RD Sharma Solutions for Class 8 Math Chapter 21 - Mensuration Ii (volumes And Surface Areas Of A Cuboid And A Cube)

PAGE NO 21.15:

Question 1:

Find the volume in cubic metre (cu. m) of each of the cuboids whose dimensions are:
(i) length = 12 m, breadth = 10 m, height = 4.5 cm
(ii) length = 4 m, breadth = 2.5 m, height = 50 cm.
(iii) length = 10 m, breadth = 25 dm, height = 50 cm.

ANSWER:

(i)

$\text{Length} = 12\ \text{m}$

$\text{Breadth} = 10\ \text{m}$

$\text{Height} = 4.5\ \text{m}$

$\therefore\ \text{Volume of the cuboid} = \text{length} \times \text{breadth} \times \text{height}$

$= 12 \times 10 \times 4.5$

$= 540\ \text{m}^3$

(ii)

$\text{Length} = 4\ \text{m}$

$\text{Breadth} = 2.5\ \text{m}$

$\text{Height} = 50\ \text{cm}$

$= \frac{50}{100}\text{m}\ \ (\because 1\ \text{m} = 100\ \text{cm})$

$= 0.5\ \text{m}$

$\therefore\ \text{Volume of the cuboid} = \text{length} \times \text{breadth} \times \text{height}$

$= 4 \times 2.5 \times 0.5$

$= 5\ \text{m}^3$

(iii)

$\text{Length} = 10\ \text{m}$

$\text{Breadth} = 25\ \text{dm}$

$= \frac{25}{10}\text{m}\ (\because 10\ \text{dm} = 1\text{m})$

$= 2.5\ \text{m}$

$\text{Height} = 25\ \text{cm} = \frac{25}{100}\text{m} = 0.25\ \text{m}$

$\therefore\ \text{Volume of the cuboid} = \text{length} \times \text{breadth} \times \text{height}$

$= 10 \times 2.5 \times 0.25$

$= 6.25\ \text{m}^3$

PAGE NO 21.15:

Question 2:

Find the volume in cubic decimetre of each of the cubes whose side is
(i) 1.5 m
(ii) 75 cm
(iii) 2 dm 5 cm

ANSWER:

(i)

Side of the cube $= 1.5$ m

$= 1.5 \times 10$ dm $(\because 1\text{ m} = 10\text{ dm})$

$= 15$ dm

$\therefore$ Volume of the cube $= (\text{side})^3 = (15)^3 = 3375\text{ dm}^3$

(ii)

Side of the cube $= 75$ cm

$= 75 \times \frac{1}{10}$ dm $(\because 1\text{ dm} = 10\text{ cm})$

$= 7.5$ dm

$\therefore$ Volume of the cube $= (\text{side})^3 = (7.5)^3 = 421.875\text{ dm}^3$

(iii)

Side of the cube $= 2$ dm 5 cm

$= 2\text{ dm} + 5 \times \frac{1}{10}$ dm $(\because 1\text{ dm} = 10\text{ cm})$

$= 2\text{ dm} + 0.5\text{ dm}$

$= 2.5$ dm

$\therefore$ Volume of the cube $= (\text{side})^3 = (2.5)^3 = 15.625\text{ dm}^3$

PAGE NO 21.15:

Question 3:

How much clay is dug out in digging a well measuring 3 m by 2 m by 5 m?

ANSWER:

The measure of well is $3\text{ m} \times 2\text{ m} \times 5\text{ m}$.

$\therefore$ Volume of the clay dug out $= (3 \times 2 \times 5)\text{ m}^3 = 30\text{ m}^3$

PAGE NO 21.15:

Question 4:

What will be the height of a cuboid of volume 168 m^3, if the area of its base is 28 m^2?

ANSWER:

Volume of the cuboid $= 168\text{ m}^3$

Area of its base $= 28\text{ m}^2$

Let h m be the height of the cuboid.

Now, we have the following :

Area of the rectangular base = lenght × breadth

Volume of the cuboid = lenght × breadth × height

$\Rightarrow$ Volume of the cuboid = (area of the base) × height

$\Rightarrow 168 = 28 \times h$

$\Rightarrow h = \frac{168}{28} = 6$ m

$\therefore$ The height of the cuboid is 6 m.

PAGE NO 21.15:

Question 5:

A tank is 8 m long, 6 m broad and 2 m high. How much water can it contain?

ANSWER:

$\text{Length of the tank} = 8\ \text{m}$
$\text{Breadth} = 6\ \text{m}$
$\text{Height} = 2\ \text{m}$
$\therefore \text{ Its volume} = \text{length} \times \text{breadth} \times \text{height} = (8 \times 6 \times 2)\ \text{m}^3 = 96\ \text{m}^3$
$\text{We know that } 1\text{m}^3 = 1000\ \text{L}$
$\text{Now, } 96\ \text{m}^3 = 96 \times 1000\ \text{L} = 96000\ \text{L}$
$\therefore \text{ The tank can store } 96000\ \text{L of water.}$

PAGE NO 21.15:

Question 6:

The capacity of a certain cuboidal tank is 50000 litres of water. Find the breadth of the tank, if its height and length are 10 m and 2.5 m respectively.

ANSWER:

$\text{Capacity of the cuboidal tank} = 50000\ \text{L}$
$1000\ \text{L} = 1\ \text{m}^3$
$\text{i.e., } 50000\ \text{L} = 50 \times 1000\ \text{litres} = 50\ \text{m}^3$
$\therefore \text{ The volume of the tank is } 50\ \text{m}^3.$
$\text{Also, it is given that the length of the tank is } 10\ \text{m.}$
$\text{Height } = 2.5\ \text{m}$
$\text{Suppose that the breadth of the tank is } b\ \text{m.}$
$\text{Now, volume of the cuboid} = \text{length} \times \text{breadth} \times \text{height}$
$\Rightarrow 50 = 10 \times b \times 2.5$
$\Rightarrow 50 = 25 \times b$
$\Rightarrow b = \frac{50}{25} = 2\ \text{m}$
$\therefore \text{ The breadth of the tank is } 2\ \text{m.}$

PAGE NO 21.15:

Question 7:

A rectangular diesel tanker is 2 m long, 2 m wide and 40 cm deep. How many litres of diesel can it hold?

ANSWER:

$\text{Lenght of the rectangular diesel tanker} = 2\ \text{m}$
$\text{Breadth} = 2\ \text{m}$
$\text{Height} = 40\ \text{cm}$
$= 40 \times \frac{1}{100}\text{m} \quad (\because 1\ \text{m} = 100\ \text{cm})$
$= 0.4\ \text{m}$
$\text{So, volume of the tanker} = \text{lenght} \times \text{breadth} \times \text{height}$
$= 2 \times 2 \times 0.4$
$= 1.6\ \text{m}^3$
$\text{We konw that } 1\ \text{m}^3 = 1000\ \text{L}$
$\text{i.e., } 1.6\ \text{m}^3 = 1.6 \times 1000\ \text{L} = 1600\ \text{L}$
$\therefore \text{ The tanker can hold } 1600\ \text{L of diesel.}$

PAGE NO 21.15:

Question 8:

The length , breadth and height of a room are 5 m, 4.5 m and 3 m, respectively. Find the volume of the air it contains.

ANSWER:

$$\text{Length of the room} = 5\ \text{m}$$
$$\text{Breadth} = 4.5\ \text{m}$$
$$\text{Height} = 3\ \text{m}$$
$$\text{Now, volume} = \text{length} \times \text{breadth} \times \text{height}$$
$$= 5 \times 4.5 \times 3$$
$$= 67.5\ \text{m}^3$$
$$\therefore \text{The volume of air in the room is } 67.5\ \text{m}^3.$$

PAGE NO 21.15:

Question 9:

A water tank is 3 m long, 2 m broad and 1 m deep. How many litres of water can it hold?

ANSWER:

$$\text{Length of the water tank} = 3\ \text{m}$$
$$\text{Breadth} = 2\ \text{m}$$
$$\text{Height} = 1\ \text{m}$$
$$\text{Volume of the water tank} = 3 \times 2 \times 1 = 6\ \text{m}^3$$
$$\text{We know that } 1\ \text{m}^3 = 1000\ \text{L}$$
$$\text{i.e., } 6\ \text{m}^3 = 6 \times 1000\ \text{L} = 6000\ \text{L}$$
$$\therefore \text{The water tank can hold } 6000\ \text{L of water in it.}$$

PAGE NO 21.15:

Question 10:

How many planks each of which is 3 m long, 15 cm broad and 5 cm thick can be prepared from a wooden block 6 m long, 75 cm broad and 45 cm thick?

ANSWER:

$$\text{Length of the wooden block} = 6\ \text{m}$$
$$= 6 \times 100\ \text{cm} \quad \left(\because 1\ \text{m} = 100\ \text{cm}\right)$$
$$= 600\ \text{cm}$$
$$\text{Breadth of the block} = 75\ \text{cm}$$
$$\text{Height of the block} = 45\ \text{cm}$$
$$\text{Volume of block} = \text{length} \times \text{breadth} \times \text{height}$$
$$= 600 \times 75 \times 45$$
$$= 2025000\ \text{cm}^3$$
$$\text{Again, it is given that the length of a plank} = 3\ \text{m}$$
$$= 3 \times 100\ \text{cm} \quad \left(\because 1\ \text{m} = 100\ \text{cm}\right)$$
$$= 300\ \text{cm}$$
$$\text{Breadth} = 15\ \text{cm},$$
$$\text{Height} = 5\ \text{cm}$$
$$\text{Volume of the plank} = \text{leng th} \times \text{breadth} \times \text{height}$$
$$= 300 \times 15 \times 5 = 22500\ \text{cm}^3$$
$$\therefore \text{The number of such planks} = \frac{\text{volume of the wooden block}}{\text{voume of a plank}} = \frac{2025000\ \text{cm}^3}{22500\ \text{cm}^3} = 90$$

PAGE NO 21.15:

Question 11:

How many bricks each of size 25 cm × 10 cm × 8 cm will be required to build a wall 5 m long, 3 m high and 16 cm thick, assuming that the volume of sand and cement used in the construction is negligible?

