

EXERCISE 21.1

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.

Solution:

(i) The given details are:

Length of a cuboid = 12 cm

Breadth of a cuboid = 8 cm

Height of a cuboid = 6 cm

By using the formula

$$\begin{aligned}\text{Volume of a cuboid} &= \text{length} \times \text{breadth} \times \text{height} \\ &= 12 \times 8 \times 6 \\ &= 576 \text{ cm}^3\end{aligned}$$

(ii) The given details are:

Length of a cuboid = 1.2 m = 120 cm

Breadth of a cuboid = 30 cm

Height of a cuboid = 15 cm

By using the formula

$$\begin{aligned}\text{Volume of a cuboid} &= \text{length} \times \text{breadth} \times \text{height} \\ &= 120 \times 30 \times 15 \\ &= 54000 \text{ cm}^3\end{aligned}$$

(iii) The given details are:

Length of a cuboid = 15 cm

Breadth of a cuboid = 2.5 dm = 25 cm

Height of a cuboid = 8 cm

By using the formula

$$\begin{aligned}\text{Volume of a cuboid} &= \text{length} \times \text{breadth} \times \text{height} \\ &= 15 \times 25 \times 8 \\ &= 3000 \text{ cm}^3\end{aligned}$$

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

Solution:

(i) Given details are,

Side of cube = 4 cm

$$\begin{aligned}\text{Volume of cube} &= (\text{side})^3 \\ &= 4^3 = 64 \text{ cm}^3\end{aligned}$$

(ii) Given details are,

Side of cube = 8 cm

$$\begin{aligned}\text{Volume of cube} &= (\text{side})^3 \\ &= 8^3 = 512 \text{ cm}^3\end{aligned}$$

(iii) Given details are,

Side of cube = 1.5 dm

$$\begin{aligned}\text{Volume of cube} &= (\text{side})^3 \\ &= 1.5^3 = 3.375 \text{ dm}^3 = 3375 \text{ cm}^3\end{aligned}$$

(iv) Given details are,

Side of cube = 1.2 m

$$\begin{aligned}\text{Volume of cube} &= (\text{side})^3 \\ &= 1.2^3 = 1.728 \text{ m}^3\end{aligned}$$

(v) Given details are,

Side of cube = 25 mm

$$\begin{aligned}\text{Volume of cube} &= (\text{side})^3 \\ &= 25^3 = 15625 \text{ mm}^3 = 15.625 \text{ cm}^3\end{aligned}$$

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

Solution:

Given details are,

Volume of a cuboid = 100 cm^3

Length of a cuboid = 5 cm

Breadth of a cuboid = 4 cm

Let height of cuboid be 'h' cm

We know that, $l \times b \times h = 100 \text{ cm}^3$

$$h = 100 / (l \times b)$$

$$= 100 / (5 \times 4)$$

$$= 5 \text{ cm}$$

4. A cuboidal vessel is 10 cm long and 5 cm wide. How high it must be made to hold

300 cm³ of a liquid?

Solution:

Given details are,

Volume of a liquid in the vessel = 300 cm³

Length of a cuboidal vessel = 10 cm

Breadth of a cuboidal vessel = 5 cm

Let height of cuboidal vessel be 'h' cm

We know that, $l \times b \times h = 300 \text{ cm}^3$

$$h = 300 / (1 \times b)$$

$$= 300 / (10 \times 5)$$

$$= 6 \text{ cm}$$

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?

Solution:

Given details are,

Volume = 4 litres = 4000 cm³

Length of a milk container = 8 cm

Breadth of a milk container = 50 cm

Let height of milk container be 'h' cm

We know that, $l \times b \times h = 4000 \text{ cm}^3$

$$h = 4000 / (1 \times b)$$

$$= 4000 / (50 \times 8)$$

$$= 10 \text{ cm}$$

6. A cuboidal wooden block contains 36 cm³ wood. If it be 4 cm long and 3 cm wide, find its height.

Solution:

Given details are,

Volume of wooden block = 36 cm³

Length of the wooden block = 4 cm

Breadth of a wooden block = 3 cm

Let height of wooden block be 'h' cm

We know that, $l \times b \times h = 36 \text{ cm}^3$

$$h = 36 / (1 \times b)$$

$$= 36 / (4 \times 3)$$

$$= 3 \text{ cm}$$

7. What will happen to the volume of a cube, if its edge is

(i) halved (ii) trebled?

