edge of the given cube} = 8 \text{ cm}$$

We know that

$$\text{Volume of the given cube} = (\text{Edge})^3 = (8)^3 = 8 \times 8 \times 8 = 512 \text{ cm}^3$$

$$\text{Total surface area of a cube} = 6(\text{Edge})^2 = 6 \times (8)^2 = 384 \text{ cm}^2$$

(ii) 2 m 40 cm.

**Solution:-**

$$(ii) \text{Edge of the given cube} = 2 \text{ m } 40 \text{ cm} = 2.40 \text{ m}$$

We know that

$$\text{Volume of a cube} = (\text{Edge})^3$$

Substituting the values

$$\text{Volume of the given cube} = (2.40)^3 = 2.40 \times 2.40 \times 2.40 = 13.824 \text{ m}^3$$

$$\text{Total surface area of the given cube} = 6 \times 2.4 \times 2.4 = 34.56 \text{ m}^2$$

### Question 6.

Find the length of each edge of a cube, if its volume is:

(i)  $216 \text{ cm}^3$

**Solution:-**

$$(\text{Edge})^3 = \text{Volume of a cube}$$

Substituting the values

$$(\text{Edge})^3 = 216 \text{ cm}^3$$

It can be written as

$$\text{Edge} = (216)^{1/3}$$

$$\text{Edge} = (3 \times 3 \times 3 \times 2 \times 2 \times 2)^{1/3}$$

We get

$$\text{Edge} = 3 \times 2$$

Ans. Edge = 6 cm.

(ii)  $1.728\text{m}^3$

**Solution:-**

$$(\text{Edge})^3 = \text{Volume of a cube}$$

Substituting the values

$$(\text{Edge})^3 = 1.728\text{m}^3 \Rightarrow (\text{Edge})^3 = \frac{1.728}{1000} = \frac{1728}{1000}$$

It can be written as

$$\text{Edge} = \left(\frac{1728}{1000}\right)^{1/3}$$

By further calculation

$$\text{Edge} = \left(\frac{2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 3}{10 \times 10 \times 10}\right)^{1/3} \quad \text{Edge} = \frac{2 \times 2 \times 3}{10}$$

So we get

$$\text{Edge} = \frac{12}{10} \text{m}$$

Edge = 1.2 m.

**Question 7.**

The total surface area of a cube is  $216 \text{ cm}^2$ . Find its volume.

**Solution:-**

$$6(\text{Edge})^2 = \text{Total surface area of a cube}$$

Substituting the values

$$6(\text{Edge})^2 = 216\text{cm}^2 \quad (\text{Edge})^2 = \frac{216}{6}$$

By further calculation

$$(\text{Edge})^2 = 36$$
$$\text{Edge} = \sqrt{36}$$

$$\text{Edge} = 6 \text{ cm}$$

We know that

$$\text{Volume of the given cube} = (\text{Edge})^3 = (6)^3 = 6 \times 6 \times 6 = 216\text{cm}^3$$

**Question 8.**

A solid cuboid of metal has dimensions 24 cm, 18 cm and 4 cm. Find its volume.

**Solution:-**

It is given that

$$\text{Length of the cuboid} = 24 \text{ cm}$$

$$\text{Breadth of the cuboid} = 18 \text{ cm}$$

$$\text{Height of the cuboid} = 4 \text{ cm}$$

We know that

$$\text{Volume of the cuboid} = l \times b \times h = 24 \times 18 \times 4 = 1728\text{cm}^3$$

**Question 9.**

A wall 9 m long, 6 m high and 20 cm thick, is to be constructed using bricks of dimensions 30 cm, 15 cm and 10 cm. How many bricks will be required?

**Solution:**

It is given that

$$\text{Length of the wall} = 9\text{m} = 9 \times 100\text{cm} = 900\text{cm}$$

$$\text{Height of the wall} = 6\text{m} = 6 \times 100\text{cm} = 600\text{cm}$$

$$\text{Breadth of the wall} = 20 \text{ cm}$$

We know that

$$\text{Volume of the wall} = 900 \times 600 \times 20\text{cm}^3 = 10800000\text{cm}^3$$

$$\text{Volume of one Brick} = 30 \times 15 \times 10\text{cm}^3 = 4500\text{cm}^3$$

So we get

$$\text{Number of bricks required to construct the wall} = \frac{\text{Volume of wall}}{\text{Volume of one brick}} = \frac{10800000}{4500}$$

$$= 2400$$

**Question 10.**

A solid cube of edge 14 cm is melted down and recasted into smaller and equal cubes each of edge 2 cm; find the number of smaller cubes obtained.

**Solution:-**

We know that

Edge of the big solid cube = 14 cm

$$\text{Volume of the big solid cube} = 14 \times 14 \times 14 \text{cm}^3 = 2744 \text{cm}^3$$

Similarly

Edge of the small cube = 2 cm

$$\text{Volume of one small cube} = 2 \times 2 \times 2 \text{cm}^3 = 8 \text{cm}^3$$

So we get

$$\text{Number of smaller cubes obtained} = \frac{\text{Volume of big cube}}{\text{Volume of one small cube}} = \frac{2744}{8} = 343$$

**Question 11.**

A closed box is cuboid in shape with length = 40cm, breadth = 30cm and height = 50cm. It is made of thin metal sheet. Find the cost of metal sheet required to make 20 such boxes, if 1 m<sup>2</sup> of metal sheet costs Rs. 45.