ANSWER:

$\text{Dimension of a brick} = 25\ \text{cm} \times 10\ \text{cm} \times 8\ \text{cm}$
$\text{Volume of a brick} = 25\ \text{cm} \times 10\ \text{cm} \times 8\ \text{cm}$
$= 2000\ \text{cm}^3$
$\text{Also, it is given that the length of the wall is } 5\ \text{m}$
$= 5 \times 100\ \text{cm} \quad (\because 1\ \text{m} = 100\ \text{cm})$
$= 500\ \text{cm}$
$\text{Height of the wall} = 3\ \text{m}$
$= 3 \times 100\ \text{cm} \quad (\because 1\ \text{m} = 100\ \text{cm})$
$= 300\ \text{cm}$
$\text{It is } 16\ \text{cm thick, i.e., breadth} = 16\ \text{cm}$
$\text{Volume of the wall} = \text{length} \times \text{breadth} \times \text{height} = 500 \times 300 \times 16 = 2400000\ \text{cm}^3$
$\therefore \text{The number of bricks needed to build the wall} = \frac{\text{volume of the wall}}{\text{volume of a brick}} = \frac{2400000\ \text{cm}^3}{2000\ \text{cm}^3} = 1200$

PAGE NO 21.15:

Question 12:

A village, having a population of 4000, requires 150 litres water per head per day. It has a tank which is 20 m long, 15 m broad and 6 m high. For how many days will the water of this tank last?

ANSWER:

$\text{A village has population of } 4000 \text{ and every person needs } 150\ \text{L of water a day.}$
$\text{So, the total requirement of water in a day} = 4000 \times 150\ \text{L} = 600000\ \text{L}$
$\text{Also, it is given that the length of the water tank is } 20\ \text{m.}$
$\text{Breadth} = 15\ \text{m}$
$\text{Height} = 6\ \text{m}$
$\text{Volume of the tank} = \text{length} \times \text{breadth} \times \text{height} = 20 \times 15 \times 6 = 1800\ \text{m}^3$
$\text{Now, } 1\ \text{m}^3 = 1000\ \text{L}$
$\text{i.e., } 1800\ \text{m}^3 = 1800 \times 1000\ \text{L} = 1800000\ \text{L}$
$\text{The tank has } 1800000\ \text{L of water in it and the whole village need } 600000\ \text{L per day.}$
$\therefore \text{The water in the tank will last for } \frac{1800000}{600000} \text{ days, i.e., } 3 \text{ days.}$

PAGE NO 21.15:

Question 13:

A rectangular field is 70 m long and 60 m broad. A well of dimensions 14 m × 8 m × 6 m is dug outside the field and the earth dug-out from this well is spread evenly on the field. How much will the earth level rise?

ANSWER:

$\text{Dimension of the well} = 14\ \text{m} \times 8\ \text{m} \times 6\ \text{m}$
$\text{The volume of the dug} - \text{out earth} = 14 \times 8 \times 6 = 672\ \text{m}^3$
$\text{Now, we will spread this dug} - \text{out earth on a field whose length, breadth and height are } 70\ \text{m, } 60\ \text{m and } h\ \text{m, respectively.}$
$\text{Volume of the dug} - \text{out earth} = \text{length} \times \text{breadth} \times \text{height} = 70 \times 60 \times h$
$\Rightarrow 672 = 4200 \times h$
$\Rightarrow h = \frac{672}{4200} = 0.16\ \text{m}$
$\text{We know that } 1\ \text{m} = 100\ \text{cm}$
$\therefore \text{The earth level will rise by } 0.16\ \text{m} = 0.16 \times 100\ \text{cm} = 16\ \text{cm.}$

PAGE NO 21.15:

Question 14:

A swimming pool is 250 m long and 130 m wide. 3250 cubic metres of water is pumped into it. Find the rise in the level of water.

ANSWER:

Length of the pool $= 250\text{ m}$
Breadth of the pool $= 130\text{ m}$
Also, it is given that 3250 m^3 of water is poured into it.
i.e., volume of water in the pool $= 3250\text{ m}^3$
Suppose that the height of the water level is h m.
Then, volume of the water $=$ length $\times$ breadth $\times$ height
$\Rightarrow 3250 = 250 \times 130 \times h$
$\Rightarrow 3250 = 32500 \times h$
$\Rightarrow h = \frac{3250}{32500} = 0.1\text{ m}$
$\therefore$ The water level in the tank will rise by 0.1 m.

PAGE NO 21.15:

Question 15:

A beam 5 m long and 40 cm wide contains 0.6 cubic metre of wood. How thick is the beam?

ANSWER:

Length of the beam $= 5\text{m}$
Breadth $= 40$ cm
$= 40 \times \frac{1}{100}\text{m}$ $(\because 100\text{ cm} = 1\text{ m})$
$= 0.4\text{ m}$
Suppose that the height of the beam is h m.
Also, it is given that the beam contains 0.6 cubic metre of wood.
i.e., volume of the beam $= 0.6\text{ m}^3$
Now, volume of the cuboidal beam $=$ length $\times$ breadth $\times$ height
$\Rightarrow 0.6 = 5 \times 0.4 \times h$
$\Rightarrow 0.6 = 2 \times h$
$\Rightarrow h = \frac{0.6}{2} = 0.3\text{ m}$
$\therefore$ The beam is 0.3 m thick.

PAGE NO 21.15:

Question 16:

The rainfall on a certain day was 6 cm. How many litres of water fell on 3 hectares of field on that day?

ANSWER:

The rainfall on a certain day $= 6$ cm
$= 6 \times \frac{1}{100}\text{m}$ $(\because 1\text{ m} = 100\text{ cm})$
$= 0.06\text{ m}$
Area of the field $= 3$ hectares
We know that 1 hectare $= 10000\text{ m}^2$
i.e., 3 hectares $= 3 \times 10000\text{ m}^2 = 30000\text{ m}^2$
Thus, volume of rain water that fell in the field $=$ (area of the field) $\times$ (height of rainfall)
$= 30000 \times 0.06 = 1800\text{ m}^3$
Since $1\text{ m}^3 = 1000\text{ L}$, we have:
$1800\text{ m}^3 = 1800 \times 1000\text{ L} = 1800000\text{ L} = 18 \times 100000\text{ L} = 18 \times 10^5\text{ L}$
$\therefore$ On that day, 18×10^5 L of rain water fell on the field.

PAGE NO 21.15:

Question 17:

An 8 m long cuboidal beam of wood when sliced produces four thousand 1 cm cubes and there is no wastage of wood in this process. If one edge of the beam is 0.5 m, find the third edge.

ANSWER:

Length of the wooden beam $= 8$ m
Width $= 0.5$ m
Suppose that the height of the beam is h m.
Then, its volume $=$ length $\times$ width $\times$ height $= 8 \times 0.5 \times h = 4 \times h\ \text{m}^3$
Also, it produces 4000 cubes, each of edge $1\ \text{cm} = 1 \times \frac{1}{100}\text{m} = 0.01\ \text{m}$ $(100\ \text{cm} = 1\ \text{m})$
Volume of a cube $= (\text{side})^3 = (0.01)^3 = 0.000001\ \text{m}^3$
$\therefore$ Volume of 4000 cubes $= 4000 \times 0.000001 = 0.004\ \text{m}^3$
Since there is no wastage of wood in preparing cubes, the volume of the 4000 cubes will be equal to the volume of the cuboidal beam.
i.e., Volume of the cuboidal beam $=$ volume of 4000 cubes
$\Rightarrow 4 \times h = 0.004$
$\Rightarrow h = \frac{0.004}{4} = 0.001$ m
$\therefore$ The third edge of the cuboidal wooden beam is 0.001 m.

PAGE NO 21.15:

Question 18:

The dimensions of a metal block are 2.25 m by 1.5 m by 27 cm. It is melted and recast into cubes, each of the side 45 cm. How many cubes are formed?

ANSWER:

Dimension of the metal block is $2.25\ \text{m} \times 1.5\ \text{m} \times 27\ \text{cm}$, i.e., $225\ \text{cm} \times 150\ \text{cm} \times 27\ \text{cm}$ $(\because 1\ \text{m} = 100\ \text{cm})$.
Volume of the metal block $= 225 \times 150 \times 27 = 911250\ \text{cm}^3$
This metal block is melted and recast into cubes each of side 45 cm.
Volume of a cube $= (\text{side})^3 = 45^3 = 91125\ \text{cm}^3$
$\therefore$ The number of such cubes formed from the metal block $= \frac{\text{volume of the metal block}}{\text{volume of a metal cube}} = \frac{911250\ \text{cm}^3}{91125\ \text{cm}^3}$
$= 10$

PAGE NO 21.15:

Question 19:

A solid rectangular piece of iron measures 6 m by 6 cm by 2 cm. Find the weight of this piece, if 1 cm^3 of iron weighs 8 gm.

ANSWER:

The dimensions of the an iron piece is $6\ \text{m} \times 6\ \text{cm} \times 2\ \text{cm}$, i.e., $600\ \text{cm} \times 6\ \text{cm} \times 2\ \text{cm}$ $(\because 1\ \text{m} = 100\ \text{cm})$.
Its volume $= 600 \times 6 \times 2 = 7200\ \text{cm}^3$
Now, $1\ \text{cm}^3 = 8$ gm
i.e., $7200\ \text{cm}^3 = 7200 \times 8\ \text{gm} = 57600$ gm
$\therefore$ Weight of the iron piece $= 57600$ gm
$= 57600 \times \frac{1}{1000}\text{kg}$ $(\because 1\ \text{Kg} = 1000\ \text{gm})$
$= 57.6$ kg

Question 20:

Fill in the blanks in each of the following so as to make the statement true:
(i) 1 m^3 = ...cm^3
(ii) 1 litre = ... cubic decimetre
(iii) 1 kl = ... m^3
(iv) The volume of a cube of side 8 cm is ....
(v) The volume of a wooden cuboid of length 10 cm and breadth 8 cm is 4000 cm^3. The height of the cuboid is .... cm.
(vi) 1 cu.dm = ... cu. mm
(vii) 1 cu. km = ... cu. m
(viii) 1 litre = ... cu. cm
(ix) 1 ml = ... cu. cm
(x) 1 kl = ... cu. dm = ... cu. cm.

ANSWER:

(i)

$1\ m^3 = 1\ m \times 1\ m \times 1\ m$

$= 100\ cm \times 100\ cm \times 100\ cm \quad (\because\ 1\ m = 100\ cm)$

$= 1000000\ cm^3$

$= 10^6\ cm^3$

(ii)

$1\ L = \frac{1}{1000} m^3$

$= \frac{1}{1000} 1\ m \times 1\ m \times 1\ m$

$= \frac{1}{1000} \times 10\ dm \times 10\ dm \times 10\ dm$

$= 1\ dm^3$

(iii)

$1\ kL = 1000\ L$

$= 1\ m^3 \ (1000\ L = 1\ m^3)$

(iv)

Volume of a cube of side 8 cm $= (\text{side})^3 = 8^3 = 512\ cm^3$

(v)

Lenght of the wooden cuboid $= 10$ cm

Breadth $=$ 8 cm

Its volume $= 4000\ cm^3$

Suppose that the height of the cuboid is h cm.

