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

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

Here

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 = 3.5m, b = 2.6m and h = 90cm,

Solution:-

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

We know that

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

Here

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

By further calculation

=2(910+2.34+3.15)=2(14.59) $= 29.18m^2$

Question 2.

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

Solution:

Volume of the given cuboid $= 3456cm^3$.

Length of the given cuboid =24 cm

Breadth of the given cuboid =18 cm

Here

Length × Breadth × Height = Volume of a cuboid

Substituting the values

24×18× Height =3456

By further calculation

Height $= \frac{3456}{24\times18}$

So we get

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

Height =8cm

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

Solution:-

Volume of a cuboid =7.68 m^3

Length of a cuboid =3.2 m

Height of a cuboid =1.0 m

Here

Length x Breadth x Height = Volume of a cuboid

Substituting the values

3.2 × Breadth × 1.0=7.68

By further calculation

$\Rightarrow$ Breadth $= \frac{7.68}{3.2\times1.0}$

So we get

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

$\Rightarrow$ Breadth =2.4 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 m^3; find its length.

Solution:-

Volume of a rectangular solid =1.92 m^3

Breadth of a rectangular solid = 1.20 m

Height of a rectangular solid =80 cm=0.8 m

Here

Length × Breadth × Height = Volume of a rectangular solid (cubical)

Substituting the values

Length × 1.20 × 0.8 = 1.92

By further calculation

Length × 0.96 = 1.92

$= \frac{1.92}{0.96}$

So we get

$= \frac{192}{96}$

Length =2 m

Question 3.

The length, breadth and height of a cuboid are in the ratio 5:3:2. If its volume is $240cm^3$, 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 = $\text{Length} \times \text{Breadth} \times \text{height}$

Substituting the values

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

It is given that

Volume $=240cm^3$

Substituting the values

$30x^3 = 240cm^3$

By further calculation

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

So we get

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

x=2 cm

Here

Length of the given cube $=5x=5\times2=10cm$
Breadth of the given cube $=3x=3\times2=6cm$
Height of the given cube $=2x=2\times2=4cm$
We know that

Total surface area of the given cuboid $=2(1\times b+b\times h+h\times1)$
Substituting the values

$=2(10\times6+6\times4+4\times10)=2(60+24+40)=2\times124=248cm^2$

Question 4.

The length, breadth and height of a cuboid are in the ratio 6:5:3. If its total surface area is 504 c m^2; find its dimensions. Also, find the volume of the cuboid.
Solution:-

Consider length of the cuboid =6x

Breadth of the cuboid =5x

Height of the cuboid =3x

We know that

Total surface area of the given cuboid $=2(1\times b+b\times h+h\times l)$
Substituting the values

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

We get

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

It is given that

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 cm

Here

Length of the cuboid $=6x=6\times2=12cm$
Breadth of the cuboid $=5x=5\times2=10cm$
Height of the cuboid $=3x=3\times2=6cm$
We get

Volume of the cuboid $=l\times b\times h=12\times10\times6=720cm^3$

Question 5.

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

(i) 8 cm

Solution:-

Edge of the given cube =8cm

We know that

Volume of the given cube $=(\text{ Edge })^3=(8)^3=8\times8\times8=512cm^3$

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

(ii) 2m 40 cm.

Solution:-

(ii)Edge of the given cube =2 m 40 cm=2.40 m

We know that

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

Substituting the values

Volume of the given cube $=(2.40)^3=2.40\times2.40\times2.40=13.824m^2$

Total surface area of the given cube $=6\times2.4\times2.4=34.56m^2$

Question 6.

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

(i) $216cm^3$

Solution:-

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

Substituting the values

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

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) 1.728m^3

Solution:-

$(Edge)^3$ = 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

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

By further calculation

$\text{Edge} = \left(\frac{2\times2\times2\times2\times2\times2\times3\times3\times3}{10\times10\times10}\right)^{1/3}$ $Edge = \frac{2\times2\times3}{10}$

So we get

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

Edge =1.2 m.

Question 7.

The total surface area of a cube is 216 cm^2. Find its volume.

Solution:-

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

Substituting the values

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

By further calculation

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

Edge =6 cm

We know that

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

Question 8.

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

Solution:-

It is given that

Length of the cuboid =24 cm

Breadth of the cuboid =18 cm

Height of the cuboid =4 cm

We know that

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

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

Length of the wall $=9\text{m}=9\times100\text{cm}=900\text{cm}$
Height of the wall $=6\text{m}=6\times100\text{cm}=600\text{cm}$
Breadth of the wall =20 cm

We know that

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

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

So we get

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

$$\text{Number of smaller cubes obtained} = \frac{\text{Volume of big cube}}{\text{Volume of one small cube}} = \frac{2774}{8} = 343$$

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^2 of metal sheet costs Rs. 45.

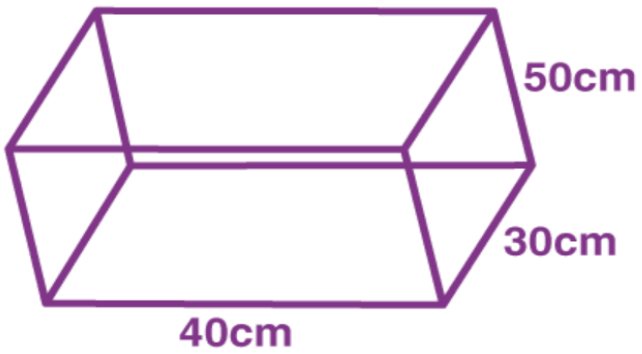
Solution:-

It is given that

Length of closed box (1) =40cm

Breadth (b) =30cm

And height (h) =50cm



We know that

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

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

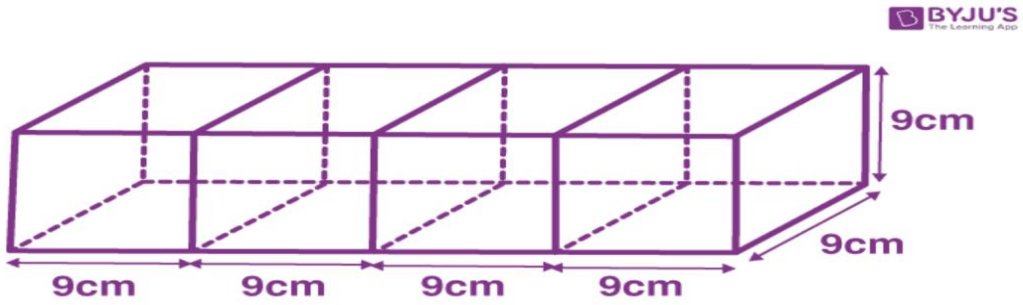
Cost of $1\text{m}^2 sheet = Rs.45$

We get

Total cost $= 18.8 \times 45 = Rs.846$

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) $=9\times4=36\text{cm}$
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

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

(iii) $Volume = \quad l \times b \times h = 36 \times 9 \times 9cm^2 = 2916cm^3$

Question 13.

How many persons can be accommodated in a big-hall of dimensions 40 m, 25m and 15m; assuming that each person requires 5m^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

Volume of the hall$= 1 \times \text{b} \times \text{h} = 40 \times 25 \times 15 = 15000\text{m}^3$

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 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

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

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

So we get

No. of children who can be accommodated in the class room. $= \frac{\text{Volume of class room}}{\text{Volume of air needed for each child}} = \frac{1350\text{m}^3}{3{\cdot}6\text{m}^3}$

=375.

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