Solution:

Let us consider edge of a cube be 'a' cm

Volume of a cube will be 'a³'cm

(i) When halved

Edge = a/2

Volume = (a/2)³ = a³/2³ = a³/8 = 1/8times

(ii) When trebled

Edge = 3a

Volume = (3a)³ = 27a³ = 27times

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 same?

Solution:

Let us consider,

Length of a cuboid be 'l'

Breadth of a cuboid be 'b'

Height of a cuboid be 'h'

So, Volume of a cuboid = l × b × h

Now,

(i) Length of a cuboid becomes = 2l

Breadth = b/2

Height = h

Volume of cuboid = 2l × b/2 × h = l × b × h (remains same)

(ii) Length of a cuboid becomes = 2l

Breadth = b

Height = 2h

Volume of cuboid = 2l × b × 2h = 4lbh (four times)

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

Solution:

Given details are,

Volume of First cuboid = 5 × 6 × 7 = 210 cm³

Volume of second cuboid = 4 × 7 × 8 = 224 cm³

$$\text{Volume of third cuboid} = 2 \times 3 \times 13 = 78 \text{ cm}^3$$

$$\text{So, Volume of a cube} = 210 + 224 + 78 = 512 \text{ cm}^3$$

Let side of a cube be 'a'

$$a^3 = 512$$

$$\therefore a = 8 \text{ cm}$$

10. Find the weight of solid rectangular iron piece of size 50 cm × 40 cm × 10 cm, if 1 cm³ of iron weights 8 gm.

Solution:

Given details are,

$$\text{Dimension of rectangular iron piece} = 50\text{cm} \times 40\text{cm} \times 10\text{cm}$$

$$\text{Volume of solid rectangular} = 50 \times 40 \times 10 = 20000 \text{ cm}^3$$

$$\text{Weight of 1 cm}^3 \text{ iron} = 8 \text{ gm.}$$

$$\begin{aligned} \therefore \text{Weight of 20000 cm}^3 \text{ iron} &= 8 \times 20000 \\ &= 160000 \text{ gm.} \\ &= 160 \text{ kg} \end{aligned}$$

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:

Given details are,

$$\text{Dimensions of log of wood} = 3\text{m} \times 75\text{cm} \times 50\text{cm}$$

$$\text{Side of cubical block} = 25\text{cm}$$

We know that,

$$\text{Number of cubical block that can be made from wooden log} =$$

$$\text{Volume of wooden block} / \text{volume of cubical block}$$

$$= (300 \times 75 \times 50) / (25 \times 25 \times 25)$$

$$= 72 \text{ blocks}$$

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 cm³ each are to be made. Find the number of beads that can be made from the block.

Solution:

Given details are,

$$\text{Length of a cuboidal block of silver} = 9\text{cm}$$

$$\text{Breadth} = 4\text{cm}$$

$$\text{Height} = 3.5\text{cm}$$

$$\text{Volume of a cuboid} = l \times b \times h$$

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

So, Number of beads of volume 1.5cm^3 that can be made from the block =
Volume of silver block/volume of one bead
 $= 126\text{cm}^3/1.5\text{cm}^3$
 $= 84$ beads

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.

Solution:

Given details are,

Dimensions of cuboidal boxes is $= 2\text{cm} \times 3\text{cm} \times 10\text{cm}$

Dimensions of carton is $= 40\text{cm} \times 36\text{cm} \times 24\text{cm}$

So,

Number of boxes that can be stored in carton = volume of carton / volume of one box
 $= (40 \times 36 \times 24) / (2 \times 3 \times 10)$
 $= 576$ cuboidal boxes

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.