Then, volume of the cuboid $=$ length $\times$ breadth $\times$ height

$\Rightarrow 4000 = 10 \times 8 \times h$

$\Rightarrow 4000 = 80 \times h$

$\Rightarrow h = \frac{4000}{80} = 50$ cm

(vi)

1 cu dm $= 1\ dm \times 1\ dm \times 1\ dm$

$= 100\ mm \times 100\ mm \times 100\ mm$

$= 1000000\ mm^3$

$= 10^6$ cu mm

(vii)

1 cu km $= 1\ km \times 1\ km \times 1\ km$

$= 1000\ m \times 1000\ m \times 1000\ m \ (\because\ 1\ km = 1000\ m)$

$= 1000000000\ m^3$

$= 10^9$ cu m

(viii)

$1\ L = \frac{1}{1000} m^3$

$= \frac{1}{1000} \times 1\ m \times 1\ m \times 1\ m$

$= \frac{1}{1000} \times 100\ cm \times 100\ cm \times 100\ cm \quad (\because\ 1\ m = 100\ cm)$

$= 1000\ cm^3$

$= 10^3$ cu cm

(ix)

$1\ mL = \frac{1}{1000} \times 1\ L = \frac{1}{1000} \times \frac{1}{1000} m^3$

$= \frac{1}{1000} \times \frac{1}{1000} \times 1\ m \times 1\ m \times 1\ m$

$= \frac{1}{1000} \times \frac{1}{1000} \times 100\ cm \times 100\ cm \times 100\ cm \quad (\because\ 1\ m = 100\ cm)$

$= 1$ cu cm

(x)

$1\ kL = 1000\ L = 1000 \times \frac{1}{1000} m^3 = 1\ m^3$

$= 1\ m \times 1\ m \times 1\ m$

$= 10\ dm \times 10\ dm \times 10\ dm \quad (\because\ 1\ m = 10\ dm)$

$= 1000$ cu dm

$= 1000 \times 10\ cm \times 10\ cm \times 10\ cm \quad (\because\ 1\ dm = 10\ cm)$

$= 1000000\ cm^3$

$= 10^6$ cu cm

Question 1:

Find the surface area of a cuboid whose
(i) length = 10 cm, breadth = 12 cm, height = 14 cm
(ii) length = 6 dm, breadth = 8 dm, height = 10 dm
(iii) length = 2 m, breadth = 4 m, height = 5 m
(iv) length = 3.2 m, breadth = 30 dm, height = 250 cm.

ANSWER:

(i)
Dimension of the cuboid :
$\text{Length} = 10\ \text{cm}$
$\text{Breadth} = 12\ \text{cm}$
$\text{Height} = 14\ \text{cm}$
$\text{Surface area of the cuboid} = 2 \times (\text{length} \times \text{breadth} + \text{breadth} \times \text{height} + \text{length} \times \text{height})$
$= 2 \times (10 \times 12 + 12 \times 14 + 10 \times 14)$
$= 2 \times (120 + 168 + 140)$
$= 856\ \text{cm}^2$
(ii)
Dimensions of the cuboid :
$\text{Length} = 6\ \text{dm}$
$\text{Breadth} = 8\ \text{dm}$
$\text{Height} = 10\ \text{dm}$
$\text{Surface area of the cuboid} = 2 \times (\text{length} \times \text{breadth} + \text{breadth} \times \text{height} + \text{length} \times \text{height})$
$= 2 \times (6 \times 8 + 8 \times 10 + 6 \times 10)$
$= 2 \times (48 + 80 + 60)$
$= 376\ \text{dm}^2$
(iii)
Dimensions of the cuboid :
$\text{Length} = 2\ \text{m}$
$\text{Breadth} = 4\ \text{m}$
$\text{Height} = 5\ \text{m}$
$\text{Surface area of the cuboid} = 2 \times (\text{length} \times \text{breadth} + \text{breadth} \times \text{height} + \text{length} \times \text{height})$
$= 2 \times (2 \times 4 + 4 \times 5 + 2 \times 5)$
$= 2 \times (8 + 20 + 10)$
$= 76\ \text{m}^2$
(iv)
Dimensions of the cuboid :
$\text{Length} = 3.2\text{m}$
$= 3.2 \times 10\ \text{dm} \quad (1\ \text{m} = 10\ \text{dm})$
$= 32\ \text{dm}$
$\text{Breadth} = 30\ \text{dm}$
$\text{Height} = 250\ \text{cm}$
$= 250 \times \frac{1}{10}\text{dm} \quad (10\,\text{cm} = 1\ \text{dm})$
$= 25\ \text{dm}$
$\text{Surface area of the cuboid} = 2 \times (\text{length} \times \text{breadth} + \text{breadth} \times \text{height} + \text{length} \times \text{height})$
$= 2 \times (32 \times 30 + 30 \times 25 + 32 \times 25)$
$= 2 \times (960 + 750 + 800)$
$= 5020\ \text{dm}^2$

Question 2:

Find the surface area of a cube whose edge is
(i) 1.2 m
(ii) 27 cm
(iii) 3 cm
(iv) 6 m
(v) 2.1 m

ANSWER:

(i)
Edge of the a cube $= 1.2$ m
$\therefore$ Surface area of the cube $= 6 \times (\text{side})^2 = 6 \times (1.2)^2 = 6 \times 1.44 = 8.64 \text{ m}^2$.
(ii)
Edge of the a cube $= 27$ cm
$\therefore$ Surface area of the cube $= 6 \times (\text{side})^2 = 6 \times (27)^2 = 6 \times 729 = 4374 \text{ cm}^2$
(iii)
Edge of the a cube $= 3$ cm
$\therefore$ Surface area of the cube $= 6 \times (\text{side})^2 = 6 \times (3)^2 = 6 \times 9 = 54 \text{ cm}^2$
(iv)
Edge of the a cube $= 6$ m
$\therefore$ Surface area of the cube $= 6 \times (\text{side})^2 = 6 \times (6)^2 = 6 \times 36 = 216 \text{ m}^2$
(v)
Edge of the a cube $= 2.1$ m
$\therefore$ Surface area of the cube $= 6 \times (\text{side})^2 = 6 \times (2.1)^2 = 6 \times 4.41 = 26.46 \text{ m}^2$

PAGE NO 21.22:

Question 3:

A cuboidal box is 5 cm by 5 cm by 4 cm. Find its surface area.

ANSWER:

The dimensions of the cuboidal box are $5 \text{ cm} \times 5 \text{ cm} \times 4$ cm.
Surface area of the cuboidal box $= 2 \times (\text{length} \times \text{breadth} + \text{breadth} \times \text{height} + \text{length} \times \text{height})$
$= 2 \times (5 \times 5 + 5 \times 4 + 5 \times 4)$
$= 2 \times (25 + 20 + 20)$
$= 130 \text{ cm}^2$

PAGE NO 21.22:

Question 4:

Find the surface area of a cube whose volume is
(i) 343 m^3
(ii) 216 dm^3

ANSWER:

(i)

Volume of the given cube $= 343\ \text{m}^3$

We know that volume of a cube $= (\text{side})^3$

$\Rightarrow (\text{side})^3 = 343$

i.e., side $= \sqrt[3]{343} = 7\ \text{m}$

$\therefore$ Surface area of the cube $= 6 \times (\text{side})^2 = 6 \times (7)^2 = 294\ \text{m}^2$

(ii)

Volume of the given cube $= 216\ \text{dm}^3$

We know that volume of a cube $= (\text{side})^3$

$\Rightarrow (\text{side})^3 = 216$

i.e., side $= \sqrt[3]{216} = 6\ \text{dm}$

$\therefore$ Surface area of the cube $= 6 \times (\text{side})^2 = 6 \times (6)^2 = 216\ \text{dm}^2$

PAGE NO 21.22:

Question 5:

Find the volume of a cube whose surface area is
(i) 96 cm^2
(ii) 150 m^2

ANSWER:

(i)

Surface area of the given cube $= 96\ \text{cm}^2$

Surface area of a cube $= 6 \times (\text{side})^2$

$\Rightarrow 6 \times (\text{side})^2 = 96$

$\Rightarrow (\text{side})^2 = \frac{96}{6} = 16$

i.e., side of the cube $= \sqrt{16} = 4\ \text{cm}$

$\therefore$ Volume of the cube $= (\text{side})^3 = (4)^3 = 64\ \text{cm}^3$

(ii)

Surface area of the given cube $= 150\ \text{m}^2$

Surface area of a cube $= 6 \times (\text{side})^2$

$\Rightarrow 6 \times (\text{side})^2 = 150$

$\Rightarrow (\text{side})^2 = \frac{150}{6} = 25$

i.e., side of the cube $= \sqrt{25} = 5\ \text{m}$

$\therefore$ Volume of the cube $= (\text{side})^3 = (5)^3 = 125\ \text{m}^3$

PAGE NO 21.22:

Question 6:

The dimensions of a cuboid are in the ratio 5 : 3 : 1 and its total surface area is 414 m^2. Find the dimensions.

ANSWER:

It is given that the sides of the cuboid are in the ratio $5:3:1$.
Suppose that its sides are x multiple of each other, then we have :
Length $= 5x$ m
Breadth $= 3x$ m
Height $= x$ m
Also, total surface area of the cuboid $= 414\ \text{m}^2$
Surface area of the cuboid $= 2 \times (\text{length} \times \text{breadth} + \text{breadth} \times \text{height} + \text{length} \times \text{height})$
$\Rightarrow 414 = 2 \times (5x \times 3x + 3x \times 1x + 5x \times x)$
$\Rightarrow 414 = 2 \times (15x^2 + 3x^2 + 5x^2)$
$\Rightarrow 414 = 2 \times (23x^2)$
$\Rightarrow 2 \times (23 \times x^2) = 414$
$\Rightarrow (23 \times x^2) = \frac{414}{2} = 207$
$\Rightarrow x^2 = \frac{207}{23} = 9$
$\Rightarrow x = \sqrt{9} = 3$
Therefore, we have the following :
Lenght of the cuboid $= 5 \times \text{x} = 5 \times 3 = 15$ m
Breadth of the cuboid $= 3 \times \text{x} = 3 \times 3 = 9$ m
Height of the cuboid $= \text{x} = 1 \times 3 = 3$ m

PAGE NO 21.22:

Question 7:

Find the area of the cardboard required to make a closed box of length 25 cm, 0.5 m and height 15 cm.

