Surface Areas and Volumes: Exercise 13.5

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

Sol. **Given:** Dimension of matchbox, let length l = 4 cm, breadth b = 2.5 cm and height h = 1.5 cm

So, volume of one matchbox = ℓ × b × h cm^3

= (4 × 2.5 × 1.5) cm^3

= 15 cm^3

Thus, volume of a packet containing 12 boxes = 12×15

= 180 cm^3

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

Sol. **Given:** Dimension of cuboid water tank, let length l = 6 m, breadth b = 5 m and height h = 4.5 m.

So, volume of the water tank = ℓ x b x h m^3

= 6 × 5 × 4.5

= 135 m^3

Thus, the tank can hold water = 135 × 1000 ℓ (Since, $1m^3$ = 1000 ℓ)

= 135000 ℓ

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

Sol. **Given:** Dimension of cuboidal vessel, let length l= 10 m, Breadth b = 8 m and Volume V = 380 m^3

Therefore, volume of cuboid = Length x Breadth x Height

So, Height = $\frac{Volume\ of\ cuboid}{Length\ \times\ Breadth}$

= $\frac{380}{10\ \times\ 8}$

= 4.75 m

Thus, height of the cuboidal vessel = 4.75 m

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

Sol. **Given:** Dimension of cuboidal pit, let length l = 8 m, breadth b = 6 m and deep h = 3 m.

Since, volume of the pit = ℓ x b x h m^3

= (8 × 6 × 3) m^3

= 144 m^3

Since, rate of digging is Rs. 30 per m^3

So, cost of digging the pit =144 × 30

= Rs 4320.

Q.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.

Sol. Dimension of cuboidal tank, let l =2.5m, depth h = 10m and capacity of tank V = 50000 litres.

Since, 1000 litres = $1m^3$

So, 50000 litres = 50000/1000 = 50 m^3

So, Breadth of tank = $\frac{Volume\ of\ cuboid}{Length\ x\ Depth}$

$= \frac{50}{2.5\ x\ 10}$ m

= 2m

Thus, Find the breadth of the cuboidal tank = 2m

Q.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 of this tank last?

***Sol.* Given:** Dimension of tank, let length *l = 20 m, breadth b =15 m and height h = 6 m*

So, capacity of the tank = ℓ x b x h m^3

= 20 × 15 × 6 m^3

= 1800 m^3

Since, water needed per person per day =150 litres

So, water needed for 4000 person per day = 4000×150

= 600000 litres

Since, 1000 litres = $1m^3$

So, 600000 litres = $\frac{4000\ \times\ 150}{1000}$ = 600 m^3

Therefore, number of days the water will last = $\frac{Capacity\ of\ tank}{Total\ water\ required\ per\ day}$

= 1800/600 = 3

Hence, the water of this tank will last for 3 days.

Q.7 A godown measures 60 m × 25 m × 10 m. Find the maximum number of wooden crates each measuring 1.5 m × 1.25 m × 0.5 m that can be stored in the godown.

***Sol.* Given:** Dimension of godown = 60 m × 25 m × 10 m and Dimension of wooden crates = 1.5 m × 1.25 m × 0.5 m.

So, volume of the godown = (60 × 25 × 10) m^3

= 15000 m^3

And volume of 1 crates = (1.5 × 1.25 × 0.5) m^3

= 0.9375 m^3

Therefore, no. of crates that can be stored in the godown = $\frac{Volume\ of\ the\ godown}{Volume\ of\ 1\ crate}$

$= \frac{15000}{0.9375}$

= 16000

Thus, number of crates that can be stored in the godown = 16000

Q.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.

***Sol.* Given:** Side of a solid cube = 12 cm

Let V_1 be volume of the solid cube.

So, volume of the cube $V_1 = (12 \times 12 \times 12)\ cm^3$
Since, this solid cube is cut into eight cubes of equal volume. Let V_2 be the volume of the cube cut out of the first one.

So, $V_2 = \frac{1}{8} \times V_1$

$= (\frac{1}{8} \times 12 \times 12 \times 12)\ cm^3$

$= (6 \times 6 \times 6)\ cm^3$

Thus, side of the new cube is 6 cm.

And ratio of their surface areas $= \frac{6(side)_1^2}{6(side)_2^2} = \frac{6 \times 12 \times 12}{6 \times 6 \times 6}$

$= \frac{4}{1}$

Thus, the ratio of their surface areas is 4:1.

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

Sol. **Given:** Depth of river, h = 3m and width, b = 40m.
Since, the water flows at the rate of 2 km/hr,
It means that water from 2 km of river flows into the sea in one hour.
So, the volume of water flowing into the sea in one hour = Volume of the cuboid

$= \ell \times b \times h\ m^3$

$= (2000 \times 40 \times 3)\ m^3$

So, the volume of water flowing into the sea in one minute $= \frac{2000 \times 40 \times 3}{60}\ m^3$

$= 4000\ m^3$

Thus, the volume of water flowing into the sea in one minute = $4000\ m^3$