Solution:

Given details are,

Dimensions of cuboidal block of iron is $= 50\text{cm} \times 45\text{cm} \times 34\text{cm}$

Size of small cuboids cutting from it is $= 5\text{cm} \times 3\text{cm} \times 2\text{cm}$

So,

Number of small cuboids that can be cut =
Volume of large iron cuboid/ volume of small cuboid
 $= (50 \times 45 \times 34) / (5 \times 3 \times 2)$
 $= 2550$ cuboidal blocks

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?

Solution:

Given details are,

Let side of cube B be 'x' cm

Then, side of cube A = $3x$ cm

So now,

Ratio = volume of cube A / volume of cube B
 $= (3x)^3 / (x)^3$
 $= 27x^3 / x^3 = 27/1 = 27:1$

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?

Solution:

Given details are,

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

Dimensions of fridge is = $100 \text{ cm} \times 50 \text{ cm} \times 42 \text{ cm}$

So,

Number of bricks that can be put in fridge = volume of fridge / volume of one ice brick
 $= (100 \times 50 \times 42) / (20 \times 10 \times 7)$
 $= 150$ ice cream bricks

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.

Solution:

Given details are,

Edge of one cube $a_1 = 2 \text{ cm}$

Edge of second cube $a_2 = 4 \text{ cm}$

So, volume $v_1 = 2^3 = 8 \text{ cm}^3$

Volume $v_2 = 4^3 = 64 \text{ cm}^3$

$$v_2 = 8v_1$$

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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?

Solution:

Given details are,

Dimensions of tea packet = $10 \text{ cm} \times 6 \text{ cm} \times 4 \text{ cm}$

Dimension of cardboard box = $50 \text{ cm} \times 30 \text{ cm} \times 0.2 \text{ m}$

So,

Number of tea packets can be put in cardboard box =
Volume of cardboard box / volume of tea packet
 $= (50 \times 30 \times 20) / (10 \times 6 \times 4)$
 $= 125$ tea packets

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.

Solution:

Given details are,

Dimensions of metal block = $5 \text{ cm} \times 4 \text{ cm} \times 3 \text{ cm}$

Weight of block = 1 kg

$$\text{Volume of box} = 5 \times 4 \times 3 = 60 \text{ cm}^3$$

Dimension of new block = 15cm × 8cm × 3cm

$$\text{Volume of new box} = 15 \times 8 \times 3 = 360 \text{ cm}^3$$

We know that,

$$60 \text{ cm}^3 = 1 \text{ kg}$$

$$360 \text{ cm}^3 = 6 \times 60 \text{ cm}^3$$

$$= 6 \times 1$$

$$= 6 \text{ kg}$$

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 × 5cm × 2.5 cm?

Solution:

Given details are,

$$\text{Dimensions of box} = 56 \text{ cm} \times 0.4 \text{ m} \times 0.25 \text{ m}$$

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

So,

$$\begin{aligned} \text{Number of soap cakes that can be placed in box} &= \text{volume of box} / \text{volume of soap cake} \\ &= (56 \times 40 \times 25) / (7 \times 5 \times 2.5) \\ &= 640 \text{ soap cakes} \end{aligned}$$

21. The volume of a cuboidal box is 48 cm³. If its height and length are 3 cm and 4 cm respectively, find its breadth.

Solution:

Given details are,

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

$$\text{Length of a cuboidal box} = 4 \text{ cm}$$

$$\text{Height of a cuboidal box} = 3 \text{ cm}$$

Let breadth of wooden block be 'b' cm

$$\text{We know that, } l \times b \times h = 48 \text{ cm}^3$$

$$b = 48 / (l \times h)$$

$$= 48 / (4 \times 3)$$

$$= 4 \text{ cm}$$