ANSWER:

Length of the box $= 25$ cm
Width of the box $= 0.5$ m
$= 0.5 \times 100$ cm $(\because 1\ \text{m} = 100\ \text{cm})$
$= 50$ cm
Height of the box $= 15$ cm
$\therefore$ Surface area of the box $= 2 \times (\text{length} \times \text{breadth} + \text{breadth} \times \text{height} + \text{length} \times \text{height})$
$= 2 \times (25 \times 50 + 50 \times 15 + 25 \times 15)$
$= 2 \times (1250 + 750 + 375)$
$= 4750\ \text{cm}^2$

PAGE NO 21.22:

Question 8:

Find the surface area of a wooden box whose shape is of a cube, and if the edge of the box is 12 cm.

ANSWER:

It is given that the side of the cubical wooden box is 12 cm.
$\therefore$ Surface area of the cubical box $= 6 \times (\text{side})^2 = 6 \times (12)^2 = 864\ \text{cm}^2$

PAGE NO 21.22:

Question 9:

The dimensions of an oil tin are 26 cm × 26 cm × 45 cm. Find the area of the tin sheet required for making 20 such tins. If 1 square metre of the tin sheet costs Rs 10, find the cost of tin sheet used for these 20 tins.

ANSWER:

Dimensions of the oil tin are $26 \text{ cm} \times 26 \text{ cm} \times 45$ cm.
So, the area of tin sheet required to make one tin $= 2$
$\times$ (length $\times$ breadth $+$ breadth $\times$ height $+$ length $\times$ height)
$= 2 \times (26 \times 26 + 26 \times 45 + 26 \times 45)$
$= 2 \times (676 + 1170 + 1170) = 6032 \text{ cm}^2$
Now, area of the tin sheet required to make 20 such tin $s = 20 \times$ surface area of one tin
$= 20 \times 6032$
$= 120640 \text{ cm}^2$
It can be observed that $120640 \text{ cm}^2 = 120640 \times 1\text{cm} \times 1 \text{ cm}$

$$= 120640 \times \frac{1}{100}\text{m} \times \frac{1}{100}\text{m} \quad (\because 100 \text{ cm} = 1 \text{ m})$$
$$= 12.0640 \text{ m}^2$$

Also, it is given that the cost of 1 m^2 of tin sheet $=$ Rs 10
$\therefore$ The cost of 12.0640 m^2 of tin sheet $= 12.0640 \times 10 =$ Rs 120.6

PAGE NO 21.22:

Question 10:

A cloassroom is 11 m long, 8 m wide and 5 m high. Find the sum of the areas of its floor and the four walls (including doors, windows, etc.)

ANSWER:

Lenght of the classroom $= 11$ m
Width $= 8$ m
Height $= 5$ m
We have to find the sum of the areas of its floor and the four walls (i.e., like an open box).
$\therefore$ The sum of areas of the floor and the four walls $=$ (length $\times$ width) $+ 2$
$\times$ (width $\times$ height $+$ length $\times$ height)
$= (11 \times 8) + 2 \times (8 \times 5 + 11 \times 5)$
$= 88 + 2 \times (40 + 55)$
$= 88 + 190$
$= 278 \text{ m}^2$

PAGE NO 21.22:

Question 11:

A swimming pool is 20 m long 15 m wide and 3 m deep. Find the cost of repairing the floor and wall at the rate of Rs 25 per square metre.

ANSWER:

Length of the swimming pool $= 20$ m
Breadth $= 15$ m
Height $= 3$ m
Now, surface area of the floor and all four walls of the pool $=$ (length $\times$ breadth) $+ 2$
$\times$ (breadth $\times$ height $+$ length $\times$ height)
$= (20 \times 15) + 2 \times (15 \times 3 + 20 \times 3)$
$= 300 + 2 \times (45 + 60)$
$= 300 + 210$
$= 510 \text{ m}^2$
The cost of repairing the floor and the walls is Rs $25/\text{m}^2$.
$\therefore$ The total cost of repairing 510 m^2 area $= 510 \times 25 =$ Rs 12750

PAGE NO 21.22:

Question 12:

The perimeter of a floor of a room is 30 m and its height is 3 m. Find the area of four walls of the room.

ANSWER:

Perimeter of the floor of the room $= 30$ m
Height of the oom $= 3$ m
Perimeter of a rectangle $= 2 \times (\text{length} + \text{breadth}) = 30$ m
So, area of the four walls $= 2 \times (\text{length} \times \text{height} + \text{breadth} \times \text{height})$
$= 2 \times (\text{length} + \text{breadth}) \times \text{height}$
$= 30 \times 3 = 90\ \text{m}^2$

PAGE NO 21.22:

Question 13:

Show that the product of the areas of the floor and two adjacent walls of a cuboid is the square of its volume.

ANSWER:

Suppose that the length, breadth and height of the cuboidal floor are l cm, b cm and h cm, respectively.
Then, area of the floor $= l \times b\ \text{cm}^2$
Area of the wall $= b \times h\ \text{cm}^2$
Area of its adjacent wall $= l \times h\ \text{cm}^2$
Now, product of the areas of the floor and the two adjacent walls $= (l \times b) \times (b \times h) \times (l \times h)$
$= l^2 \times b^2 \times h^2 = (l \times b \times h)^2$
Also, volume of the cuboid $= l \times b \times h\ \text{cm}^2$
$\therefore$ Product of the areas of the floor and the two adjacent walls $= (l \times b \times h)^2 = (\text{volume})^2$

PAGE NO 21.22:

Question 14:

The walls and ceiling of a room are to be plastered. The length, breadth and height of the room are 4.5 m, 3 m and 350 cm, respectively. Find the cost of plastering at the rate of Rs 8 per square metre.

ANSWER:

Length of a room $= 4.5$ m
Breadth $= 3$ m
Height $= 350$ cm
$= \frac{350}{100}$ m $\quad (\because 1\ \text{m} = 100\ \text{cm})$
$= 3.5$ m
Since only the walls and the ceiling of the room are to be plastered, we have :
So, total area to be plastered = area of the ceiling + area of the walls
$= (\text{length} \times \text{breadth}) + 2 \times (\text{length} \times \text{height} + \text{breadth} \times \text{height})$
$= (4.5 \times 3) + 2 \times (4.5 \times 3.5 + 3 \times 3.5)$
$= 13.5 + 2 \times (15.75 + 10.5)$
$= 13.5 + 2 \times (26.25)$
$= 66\ \text{m}^2$
Again, cost of plastering an area of $1\ \text{m}^2 = $ Rs 8
$\therefore$ Total cost of plastering an area of $66\ \text{m}^2 = 66 \times 8 = $ Rs 528

PAGE NO 21.23:

Question 15:

A cuboid has total surface area of 50 m^2 and lateral surface area is 30 m^2. Find the area of its base.

ANSWER:

$$\text{Total surface area of the cuboid} = 50\ \text{m}^2$$
$$\text{Its lateral surface area} = 30\ \text{m}^2$$
$$\text{Now, total surface area of the cuboid} = 2\times(\text{surface area of the base})$$
$$+(\text{surface area of the 4 walls})$$
$$\Rightarrow 50 = 2\times(\text{surface area of the base}) + (30)$$
$$\Rightarrow 2\times(\text{surface area of the base}) = 50 - 30 = 20$$
$$\therefore \text{ Surface area of the base} = \frac{20}{2} = 10\ \text{m}^2$$

PAGE NO 21.23:

Question 16:

A classroom is 7 m long, 6 m broad and 3.5 m high. Doors and windows occupy an area of 17 m^2. What is the cost of white-washing the walls at the rate of Rs 1.50 per m^2.

ANSWER:

$$\text{Length of the classroom} = 7\text{m}$$
$$\text{Breadth of the classroom} = 6\ \text{m}$$
$$\text{Height of the classroom} = 3.5\ \text{m}$$
$$\text{Total surface area of the classroom to be whitewashed} = \text{areas of the 4 walls}$$
$$= 2\times(\text{breadth}\times\text{height} + \text{length}\times\text{height})$$
$$= 2\times(6\times3.5 + 7\times3.5)$$
$$= 2\times(21 + 24.5)$$
$$= 91\ \text{m}^2$$
$$\text{Also, the doors and windows occupy } 17\ \text{m}^2.$$
$$\text{So, the remaining area to be whitewashed} = 91 - 17 = 74\ \text{m}^2$$
$$\text{Given that the cost of whitewashing } 1\ \text{m}^2 \text{ of wall} = \text{Rs } 1.50$$
$$\therefore \text{ Total cost of whitewashing } 74\ \text{m}^2 \text{ of area} = 74\times1.50 = \text{Rs } 111$$

PAGE NO 21.23:

Question 17:

The central hall of a school is 80 m long and 8 m high. It has 10 doors each of size 3 m × 1.5 m and 10 windows each of size 1.5 m × 1 m. If the cost of white-washing the walls of the hall at the rate of Rs 1.20 per m^2 is Rs 2385.60, fidn the breadth of the hall.

ANSWER:

Suppose that the breadth of the hall is b m.
Lenght of the hall $= 80$ m
Height of the hall $= 8$ m
Total surface area of 4 walls including doors and windows $= 2 \times (\text{length} \times \text{height} + \text{breadth} \times \text{height})$
$= 2 \times (80 \times 8 + \text{b} \times 8)$
$= 2 \times (640 + 8\text{b})$
$= 1280 + 16\text{b m}^2$
The walls have 10 doors each of dimensions $3 \text{ m} \times 1.5 \text{ m}$.
i.e., area of a door $= 3 \times 1.5 = 4.5 \text{ m}^2$
$\therefore$ Area of 10 doors $= 10 \times 4.5 = 45 \text{ m}^2$
Also, there are 10 windows each of dimensions $1.5 \text{ m} \times 1 \text{ m}$.
i.e., area of one window $= 1.5 \times 1 = 1.5 \text{ m}^2$
$\therefore$ Area of 10 windows $= 10 \times 1.5 = 15 \text{ m}^2$
Thus, total area to be whitwashed $=$ (total area of 4 walls) $-$ (areas of 10 doors $+$ areas of 10 windows)
$= (1280 + 16b) - (45 + 15)$
$= 1280 + 16b - 60$
$= 1220 + 16b \text{ m}^2$
It is given that the cost of whitewashing 1 m^2 of area $=$ Rs 1.20
$\therefore$ Total cost of whitewashing the walls $= (1220 + 16b) \times 1.20$
$= 1220 \times 1.20 + 16b \times 1.20$
$= 1464 + 19.2b$
Since the total cost of whitewashing the walls is Rs 2385.60, we have:
$1464 + 19.2b = 2385.60$
$\Rightarrow 19.2b = 2385.60 - 1464$
$\Rightarrow 19.2b = 921.60$
$\Rightarrow b = \frac{921.60}{19.2} = 48 \text{ m}$
$\therefore$ The breadth of the central hall is 48 m.

