

Chapter-21

Mensuration-II

Volumes and surface Area of cuboid and cub

Exercise 21.1

Q.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

Sol: (i) Volume of cuboid = $l \times b \times h$
 $= 12 \times 8 \times 6 = 576 \text{ cm}^3$

(ii) V. of cuboid = $l \times b \times h$
 $= 120 \times 30 \times 15$
 $= 54000 \text{ cm}^3$

$\left\{ \begin{array}{l} l = 1.2 \text{ m} = 120 \text{ cm} \end{array} \right.$

(iii) $l = 15 \text{ cm}$, breadth = $2.5 \text{ dm} = 0.25 \text{ m} = 25 \text{ cm}$.
 height = 8 cm

$V = l \times b \times h$
 $= 15 \times 25 \times 8 = 3000 \text{ cm}^3$

Q.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

Sol: $\therefore$ volume of cube = (side)³

(i) side = 4 cm

$$\text{volume} = (4)^3 = 64 \text{ cm}^3$$

(ii) side of cube = 8 cm

$$\text{volume} = (8)^3 = 512 \text{ cm}^3$$

(iii) side of cube = 1.5 dm

$$\text{volume of cube} = (1.5)^3 = 3.375 \text{ dm}^3$$

$$= 3.375 \times 1000 \text{ cm}^3$$

$$= 3375 \text{ cm}^3$$

(iv) side of cube = 1.2 m

$$\therefore \text{volume of cube} = (1.2)^3 = 1.728 \text{ m}^3$$

(v) side of cube = 25 mm = 2.5 cm

$$\text{volume} = (2.5)^3 \text{ cm}^3$$

$$= 15.625 \text{ cm}^3$$

(3)

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

Sol: volume of cuboid = 100 cm^3

$$l \times b \times h = 100$$

$$\Rightarrow 5 \times 4 \times h = 100$$

$$\Rightarrow 20h = 100$$

$$\Rightarrow h = \frac{100}{20} = 5 \text{ cm.}$$

Q.4 A cuboidal vessel is 10 cm long and 5 cm wide, what should be its height so that it can hold 4 litres of milk.

Sol:

length of vessel = 10 cm

breadth = 5 cm

$$\begin{aligned} \text{Volume} &= 4 \text{ litres} = 4 \times 1000 \text{ cm}^3 \\ &= 4000 \text{ cm}^3 \end{aligned}$$

$$\therefore V = l \times b \times h$$

$$\Rightarrow 4000 = 10 \times 5 \times h$$

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

Q.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?

Sol!

Capacity of container = 4 litres
= 4000 cm^3 $\{ 1 \text{ l} = 1000 \text{ cm}^3$

$$V = 4000$$

$$\Rightarrow 8 \times 50 \times h = 4000$$

$$h = \frac{4000}{400}$$

$$h = 10 \text{ cm.}$$

Q6 A cuboidal wooden block contains 36 cm^3 wood. If it be 4 cm long and 3 cm wide, find its height.

Sol!

$$\text{height} = \frac{\text{Volume}}{l \times b}$$

$$= \frac{36}{4 \times 3} = 3 \text{ cm.}$$

Q7 What will happen to the volume of a cube, if its edge is -

(i) halved

(ii) tripled.

Sol!

Let edge of cube = $a \text{ cm}$

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

(i) If edge is halved then

$$\text{new edge} = \frac{a}{2}$$

$$\text{Volume} = \left(\frac{a}{2}\right)^3 = \frac{1}{8} a^3$$

$\Rightarrow$ Volume will be $\frac{1}{8}$ times.

(11) If each edge is trebled, then new edge = $3a$ ⑤

$$\begin{aligned}\text{Volume} &= (3a)^3 \\ &= 27a^3\end{aligned}$$

$\therefore$ Volume will be 27 times.

Q.9 Three cuboids of dimensions $5\text{cm} \times 6\text{cm} \times 7\text{cm}$, $4\text{cm} \times 7\text{cm} \times 8\text{cm}$ and $2\text{cm} \times 3\text{cm} \times 13\text{cm}$ are melted to form a cube. Find the side of cube.

Sol:

Volume of cube = V of cuboid 1 + V of cuboid 2.
+ V of cuboid 3

$$\Rightarrow V = V_1 + V_2 + V_3$$

$$= (5 \times 6 \times 7) + (4 \times 7 \times 8) + (2 \times 3 \times 13)$$

$$= 210 + 224 + 78$$

$$a^3 = 512$$

$$\Rightarrow a^3 = (8)^3$$

$$\Rightarrow a = 8$$

$\therefore$ Side of new cube = 8 cm.

Q.10 Find the weight of solid rectangular iron piece of size $50\text{cm} \times 40\text{cm} \times 10\text{cm}$. If 1cm^3 of iron weighs 8 gm.

Sol:

Dimensions of rectangular piece = 50 cm, 40 cm, 10 cm

$$\begin{aligned}\text{Volume} &= 50 \times 40 \times 10 \\ &= 20000 \text{ cm}^3\end{aligned}$$

$$\therefore \text{weight of } 1 \text{ cm}^3 = 8 \text{ gm}$$

$$\begin{aligned}\text{Total weight} &= 8 \times 20000 \\ &= 160000 \text{ gm} \\ &= \frac{160000}{1000} \text{ kg} \\ &= 160 \text{ kg}\end{aligned}$$

Q.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.