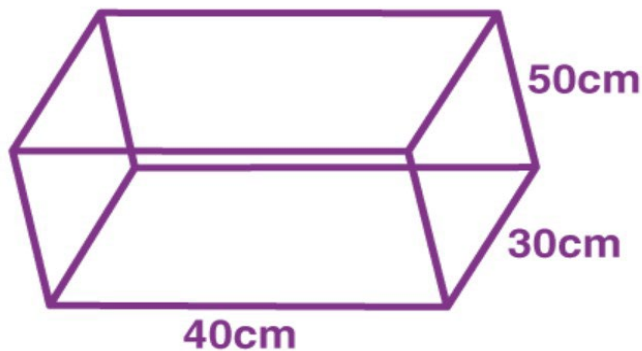
**Solution:-**

It is given that

Length of closed box (l) = 40cm

Breadth (b) = 30cm

And height (h) = 50cm



We know that

$$\text{Total surface area} = 2(l \times b + b \times h + h \times l)$$

Substituting the values

$$= 2(40 \times 30 + 30 \times 50 + 50 \times 40)\text{cm}^2$$

By further calculation

$$= 2(1200 + 1500 + 2000)\text{cm}^2$$

So we get

$$= 2 \times 4700 = 9400\text{cm}^2$$

Here

$$\text{Surface area of sheet used for 20 such boxes} = 9400 \times 20 = 188000\text{cm}^2 = 18.8\text{m}^2$$

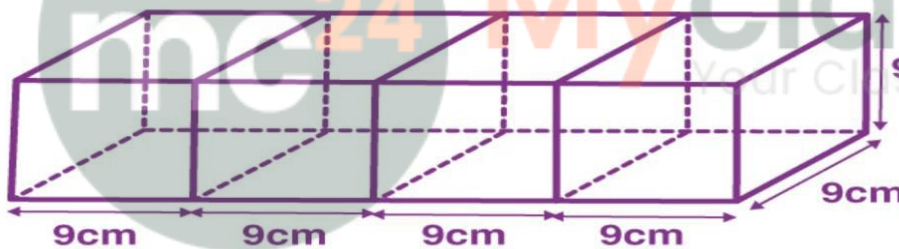
$$\text{Cost of } 1\text{m}^2 \text{ sheet} = \text{Rs.}45$$

We get

$$\text{Total cost} = 18.8 \times 45 = \text{Rs.}846$$

#### Question 12.

Four cubes, each of edge 9 cm, are joined as shown below:



Write the dimensions of the resulting cuboid obtained. Also, find the total surface area and the volume of the resulting cuboid.

#### Solution:-

Edge of each cube = 9cm

(i) We know that

Length of the cuboid formed by 4 cubes (l) =  $9 \times 4 = 36\text{cm}$

Breadth (b) = 9cm and height (h) = 9cm

(ii) Total surface area of the cuboid =  $2(lb + bh + hl)$

Substituting the values

$$= 2(36 \times 9 + 9 \times 9 + 9 \times 36)\text{cm}^2$$

By further calculation

$$= 2(324 + 81 + 324)\text{cm}^2$$

So we get

$$= 2 \times 729\text{cm}^2 = 1458\text{cm}^2$$

$$\text{(iii) Volume} = l \times b \times h = 36 \times 9 \times 9\text{cm}^3 = 2916\text{cm}^3$$

**Question 13.**

How many persons can be accommodated in a big-hall of dimensions 40 m, 25m and 15m; assuming that each person requires  $5\text{m}^3$  of air?

**Solution:-**

$$\text{No. of persons} = \frac{\text{Vol. of the hall}}{\text{Vol. of air required for each person}}$$

It is given that

Length of the hall = 40m

Breadth = 25m

Height = 15m

Here

$$\text{Volume of the hall} = l \times b \times h = 40 \times 25 \times 15 = 15000\text{m}^3$$

$$\text{Volume of the air required for each person} = 5\text{m}^3$$

So we get

$$\text{No. of persons who can be accommodated} = \frac{\text{Volume of the hall}}{\text{Volume of air required for each person}} = \frac{15000\text{m}^3}{5\text{m}^3} = 3000$$

**Question 14.**

The dimension of a class-room are; length = 15m, breadth = 12m and height = 7.5m. Find, how many children can be accommodated in this class-room; assuming  $3.6 \text{ m}^3$  of air is needed for each child.

**Solution:-**

It is given that

Length of the room = 15m

Breadth of the room = 12m

Height of the room = 7.5m

We know that

$$\text{Volume of the room} = L \times B \times H = 15 \times 12 \times 7.5\text{m}^3 = 1350\text{m}^3$$

$$\text{Volume of air required for each child} = 3.6\text{m}^3$$

So we get

$$\begin{aligned} \text{No. of children who can be accommodated in the class room.} &= \frac{\text{Volume of class room}}{\text{Volume of air needed for each child}} = \frac{1350\text{m}^3}{3.6\text{m}^3} \\ &= 375. \end{aligned}$$

**Question 15.**

The length, breadth and height of a room are 6m, 5.4m and 4 m respectively. Find the area of:

- (i) Its four-walls
- (ii) Its roof.

**Solution:-**

It is given that

Length of the room = 6m

Breadth of the room = 5.4m

Height of the room = 4m

$$(i) \text{ Area of four walls} = 2(L + B) \times H = 2(6 + 5.4) \times 4 = 2 \times 11.4 \times 4 = 91.2\text{m}^2$$

$$(ii) \text{ Area of the roof} = L \times B = 6 \times 5.4 = 32.4\text{m}^2$$