PAGE NO 21.30:

Question 1:

Find the length of the longest rod that can be placed in a room 12 m long, 9 m broad and 8 m high.

ANSWER:

Length of the room $= 12$ m
Breadth $= 9$ m
Height $= 8$ m
Since the room is cuboidal in shape, the length of the longest rod that can be placed in the room will be equal to the length of the diagonal between opposite vertices.
Length of the diagonal of the floor using the Pythagorus theorem
$= \sqrt{\text{l}^2 + \text{b}^2}$
$= \sqrt{(12)^2 + (9)^2}$
$= \sqrt{144 + 81}$
$= \sqrt{225}$
$= 15$ m
i.e., the length of the longest rod would be equal to the length of the diagonal of the right angle triangle of base 15 m and altitude 8 m.
Similarly, using the Pythagorus theorem, length of the diagonal
$= \sqrt{15^2 + 8^2}$
$= \sqrt{225 + 64}$
$= 17$ m
$\therefore$ The length of the longest rod that can be placed in the room is 17 m.

PAGE NO 21.30:

Question 2:

If V is the volume of a cuboid of dimensions a, b, c and S is its surface area, then prove that
$\frac{1}{V}=\frac{2}{S}\left(\frac{1}{a}+\frac{1}{b}+\frac{1}{c}\right)$

ANSWER:

It is given that V is the volume of a cuboid of length $= a$, breadth $= b$ and height $= c$. Also, S is surface area of cuboid.

Then, $V = a \times b \times c$

Surface area of the cuboid $= 2 \times \left(\text{length} \times \text{breadth} + \text{breadth} \times \text{height} + \text{length} \times \text{height}\right)$

$\Rightarrow S = 2 \times \left(a \times b + b \times c + a \times c\right)$

Let us take the right − hand side of the equation to be proven.

$\frac{2}{S}\left(\frac{1}{a}+\frac{1}{b}+\frac{1}{c}\right) = \frac{2}{2\times(a\times b+b\times c+a\times c)} \times \left(\frac{1}{a}+\frac{1}{b}+\frac{1}{c}\right)$

$= \frac{1}{(a\times b+b\times c+a\times c)} \times \left(\frac{1}{a}+\frac{1}{b}+\frac{1}{c}\right)$

Now, multiplying the numerator and the denominator with $a \times b \times c$, we get :

$\frac{1}{(a\times b+b\times c+a\times c)} \times \left(\frac{1}{a}+\frac{1}{b}+\frac{1}{c}\right) \times \frac{a\times b\times c}{a\times b\times c}$

$= \frac{1}{(a\times b+b\times c+a\times c)} \times \left(\frac{a\times b\times c}{a}+\frac{a\times b\times c}{b}+\frac{a\times b\times c}{c}\right) \times \frac{1}{a\times b\times c}$

$= \frac{1}{(a\times b+b\times c+a\times c)} \times \left(b \times c + a \times c + a \times b\right) \times \frac{1}{a\times b\times c}$

$= \frac{1}{(a\times b+b\times c+a\times c)} \times \left(a \times b + b \times c + a \times c\right) \times \frac{1}{a\times b\times c}$

$= \frac{1}{a\times b\times c}$

$= \frac{1}{V}$

$\therefore \frac{2}{S}\left(\frac{1}{a}+\frac{1}{b}+\frac{1}{c}\right) = \frac{1}{V}$

PAGE NO 21.30:

Question 3:

The areas of three adjacent faces of a cuboid are x, y and z. If the volume is V, prove that $V^2 = xyz$.

ANSWER:

The areas of three adjacent faces of a cuboid are x, y and z.

Volume of the cuboid $=$ V

Observe that $x = \text{length} \times \text{breadth}$

$y = \text{breadth} \times \text{height}$,

$z = \text{length} \times \text{height}$

Since volume of cuboid V $= \text{length} \times \text{breadth} \times \text{height}$, we have :

$V^2 = V \times V$

$= (\text{length} \times \text{breadth} \times \text{height}) \times (\text{length} \times \text{breadth} \times \text{height})$

$= (\text{length} \times \text{breadth}) \times (\text{breadth} \times \text{height}) \times (\text{length} \times \text{height})$

$= x \times y \times z$

$= xyz$

$\therefore V^2 = xyz$

PAGE NO 21.30:

Question 4:

A rectangular water reservoir contains 105 m^3 of water. Find the depth of the water in the reservoir if its base measures 12 m by 3.5 m.

ANSWER:

Length of the rectangular water reservoir $= 12$ m
Breadth $= 3.5$ m
Suppose that the height of the reservoir $= h$ m
Also, it contains $105\ m^3$ of water, i.e., its volume $= 105\ m^3$
Volume of the cuboidal water reservoir $=$ length $\times$ breadth $\times$ height
$\Rightarrow 105 = 12 \times 3.5 \times h$
$\Rightarrow 105 = 42 \times h$
$\Rightarrow h = \frac{105}{42} = 2.5$ m
$\therefore$ The depth of the water in the reservoir is 2.5 m.

PAGE NO 21.30:

Question 5:

Cubes *A*, *B*, *C* having edges 18 cm, 24 cm and 30 cm respectively are melted and moulded into a new cube *D*. Find the edge of the bigger cube *D*.

ANSWER:

We have the following :
Length of the edge of cube A $= 18$ cm
Length of the edge of cube B $= 24$ cm
Length of the edge of cube C $= 30$ cm
The given cubes are melted and moulded into a new cube D.
Hence, volume of cube D $=$ volume of cube A $+$ volume of cube B $+$ volume of cube C
$= (\text{side of cube A})^3 + (\text{side of cube B})^3 + (\text{side of cube C})^3$
$= 18^3 + 24^3 + 30^3$
$= 5832 + 13824 + 27000$
$= 46656\ cm^3$
Suppose that the edge of the new cube D $= x$
$\Rightarrow x^3 = 46656$
$\Rightarrow x = \sqrt[3]{46656} = 36$ cm
$\therefore$ The edge of the bigger cube D is 36 cm.

PAGE NO 21.30:

Question 6:

The breadth of a room is twice its height, one half of its length and the volume of the room is 512 cu. dm. Find its dimensions.

ANSWER:

Suppose that the breadth of the room $= x$ dm
Since breadth is twice the height, breadth $= 2 \times$ height
So, height of the room $= \frac{\text{breadth}}{2} = \frac{x}{2}$
Also, it is given that the breadth is half the length.
So, breadth $= \frac{1}{2} \times$ length
i.e., length $= 2 \times$ breadth $= 2 \times x$
Since volume of the room $= 512$ cu dm, we have :
Volume of a cuboid $=$ length $\times$ breadth $\times$ height
$\Rightarrow 512 = 2 \times x \times x \times \frac{x}{2}$
$\Rightarrow 512 = x^3$
$\Rightarrow x = \sqrt[3]{512} = 8$ dm
Hence, length of the room $= 2 \times x = 2 \times 8 = 16$ dm
Breadth of the room $= x = 8$ dm
Height of the the room $= \frac{x}{2} = \frac{8}{2} = 4$ dm

Question 7:

A closed iron tank 12 m long, 9 m wide and 4 m deep is to be made. Determine the cost of iron sheet used at the rate of Rs 5 per metre sheet, sheet being 2 m wide.

ANSWER:

A closed iron tank of dimensions $12\ \text{m}$ long, $9\ \text{m}$ wide and $4\ \text{m}$ deep is to be made.
Surface area of the cuboidal tank $= 2 \times (\text{length} \times \text{breadth} + \text{breadth} \times \text{height} + \text{length} \times \text{height})$
$= 2 \times (12 \times 9 + 9 \times 4 + 12 \times 4)$
$= 2 \times (108 + 36 + 48)$
$= 384\ \text{m}^2$
Also, the cost of an iron sheet is Rs 5 per metre and the sheet is 2 metres wide.
i.e., area of a sheet $= 1\ \text{m} \times 2\ \text{m} = 2\ \text{m}^2$
So, the cost of $2\ \text{m}^2$ of iron sheet = Rs 5
i.e., the cost of $1\ \text{m}^2$ of iron sheet = Rs $\frac{5}{2}$
$\therefore$ Cost of $384\ \text{m}^2$ of iron sheet $= 384 \times \frac{5}{2} =$ Rs 960

Question 8:

A tank open at the top is made of iron sheet 4 m wide. If the dimensions of the tank are 12 m × 8 m × 6 m, find the cost of iron sheet at Rs 17.50 per metre.

ANSWER:

An open iron tank of dimensions $12\ \text{m} \times 8\ \text{m} \times 6\ \text{m}$ is to be made.
Surface area of the open tank = (area of the base) + (total area of the 4 walls)
$= (12 \times 8) + 2 \times (8 \times 6 + 12 \times 6)$
$= (96) + 2 \times (48 + 72)$
$= 336\ \text{m}^2$
Also, it is given that the cost of the iron sheet that is $4\ \text{m}$ wide is Rs 17.50 per metre.
i.e., the area of the iron sheet $= 1\ \text{m} \times 4\ \text{m} = 4\ \text{m}^2$
So, the cost of $4\ \text{m}^2$ of iron sheet = Rs 17.50
$\therefore$ The cost of iron sheet required to an iron tank of surface area $336\ \text{m}^2 = 336 \times \frac{17.50}{4} =$ Rs 1470

Question 9:

Three equal cubes are placed adjacently in a row. Find the ratio of total surface area of the new cuboid to that of the sum of the surface areas of the three cubes.

ANSWER:

Suppose that the side of the cube $= \mathbf{x}$ cm

Surface area of the cube $= 6 \times (\text{side})^2 = 6 \times \mathbf{x}^2 = 6\mathbf{x}^2$ cm^2

i.e., the sum of the surface areas of three such cubes $= 6\mathbf{x}^2 + 6\mathbf{x}^2 + 6\mathbf{x}^2 = 18\,\mathbf{x}^2$ cm^2

Now, these three cubes area placed together to form a cuboid.