Solution:

$$V \text{ of cubical blocks} = (25)^3 = 15625 \text{ cm}^3$$

$$V. \text{ of log of wood} = (300 \times 75 \times 50) \text{ cm}^3.$$

$$\begin{aligned}\therefore \text{No. of blocks} &= \frac{300 \times 75 \times 50}{15625} \\ &= 72 \text{ blocks.}\end{aligned}$$

Q.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?

Sol:

length of cuboid = 9 cm

breadth = 4 cm

height = 3.5 cm

Volume of cuboid = $l \times b \times h$

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

$$= 126 \text{ cm}^3$$

Volume of each bead = 1.5 cm^3

$$\therefore \text{No. of beads} = \frac{\text{V. of cuboid}}{\text{V of one bead}} = \frac{126}{1.5}$$
$$= 84 \text{ beads.}$$

Q. 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?

Sol:

Dimensions of cuboidal box = 2 cm, 3 cm, 10 cm

Dimensions of carton = 40 cm, 36 cm, 24 cm.

$$\therefore \text{Number of cuboidal box stored} = \frac{\text{V. of Carton}}{\text{V of one box}}$$
$$= \frac{40 \times 36 \times 24}{2 \times 3 \times 10} = 576 \text{ boxes.}$$

Q.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.

Sol: No. of cuboids = $\frac{\text{V of wooden block}}{\text{V. of cuboidal box}}$

$$= \frac{50 \times 45 \times 34}{5 \times 3 \times 2} = 2550 \text{ boxes}$$

Q.15 A cube A has side twice as long as that of cube B. What is the ratio of the volume of cube A to that of cube B?

Sol: Let side of cube B = a cm
 V. of cube B = $a^3 \text{ cm}^3$

Then, side of cube A = $3a$ cm
 Vol. of cube A = $(3a)^3 = 27a^3$

$$\frac{\text{Vol of cube A}}{\text{Vol. of cube B}} = \frac{27a^3}{a^3} = \frac{27}{1}$$

$$= 27:1$$

Q.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?

Sol:

$$\begin{aligned}\text{No. of ice-cream bricks} &= \frac{\text{v. of fridge}}{\text{v. of ice-cream brick}} \\ &= \frac{100 \times 50 \times 42}{20 \times 10 \times 7} \\ &= 150 \text{ bricks.}\end{aligned}$$

Q.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.

Sol: Side of cube₁ = 2 cm

$$\text{Volume}_1 = V_1 = (2)^3 = 8 \text{ cm}^3$$

Side of cube₂ = 4 cm

$$V_2 = (4)^3 = 64 \text{ cm}^3$$

Now $\frac{V_1}{V_2} = \frac{8}{64} = \frac{1}{8}$

$$\therefore V_1 : V_2 = 1 : 8$$

Q.18 A tea packet measures $10\text{cm} \times 6\text{cm} \times 4\text{cm}$. How many such tea packets can be placed in cardboard box of dimension $50\text{cm} \times 30\text{cm} \times 0.2\text{m}$?

Sol: Vol. of one tea packet $= 10 \times 6 \times 4 = 240\text{cm}^3$

dimension of Card board box

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

$$b = 30\text{cm}$$

$$h = 0.2\text{m} = 0.2 \times 100\text{cm} \\ = 20\text{cm}.$$

$$\begin{aligned} \text{V of Card board box} &= 50 \times 30 \times 20\text{ cm}^3 \\ &= 30000\text{ cm}^3 \end{aligned}$$

$$\begin{aligned} \therefore \text{No. of tea packets} &= \frac{\text{V. of Card board box}}{\text{V of tea packet}} \\ &= \frac{30000}{240} = 125 \text{ tea packets} \end{aligned}$$

Q.19 The weight of Metal block of size 5cm by 4cm by 3cm is 1kg . Find the weight of a block of same metal of size 15cm by 8cm by 3cm .

Sol: Volume of Metal block $= 5 \times 4 \times 3 = 60\text{cm}^3$
weight $= 1\text{kg} = 1000\text{g}$

$$\therefore \text{weight of } 1\text{cm}^3 \text{ Metal} = \frac{1000}{60} = \frac{50}{3}\text{g}$$

Now, Volume of another Metal block

$$= 15 \times 8 \times 3$$

$$= 360 \text{ cm}^3$$

$$\text{weight} = 360 \times \frac{50}{3} \text{ g}$$

$$= 6000 \text{ g}$$

$$= 6 \text{ kg}$$

Q.20 How many Soap Cakes can be placed in a box of size $56 \text{ cm} \times 0.4 \text{ m} \times 0.25 \text{ m}$, if the size of soap cake is $7 \text{ cm} \times 5 \text{ cm} \times 2.5 \text{ cm}$?

Sol: Dimensions of box $\therefore$: $l = 56 \text{ cm}$
 $b = 0.4 \text{ m} = 40 \text{ cm}$
 $h = 0.25 \text{ m} = 25 \text{ cm}$

$$\text{Vol. of box} = 56 \times 40 \times 25$$

$$= 56000 \text{ cm}^3$$

Now Vol. of one Soap Cake $= 7 \times 5 \times 2.5$

$$= 87.5 \text{ cm}^3$$

$$\therefore \text{No. of Soap Cakes} = \frac{\text{Vol. of box}}{\text{Vol. of one Soap Cake}}$$

$$= \frac{56000}{87.5} = 640$$

Q.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.

Sol: given, volume of cuboidal box = 48 cm^3
height = 3 cm
length = 4 cm

$$\begin{aligned}\therefore \text{breadth} &= \frac{\text{Volume}}{l \times h} \\ &= \frac{48}{3 \times 4} = 4 \text{ cm.}\end{aligned}$$

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