EXERCISE 13.5 PAGE NO: 228

1. A matchbox measures 4 cm×2.5cm×1.5cm. What will be the volume of a packet containing 12 such boxes?

Solution:

Dimensions of a matchbox (a cuboid) are l×b×h = 4 cm×2.5 cm×1.5 cm, respectively

Formula to find the volume of matchbox = l×b×h = (4×2.5×1.5) = 15

Volume of matchbox = 15 cm^3

Now, volume of 12 such matchboxes = (15×12) cm^3 = 180 cm^3

Therefore, the volume of 12 matchboxes is 180 cm^3.

2. A cuboidal water tank is 6m long, 5m wide and 4.5m deep. How many litres of water can it hold? (1 m^3= 1000 l)

Solution:

Dimensions of a cuboidal water tank are l = 6 m and b = 5 m, and h = 4.5 m

Formula to find the volume of the tank, V = l×b×h

Putting the values, we get

V = (6×5×4.5) = 135

The volume of the water tank is 135 m^3

Again,

We are given that the amount of water that 1m^3 volume can hold = 1000 l

Amount of water, 135 m^3volume hold = (135×1000) litres = 135000 litres

Therefore, given cuboidal water tank can hold up to 135000 litres of water.

3. A cuboidal vessel is 10m long and 8m wide. How high must it be made to hold 380 cubic metres of a liquid?

Solution:

Given:

Length of the cuboidal vessel, l = 10 m

Width of the cuboidal vessel, b = 8m

Volume of the cuboidal vessel, V = 380 m^3

Let the height of the given vessel be h.

Formula for volume of a cuboid, V = l×b×h

Using the formula, we have

l×b×h = 380

10×8×h= 380

Or h = 4.75

Therefore, the height of the vessels is 4.75 m.

4. Find the cost of digging a cuboidal pit 8m long, 6m broad and 3m deep at the rate of Rs 30 per m^3.

Solution:

The given pit has its length(l) as 8m, width (b)as 6m and depth (h)as 3 m.

Volume of cuboidal pit = l×b×h = (8×6×3) = 144 (using formula)

The required Volume is 144 m^3

Now,

Cost of digging per m^3 volume = Rs 30

Cost of digging 144 m^3 volume = Rs (144×30) = Rs 4320

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

Solution:

The length (l) and depth (h) of the tank are 2.5 m and 10 m, respectively.

To find: The value of breadth, say b.

Formula to find the volume of a tank = l×b×h = (2.5× b×10) m^3= 25b m^3

The capacity of tank= 25b m^3, which is equal to 25000b litres

Also, the capacity of a cuboidal tank is 50000 litres of water (Given).

Therefore, 25000 b = 50000

This implies that b = 2

Therefore, the breadth of the tank is 2 m.

6. A village, having a population of 4000, requires 150 litres of water per head per day.

It has a tank measuring 20 m×15 m×6 m. For how many days will the water in this tank last?

Solution:

Length of the tank = l = 20 m

Breadth of the tank = b = 15 m

Height of the tank = h = 6 m

Total population of a village = 4000

Consumption of water per head per day = 150 litres

Water consumed by the people in 1 day = (4000×150) litres = 600000 litres …(1)

Formula to find the capacity of the tank, C = l×b×h

Using the given data, we have

C = (20×15×6) m^3= 1800 m^3

Or C = 1800000 litres

Let water in this tank last for d days.

Water consumed by all people in d days = Capacity of the tank (using equation (1))

600000 d =1800000

d = 3

Therefore, the water in this tank will last for 3 days.

7. A godown measures 40 m×25m×15 m. Find the maximum number of wooden crates, each measuring 1.5m×1.25 m×0.5 m, that can be stored in the godown.

Solution:

From the statement, we have

Length of the godown = 40 m

Breadth = 25 m

Height = 15 m

Whereas,

Length of the wooden crate = 1.5 m

Breadth = 1.25 m

Height = 0.5 m

The godown and wooden crate are in cuboidal shape. Find the volume of each using the formula V = lbh

Now,

Volume of godown = $(40\times25\times15)\ m^3 = 15000\ m^3$

Volume of a wooden crate = $(1.5\times1.25\times0.5)\ m^3 = 0.9375\ m^3$

Let us consider that, n wooden crates can be stored in the godown, then

Volume of n wooden crates = Volume of godown

$0.9375\times n = 15000$

Or $n = 15000/0.9375 = 16000$

Hence, the number of wooden crates that can be stored in the godown is 16,000.

8. A solid cube of side 12 cm is cut into eight cubes of equal volume. What will be the side of the new cube? Also, find the ratio between their surface areas.

Solution:

Side of a cube = 12cm (Given)

Find the volume of the cube.

Volume of cube = $(Side)^3 = (12)^3 cm^3 = 1728 cm^3$

Surface area of a cube with side 12 cm = $6a^2 = 6(12)^2 cm^2$ …(1)

The cube is cut into eight small cubes of equal volume; say, the side of each cube is p.

Volume of a small cube = p^3

Surface area = $6p^2$ …(2)

Volume of each small cube = $(1728/8)\ cm^3 = 216\ cm^3$

Or $(p)^3 = 216\ cm^3$

Or p = 6 cm

Now, Surface areas of the cubes ratios = (Surface area of the bigger cube)/(Surface area of the smaller cubes)

From equations (1) and (2), we get

Surface areas of the cubes ratios = $(6a^2)/(6p^2) = a^2/p^2 = 12^2/6^2 = 4$

Therefore, the required ratio is 4 : 1.

9. A river 3m deep and 40m wide is flowing at the rate of 2km per hour. How much water will fall into the sea in a minute?

Solution:

Given:

Depth of river, h = 3 m

Width of river, b = 40 m

Rate of water flow = 2km per hour = 2000m/60min = 100/3 m/min

Now, volume of water flowed in 1 min = (100/3) × 40 × 3 = $4000m^3$

Therefore, 4000 m^3 water will fall into the sea in a minute.