Then the length of the new cuboid will be 3 times the edge of the cube $= 3 \times \mathbf{x} = 3\mathbf{x}$ cm

Breadth of the cuboid $= \mathbf{x}$ cm

Height of the cuboid $= \mathbf{x}$ cm

$\therefore$ Total surface area of the cuboid $= 2 \times (\text{length} \times \text{breadth} + \text{breadth} \times \text{height} + \text{length} \times \text{height})$

$= 2 \times (3\mathbf{x} \times \mathbf{x} + \mathbf{x} \times \mathbf{x} + 3\mathbf{x} \times \mathbf{x})$

$= 2 \times (3\mathbf{x}^2 + \mathbf{x}^2 + 3\mathbf{x}^2)$

$= 2 \times (7\mathbf{x}^2)$

$= 14\mathbf{x}^2$ cm

i.e., the ratio of the total surface area cuboid to the sum of the surface areas of the three cubes =

$14\,x^2\,cm^2 \;:\; 18\,x^2\,cm^2$

$= \;7 : 9$

Hence, the ratio is 7:9.

PAGE NO 21.30:

Question 10:

The dimensions of a room are 12.5 m by 9 m by 7 m. There are 2 doors and 4 windows in the room; each door measures 2.5 m by 1.2 m and each window 1.5 m by 1 m. Find the cost of painting the walls at Rs 3.50 per square metre.

ANSWER:

The dimensions of the room are $12.5\,\text{m} \times 9\,\text{m} \times 7\,\text{m}$.

Hence, the surface area of walls $= 2 \times (\text{length} \times \text{height} + \text{breadth} \times \text{height})$

$= 2 \times (12.5 \times 7 + 9 \times 7)$

$= 301\,\text{m}^2$

Also, there are 2 doors and 4 windows in the room.

The dimensions of door are $2.5\,\text{m} \times 1.2\,\text{m}$.

i.e., area of a door $= 2.5 \times 1.2 = 3\,\text{m}^2$

$\therefore$ Total area of 2 doors $= 2 \times 3 = 6\,\text{m}^2$

The dimensions of a window are $1.5\,\text{m} \times 1\,\text{m}$.

i.e., area of a window $= 1.5 \times 1 = 1.5\,\text{m}^2$

$\therefore$ Total area of 4 windows $= 4 \times 1.5 = 6\,\text{m}^2$

Hence, the total area to be painted $= 301 - (6 + 6) = 289\,\text{m}^2$

The rate of painting $1\,\text{m}^2$ of wall $=$ Rs 3.50

$\therefore$ The total cost of painting $289\,\text{m}^2$ of wall $=$ Rs $289 \times 3.50 =$ Rs 1011.50

PAGE NO 21.30:

Question 11:

A field is 150 m long and 100 m wide. A plot (outside the field) 50 m long and 30 m wide is dug to a depth of 8 m and the earth taken out from the plot is spread evenly in the field. By how much is the level of field raised?

ANSWER:

The dimensions of the plot dug outside the field are $50 \text{ m} \times 30 \text{ m} \times 8 \text{ m}$.
Hence, volume of the earth dug – out from the plot $= 50 \times 30 \times 8 = 12000 \text{ m}^3$
Suppose that the level of the earth rises by h m.
When we spread this dug – out earth on the field of length 150 m, breadth 100 m and height h m, we have :
Volume of earth dug – out $= 150 \times 100 \times h$
$\Rightarrow 12000 = 15000 \times h$
$\Rightarrow h = \frac{12000}{15000} = 0.8 \text{ m}$
$\Rightarrow h = 80 \text{ cm} \quad (\because 1 \text{ m} = 100 \text{ cm})$
$\therefore$ The level of the field will rise by 80 cm.

PAGE NO 21.30:

Question 12:

Two cubes, each of volume 512 cm^3 are joined end to end. Find the surface area of the resulting cuboid.

ANSWER:

Two cubes each of volume 512 cm^3 are joined end to end.
Now, volume of a cube $= (\text{side})^3$
$\Rightarrow 512 = (\text{side})^3$
$\Rightarrow$ Side of the cube $= \sqrt[3]{512} = 8$ cm
If the cubes area joined side by side, then the length of the resulting cuboid is $2 \times 8 \text{ cm} = 16$ cm.
Breadth $= 8$ cm
Height $= 8$ cm
$\therefore$ Surface area of the cuboid $= 2 \times (\text{length} \times \text{breadth} + \text{breadth} \times \text{height} + \text{length} \times \text{height})$
$= 2 \times (16 \times 8 + 8 \times 8 + 16 \times 8)$
$= 2 \times (128 + 64 + 128)$
$= 640 \text{ cm}^2$

PAGE NO 21.30:

Question 13:

Three cubes whose edges measure 3 cm, 4 cm, and 5 cm respectively are melted to form a new cube. Find the surface area of the new cube formed.

ANSWER:

Three cubes of edges 3 cm, 4 cm and 5 cm are melted and molded to form a new cube.
i.e., volume of the new cube = sum of the volumes of the three cubes
$= (3)^3 + (4)^3 + (5)^3$
$= 27 + 64 + 125$
$= 216 \text{ cm}^3$
We know that volume of a cube $= (\text{side})^3$
$\Rightarrow 216 = (\text{side})^3$
$\Rightarrow$ Side of the new cube $= \sqrt[3]{216} = 6$ cm
$\therefore$ Surface area of the new cube $= 6 \times (\text{side})^2 = 6 \times (6)^2 = 216 \text{ cm}^2$

PAGE NO 21.30:

Question 14:

The cost of preparing the walls of a room 12 m long at the rate of Rs 1.35 per square metre is Rs 340.20 and the cost of matting the floor at 85 paise per square metre is Rs 91.80. Find the height of the room.

ANSWER:

The cost of preparing 4 walls of a room whose length is 12 m is Rs 340.20 at a rate of Rs 1.35 /m^2.

$\therefore$ Area of the four walls of the room $= \frac{\text{total cost}}{\text{rate}} = \frac{\text{Rs } 340.20}{\text{Rs } 1.35} = 252 \text{ m}^2$

Also, the cost of matting the floor at 85 paise /m^2 is Rs 91.80.

$\therefore$ Area of the floor $= \frac{\text{total cost}}{\text{rate}} = \frac{\text{Rs } 91.80}{\text{Rs } 0.85} = 108 \text{ m}^2$

Hence, breadth of the room $= \frac{\text{area of the floor}}{\text{length}} = \frac{108}{12} = 9 \text{ m}$

Suppose that the height of the room is h m. Then, we have :

Area of four walls $= 2 \times (\text{length} \times \text{height} + \text{breadth} \times \text{height})$

$\Rightarrow 252 = 2 \times (12 \times h + 9 \times h)$

$\Rightarrow 252 = 2 \times (21h)$

$\Rightarrow 21h = \frac{252}{2} = 126$

$\Rightarrow h = \frac{126}{21} = 6 \text{ m}$

$\therefore$ The height of the room is 6 m.

PAGE NO 21.30:

Question 15:

The length of a hall is 18 m and the width 12 m. The sum of the areas of the floor and the flat roof is equal to the sum of the areas of the four walls. Find the height of the wall.

ANSWER:

Length of the hall $= 18$ m

Its width $= 12$ m

Suppose that the height of the wall is h m.

Also, sum of the areas of the floor and the flat roof = sum of the areas of the four walls

$\Rightarrow 2 \times (\text{length} \times \text{breadth}) = 2 \times (\text{length} + \text{breadth}) \times \text{height}$

$\Rightarrow 2 \times (18 \times 12) = 2 \times (18 + 12) \times h$

$\Rightarrow 432 = 60 \times h$

$\Rightarrow h = \frac{432}{60} = 7.2 \text{ m}$

$\therefore$ The height of wall is 7.2 m.

PAGE NO 21.30:

Question 16:

A metal cube of edge 12 cm is melted and formed into three smaller cubes. If the edges of the two smaller cubes are 6 cm and 8 cm, find the edge of the third smaller cube.

ANSWER:

Let the edge of the third cube be x cm.

Three small cubes are formed by melting the cube of edge 12 cm.

Edges of two small cubes are 6 cm and 8 cm.

Now, volume of a cube $= (\text{side})^3$

Volume of the big cube = sum of the volumes of the three small cubes

$\Rightarrow (12)^3 = (6)^3 + (8)^3 + (x)^3$

$\Rightarrow 1728 = 216 + 512 + x^3$

$\Rightarrow x^3 = 1728 - 728 = 1000$

$\Rightarrow x = \sqrt[3]{1000} = 10 \text{ cm}$

$\therefore$ The edge of the third cube is 10 cm.

PAGE NO 21.30:

Question 17:

The dimensions of a cinema hall are 100 m, 50 m and 18 m. How many persons can sit in the hall, if each person requires 150 m^3 of air?

ANSWER:

The dimensions of a cinema hall are $100 \text{ m} \times 50 \text{ m} \times 18 \text{ m}$.
i.e., volume of air in the cinema hall $= 100 \times 50 \times 18 = 90000 \text{ m}^3$
It is given that each person requires 150 m^3 of air.
$\therefore$ The number of persons that can sit in the cinema hall $= \frac{\text{volume of air in hall}}{\text{volume of air required by 1 person}} = \frac{90000}{150}$
$= 600$

PAGE NO 21.30:

Question 18:

The external dimensions of a closed wooden box are 48 cm, 36 cm, 30 cm. The box is made of 1.5 cm thick wood. How many bricks of size 6 cm × 3 cm × 0.75 cm can be put in this box?

ANSWER:

The outer dimensions of the closed wooden box are $48 \text{ cm} \times 36 \text{ cm} \times 30$ cm.
Also, the box is made of a 1.5 cm thick wood, so the inner dimensions of the box will be $(2\times1.5=3)$cm less.
i.e., the inner dimensions of the box are $45 \text{ cm} \times 33 \text{ cm} \times 27 \text{ cm}$
$\therefore$ Volume of the box $= 45 \times 33 \times 27 = 40095 \text{ cm}^3$
Also, the dimensions of a brick are $6 \text{ cm} \times 3 \text{ cm} \times 0.75$ cm.
Volume of a brick $= 6 \times 3 \times 0.75 = 13.5 \text{ cm}^3$
$\therefore$ The number of bricks that can be put in the box $= \frac{40095}{13.5} = 2970$

PAGE NO 21.31:

Question 19:

The dimensions of a rectangular box are in the ratio of 2 : 3 : 4 and the difference between the cost of covering it with sheet of paper at the rates of Rs 8 and Rs 9.50 per m^2 is Rs. 1248. Find the dimensions of the box.

ANSWER:

Suppose that the dimensions be x multiple of each other.
The dimensions are in the ratio $2:3:4$.
Hence, length $= 2x$ m
Breadth $= 3x$ m
Height $= 4x$ m
So, total surface area of the rectangular box $= 2 \times (\text{length} \times \text{breadth} + \text{breadth} \times \text{height} + \text{length} \times \text{height})$
$= 2 \times (2x \times 3x + 3x \times 4x + 2x \times 4x)$
$= 2 \times (6x^2 + 12x^2 + 8x^2)$
$= 2 \times (26x^2)$
$= 52x^2\ m^2$
Also, the cost of covering the box with paper at the rate Rs $8/m^2$ and Rs $9.50/m^2$ is Rs 1248.
Here, the total cost of covering the box at a rate of Rs $8/m^2 = 8 \times 52x^2 =$ Rs $416x^2$
And the total cost of covering the box at a rate of Rs $9.50/m^2 = 9.50 \times 52x^2 =$ Rs $494x^2$
Now, total cost of covering the box at the rate Rs $9.50/m^2$ − total cost of covering the box at the rate Rs $8/m^2 = 1248$
$\Rightarrow 494x^2 - 416x^2 = 1248$
$\Rightarrow 78x^2 = 1248$
$\Rightarrow x^2 = \frac{1248}{78} = 16$
$\Rightarrow x = \sqrt{16} = 4$
Hence, length of the rectangular box $= 2 \times x = 2 \times 4 = 8$ m
Breadth $= 3 \times x = 3 \times 4 = 12$ m
Height $= 4 \times x = 4 \times 4 = 16$ m

PAGE NO 21.8:

Question 1:

Find the volume of a cuboid whose
(i) length = 12 cm, breadth = 8 cm, height = 6 cm
(ii) length =1.2 m, breadth = 30 cm, height = 15 cm
(iii) length = 15 cm, breadth = 2.5 dm, height = 8 cm.

ANSWER:

(i)
In the given cuboid, we have:
length$=12$ cm, breadth$=8$ cm and height$=6$ cm
$\therefore$ Volume of the cuboid $=$ length$\times$breadth$\times$height
$=12\times8\times6$
$=576$ cm ^{3}
(ii)
In the given cuboid, we have:
length$=1.2$ m
$=1.2\times100$ cm $(1 \text{ m} = 100 \text{ cm})$
$=120$ cm
breadth$=30$ cm
height$=15$ cm
$\therefore$ Volume of the cuboid $=$ length$\times$breadth$\times$height
$=120\times30\times15$
$=54000$ cm ^{3}
(iii)
In the given cuboid, we have:
length$=1.5$ dm
$=1.5\times10$ $(1 \text{ dm} = 10 \text{ cm})$
$= 15$ cm
breadth$=2.5$ dm$=2.5\times10$ cm$=25$ cm
height$=8$ cm
$\therefore$ Volume of cuboid $=$ length$\times$breadth$\times$height
$=15\times25\times8$
$=3000$ cm ^{3}

PAGE NO 21.8:

Question 2:

Find the volume of a cube whose side is
(i) 4 cm
(ii) 8 cm
(iii) 1.5 dm
(iv) 1.2 m
(v) 25 mm

ANSWER:

(i)
The side of the given cube is 4 cm.
$\therefore$ Volume of the cube$=(\text{side})^3=(4)^3=64 \text{ cm}^3$
(ii)
The side of the given cube is 8 cm.
$\therefore$ Volume of the cube$=(\text{side})^3 = (8)^3 = 512 \text{ cm}^3$
(iii)
The side of the given cube $=$ 1.5 dm$=1.5\times10$ cm$=15$ cm
$\therefore$ Volume of the cube$=(\text{side})^3=(15)^3=3375 \text{ cm}^3$
(iv)
The side of the given cube $= 1.2$ m$=1.2\times100$ cm$=120$ cm
$\therefore$ Volume of the cube$=(\text{side})^3=(120)^3=1728000 \text{ cm}^3$
(v)
The side of the given cube $= 25$ mm $= \frac{25}{10}$ cm$=2.5$ cm
$\therefore$ Volume of the cube$=(\text{side})^3=(2.5)^3=15.625 \text{ cm}^3$

PAGE NO 21.8:

Question 3:

Find the height of a cuboid of volume 100 cm^3, whose length and breadth are 5 cm and 4 cm respectively.

ANSWER:

Let us suppose that the height of the cuboid is h cm.
Given :
Volume of the cuboid $= 100\ cm^3$
Length $= 5$ cm
Breadth $= 4$ cm
Now, volume of the cuboid $=$ length $\times$ breadth $\times$ height
$\Rightarrow 100 = 5 \times 4 \times h$
$\Rightarrow 100 = 20 \times h$
$\therefore h = \frac{100}{20} = 5$ cm

PAGE NO 21.8:

Question 4:

A cuboidal vessel is 10 cm long and 5 cm wide. How high it must be made to hold 300 cm^3 of a liquid?

ANSWER:

Let h cm be the height of the cuboidal vessel.
Given :
Length $= 10$ cm
Breadth $= 5$ cm
Volume of the vessel $= 300\ cm^3$
Now, volume of a cuboid $=$ length $\times$ breadth $\times$ height
$\Rightarrow 300 = 10 \times 5 \times h$
$\Rightarrow 300 = 50 \times h$
$\therefore h = \frac{300}{50} = 6$ cm

PAGE NO 21.8:

Question 5:

A milk container is 8 cm long and 50 cm wide. What should be its height so that it can hold 4 litres of milk?

ANSWER:

Length of the cuboidal milk container $= 8$ cm
Breadth $= 50$ cm
Let h cm be the height of the container.
It is given that the container can hold 4 L of milk.
i.e., volume $= 4\text{ L} = 4 \times 1000\ cm^3 = 4000\ cm^3$ $(\because 1\text{ L} = 1000\ cm^3)$
Now, volume of the container $=$ length $\times$ breadth $\times$ height
$\Rightarrow 4000 = 8 \times 50 \times h$
$\Rightarrow 4000 = 400 \times h$
$\Rightarrow h = \frac{4000}{400} = 10$ cm
$\therefore$ The height of the milk container is 10 cm.

PAGE NO 21.8:

Question 6:

A cuboidal wooden block contains 36 cm^3 wood. If it be 4 cm long and 3 cm wide, find its height.

ANSWER:

A cuboidal wooden block contains 36 cm^3 of wood.
i.e., volume $= 36$ cm^3
Length of the block $= 4$ cm
Breadth of block $= 3$ cm
Suppose that the height of the block is h cm
Now, volume of a cuboid $=$ lenght $\times$ breadth $\times$ height
$\Rightarrow 36 = 4 \times 3 \times h$
$\Rightarrow 36 = 12 \times h$
$\Rightarrow h = \frac{36}{12} = 3$ cm
$\therefore$ The height of the wooden block is 3 cm.

PAGE NO 21.8:

Question 7:

What will happen to the volume of a cube, if its edge is
(i) halved
(ii) trebled?

ANSWER:

(i)
Suppose that the length of the edge of the cube is x.
Then, volume of the cube $= (\text{side})^3 = x^3$
When the length of the side is halved, the length of the new edge becomes $\frac{x}{2}$.
Now, volume of the new cube $= (\text{side})^3 = \left(\frac{x}{2}\right)^3 = \frac{x^3}{2^3} = \frac{x^3}{8} = \frac{1}{8} \times x^3$
It means that if the edge of a cube is halved, its new volume will be $\frac{1}{8}$ times the initial volume.
(ii)
Suppose that the length of the edge of the cube is x.
Then, volume of the cube $= (\text{side})^3 = x^3$
When the length of the side is trebled, the length of the new edge becomes $3 \times x$.
Now, volume of the new cube $= (\text{side})^3 = (3 \times x)^3 = 3^3 \times x^3 = 27 \times x^3$
Thus, if the edge of a cube is trebled, its new volume will be 27 times the initial volume.

PAGE NO 21.8:

Question 8:

What will happen to the volume of a cuboid if its:
(i) Length is doubled, height is same and breadth is halved?
(ii) Length is doubled, height is doubled and breadth is sama?

ANSWER:

(i)
Suppose that the length, breadth and height of the cuboid are l, b and h, respectively.
Then, volume $= l \times b \times h$
When its length is doubled, its length becomes $2 \times l$.
When its breadth is halved, *its length becomes* $\frac{b}{2}$.
The height h remains the same.
Now, volume of the new cuboid = length × breadth × height
$= 2 \times l \times \frac{b}{2} \times h$
$= l \times b \times h$
∴ It can be observed that the new volume is the same as the initial volume. So, there is no change in volume.
(ii)
Suppose that the length, breadth and height of the cuboid are l, b and h, respectively.
Then, volume $= l \times b \times h$
When its length is doubled, its length becomes $2 \times l$.
When its height is double, it becomes $2 \times h$.
The breadth b remains the same.
Now, volume of the new cuboid = length × breadth × height
$= 2 \times l \times b \times 2 \times h$
$= 4 \times l \times b \times h$
∴ It can be observed that the volume of the new cuboid is four times the initial volume.

PAGE NO 21.8:

Question 9:

Three cuboids of dimensions 5 cm × 6 cm × 7cm, 4cm × 7cm × 8 cm and 2 cm × 3 cm × 13 cm are melted and a cube is made. Find the side of cube.

ANSWER:

The dimensions of the three cuboids are 5 cm × 6 cm × 7 cm, 4 cm × 7 cm × 8 cm and 2 cm × 3 cm × 13 cm.
Now, a new cube is formed by melting the given cuboids.
∴ Voulume of the cube = sum of the volumes of the cuboids
$= (5 \text{ cm} \times 6 \text{ cm} \times 7 \text{ cm}) + (4 \text{ cm} \times 7 \text{ cm} \times 8 \text{ cm}) + (2 \text{ cm} \times 3 \text{ cm} \times 13 \text{ cm})$
$= (210 \text{ cm}^3) + (224 \text{ cm}^3) + (78 \text{ cm}^3)$
$= 512 \text{ cm}^3$
Since volume of a cube $= (\text{side})^3$, we have :
$512 = (\text{side})^3$
$\Rightarrow (\text{side}) = \sqrt[3]{512} = 8 \text{ cm}$
∴ The side of the new cube is 8 cm.

PAGE NO 21.8:

Question 10:

Find the weight of solid rectangular iron piece of size 50 cm × 40 cm × 10cm, if 1 cm^3 of iron weighs 8 gm.

ANSWER:

The dimension of the rectangular piece of iron is 50 cm × 40 cm × 10 cm.
i.e., volume $= 50 \text{ cm} \times 40 \text{ cm} \times 10 \text{ cm} = 20000 \text{ cm}^3$
It is given that the weight of 1 cm^3 of iron is 8 gm.
∴ The weight of the given piece of iron $= 20000 \times 8$ gm
$= 160000$ gm
$= 160 \times 1000$ gm
$= 160$ kg $(\because 1 \text{ kg} = 1000 \text{ gm})$

Question 11:

How many wooden cubical blocks of side 25 cm can be cut from a log of wood of size 3 m by 75 cm by 50 cm, assuming that there is no wastage?

ANSWER:

The dimension of the log of wood is $3\ \text{m} \times 75\ \text{cm} \times 50\ \text{cm}$, i.e., $300\ \text{cm} \times 75\ \text{cm} \times 50\ \text{cm}$ $\left(\because 3\ \text{m} = 100\ \text{cm}\right)$.

$\therefore$ Volume $= 300\ \text{cm} \times 75\ \text{cm} \times 50\ \text{cm} = 1125000\ \text{cm}^3$

It is given that the side of each cubical block of wood is of 25 cm.

Now, volume of one cubical block $= \left(\text{side}\right)^3$

$$= 25^3$$
$$= 15625\ \text{cm}^3$$

$\therefore$ The required number of cubical blocks $= \frac{\text{volume of the wood log}}{\text{volume of one cubical block}}$

$$= \frac{1125000\ \text{cm}^3}{15625\ \text{cm}^3}$$
$$= 72$$

Question 12:

A cuboidal block of silver is 9 cm long, 4 cm broad and 3.5 cm in height. From it, beads of volume 1.5 cm^3 each are to be made. Find the number of beads that can be made from the block.

ANSWER:

Length of the cuboidal block of silver $= 9$ cm

Breadth $= 4$ cm

Height $= 3.5$ cm

Now, volume of the cuboidal block $=$ length $\times$ breadth $\times$ height

$$= 9 \times 4 \times 3.5$$
$$= 126\ \text{cm}^3$$

$\therefore$ The required number of beads of volume $1.5\ \text{cm}^3$ that can be made from the block

$= \frac{\text{volume of the silver block}}{\text{volume of one bead}}$

$$= \frac{126\ \text{cm}^3}{1.5\ \text{cm}^3}$$
$$= 84$$

Question 13:

Find the number of cuboidal boxes measuring 2 cm by 3 cm by 10 cm which can be stored in a carton whose dimensions are 40 cm, 36 cm and 24 cm.

ANSWER:

Dimension of one cuboidal box $= 2\ \text{cm} \times 3\ \text{cm} \times 10\ \text{cm}$

Volume $= \left(2 \times 3 \times 10\right)\ \text{cm}^3 = 60\ \text{cm}^3$

It is given that the dimension of a carton is $40\ \text{cm} \times 36\ \text{cm} \times 24\ \text{cm}$, where the boxes can be stored.

$\therefore$ Volume of the carton $= \left(40 \times 36 \times 24\right)\ \text{cm}^3 = 34560\ \text{cm}^3$

$\therefore$ The required number of cuboidal boxes that can be stored in the carton

$= \frac{\text{volume of the carton}}{\text{volume of one cuboidal box}} = \frac{34560\ \text{cm}^3}{60\ \text{cm}^3} = 576$

PAGE NO 21.8:

Question 14:

A cuboidal block of solid iron has dimensions 50 cm, 45 cm and 34 cm. How many cuboids of size 5 cm by 3 cm by 2 cm can be obtained from this block? Assume cutting causes no wastage.

ANSWER:

Dimension of the cuboidal iron block $= 50 \text{ cm} \times 45 \text{ cm} \times 34 \text{ cm}$

Volume of the iron block $=$ length $\times$ breadth $\times$ height $= \left(50 \times 45 \times 34\right) \text{ cm}^3 = 76500 \text{ cm}^3$

It is given that the dimension of one small cuboids is $5\text{cm} \times 3 \text{ cm} \times 2 \text{ cm}$.

Volume of one small cuboid $=$ length $\times$ breadth $\times$ height $= \left(5 \times 3 \times 2\right) \text{ cm}^3 = 30 \text{ cm}^3$

$\therefore$ The required number of small cuboids that can be obtained from the iron block

$= \frac{\text{volume of the iron block}}{\text{volume of one small cuboid}} = \frac{76500 \text{ cm}^3}{30 \text{ cm}^3} = 2550$

PAGE NO 21.8:

Question 15:

A cube *A* has side thrice as long as that of cube *B*. What is the ratio of the volume of cube *A* to that of cube *B*?

ANSWER:

Suppose that the length of the side of cube B is l cm.

Then, the length of the side of cube A is $3 \times l$ cm.

Now, ratio $= \frac{\text{volume of cube A}}{\text{volume of cube B}} = \frac{(3 \times l)^3 \text{ cm}^3}{(l)^3 \text{ cm}^3} = \frac{3^3 \times l^3}{l^3} = \frac{27}{1}$

$\therefore$ The ratio of the volume of cube A to the volume of cube B is $27 : 1$.

PAGE NO 21.9:

Question 16:

An ice-cream brick measures 20 cm by 10 cm by 7 cm. How many such bricks can be stored in deep fridge whose inner dimensions are 100 cm by 50 cm by 42 cm?

ANSWER:

Dimension of an ice cream brick $= 20 \text{ cm} \times 10 \text{ cm} \times 7 \text{ cm}$

Its volume $=$ length $\times$ breadth $\times$ height $= \left(20 \times 10 \times 7\right) \text{ cm}^3 = 1400 \text{ cm}^3$

Also, it is given that the inner dimension of the deep fridge is $100 \text{ cm} \times 50 \text{ cm} \times 42 \text{ cm}$.

Its volume $=$ length $\times$ breadth $\times$ height $= \left(100 \times 50 \times 42\right) \text{ cm}^3 = 210000 \text{ cm}^3$

$\therefore$ The number of ice cream bricks that can be stored in the fridge $= \frac{\text{volume of the fridge}}{\text{volume of an ice cream brick}}$

$= \frac{210000 \text{ cm}^3}{1400 \text{ cm}^3} = 150$

PAGE NO 21.9:

Question 17:

Suppose that there are two cubes, having edges 2 cm and 4 cm, respectively. Find the volumes V_1 and V_2 of the cubes and compare them.

ANSWER:

The edges of the two cubes are 2 cm and 4 cm.

Volume of the cube of side 2 cm, $V_1 = (\text{side})^3 = (2)^3 = 8 \text{ cm}^3$

Volume of the cube of side 4 cm, $V_2 = (\text{side})^3 = (4)^3 = 64 \text{ cm}^3$

We observe the following :

$V_2 = 64 \text{ cm}^3 = 8 \times 8 \text{ cm}^3 = 8 \times V_1$

$\therefore V_2 = 8V_1$

PAGE NO 21.9:

Question 18:

A tea-packet measures 10 cm × 6 cm × 4 cm. How many such tea-packets can be placed in a cardboard box of dimensions 50 cm × 30 cm × 0.2 m?

ANSWER:

Dimension of a tea packet is 10 cm × 6 cm × 4 cm.

Volume of a tea packet = length × breadth × height $= \left(10 \times 6 \times 4\right) \text{ cm}^3 = 240 \text{ cm}^3$

Also, it is given that the dimension of the cardboard box is 50 cm × 30 cm × 0.2 m, i.e., 50 cm × 30 cm × 20 cm $\left(\because 1 \text{ m} = 100 \text{ cm}\right)$

Volume of the cardboard box = length × breadth × height $= \left(50 \times 30 \times 20\right) \text{ cm}^3 = 30000 \text{ cm}^3$

$\therefore$ The number of tea packets that can be placed inside the cardboard box

$= \frac{\text{volume of the box}}{\text{volume of a tea packet}} = \frac{30000 \text{ cm}^3}{240 \text{ cm}^3} = 125$

PAGE NO 21.9:

Question 19:

The weight of a metal block of size 5 cm by 4 cm by 3 cm is 1 kg. Find the weight of a block of the same metal of size 15 cm by 8 cm by 3 cm.

ANSWER:

The weight of the metal block of dimension 5 cm × 4 cm × 3 cm is 1 kg.

Its volume = length × breadth × height $= (5 \times 4 \times 3) \text{ cm}^3 = 60 \text{ cm}^3$

i.e., the weight of 60 cm^3 of the metal is 1 kg

Again, the dimension of the other block which is of same metal is 15 cm × 8 cm × 3 cm.

Its volume = length × breadth × height $= (15 \times 8 \times 3) \text{ cm}^3 = 360 \text{ cm}^3$

$\therefore$ The weight of the required block $= 360 \text{ cm}^3$

$= 6 \times 60 \text{ cm}^3$ $\left(\because \text{ Weight of } 60 \text{ cm}^3 \text{ of the metal is } 1 \text{ Kg}\right)$

$= 6 \times 1$ kg

$= 6$ kg

PAGE NO 21.9:

Question 20:

How many soap cakes can be placed in a box of size 56 cm × 0.4 m × 0.25 m, if the size of a soap cake is 7 cm × 5 cm × 2.5 cm?

ANSWER:

Dimension of a soap cake $= 7\text{cm} \times 5\text{ cm} \times 2.5\text{ cm}$

Its volume $=$ length $\times$ breadth $\times$ height $= \left(7 \times 5 \times 2.5\right)\text{ cm}^3 = 87.5\text{ cm}^3$

Also, the dimension of the box that contains the soap cakes is $56\text{ cm} \times 0.4\text{ m} \times 0.25\text{ m}$, i.e.,

$56\text{ cm} \times 40\text{cm} \times 25\text{ cm}\left(\because 1\text{ m} = 100\text{ cm}\right)$.

Volume of the box $=$ length $\times$ breadth $\times$ height $= \left(56 \times 40 \times 25\right)\text{ cm}^3 = 56000\text{ cm}^3$

$\therefore$ The number of soap cakes that can be placed inside the box $= \frac{\text{volume of the box}}{\text{volume of a soap cake}} = \frac{56000\text{ cm}^3}{87.5\text{ cm}^3}$

$= 640$

PAGE NO 21.9:

Question 21:

The volume of a cuboidal box is 48 cm^3. If its height and length are 3 cm and 4 cm respectively, find its breadth.

ANSWER:

Suppose that the breadth of the box is b cm.

Volume of the cuboidal box $= 48\text{ cm}^3$

Height of the box $= 3\text{ cm}$

Length of the box $= 4\text{ cm}$

Now, volume of box $=$ length $\times$ breadth $\times$ height

$\Rightarrow 48 = 4 \times b \times 3$

$\Rightarrow 48 = 12 \times b$

$\Rightarrow b = \frac{48}{12} = 4\text{ cm}$

$\therefore$ The breadth of the cuboidal box is 4 cm.
