Volume and Surface Area

Exercise-84

Solution 1:

1. The measure of the place occupied by an object in space is called its volume.
2. The standard units of length are centimeter and metre.
3. The standard units of area are sq. cm and sq. m.
4. The cube whose length, breadth and height are each 1 cm has a volume of 1 cu. cm.
5. The cube whose length, breadth and height are each 1 m has a volume of 1 cu. m.

Exercise-85

Solution 1:

1. Cupboard
2. Matchbox
3. Cake of soap
4. Book
5. Trunk

Solution 2:

1. Each face of a cube is square in shape.
2. A cuboid has 12 edges.
3. A cube has 6 face altogether.
4. A cuboid has altogether 8 vertices.
5. The standard units of volume are cu. cm and cu. m.
6. All edges of a cube are of equal length.

Solution 3:

1. Vertices: P, Q, R, S, W, T, U, V
2. Edges: seg PQ, seg QR, seg RS, seg SP, seg PW, seg WT, seg TU, seg UV, seg SV, seg RU, seg QT, seg VW
3. Face: Square PQRS, square QRTU, square WTVU, square PWSV, square PQWT and square SRVU
4. Vertex R is common to seg RQ, seg RS and seg RU.
5. Vertex W is common to the seg WT, seg WV and seg WP.
6. The edges PW and WT intersect at vertex W.
7. Square PQRS is opposite to the square TUVW.

Exercise-86

Solution 1:

1. Volume of cube = $(l)^3 = (26)^3 = 17576$ cu. cm
2. Volume of cube = $(l)^3 = (2.6)^3 = 17.576$ cu. cm
3. Volume of cube = $(l)^3 = (3.9)^3 = 59.319$ cu. cm
4. Volume of cube = $(l)^3 = (12.5)^3 = 1953.125$ cu. cm
5. Volume of cube = $(l)^3 = (13.2)^3 = 2299.968$ cu. cm
6. Volume of cube = $(l)^3 = (24.3)^3 = 14348.907$ cu. cm
7. Volume of cube = $(l)^3 = (9.7)^3 = 912.673$ cu. cm
8. Volume of cube = $(l)^3 = (10.3)^3 = 1092.727$ cu.cm

Solution 2:

Side of the cube (l) = 2.5 cm.
Volume of the cubic die = Volume of a die = $(l)^3$
$= (2.5)^3$
= 15.625 cu. cm

Solution 3:

Side of the cube (l) = 6 m
Volume of water in a cube-shaped tank = Volume of cube = $(l)^3$
$= (6)^3$
= 216 cu. m
Thus, the cube-shaped tank can hold 216 cu. m of water.

Solution 4:

Side of the cube-shaped box (l) = 1.9 cm
Volume of the cube-shaped box = $(l)^3$
$= (1.9)^3$
= 6.859 cu. cm
Thus, the volume of the cube-shaped box is 6.859 cu. cm.

Exercise-87

Solution 1:

1. Total surface area of a cube = $6l^2$
$= 6(3)^2$
$= 6 \times 3 \times 3$
= 54 sq. cm

2. Total surface area of a cube = $6l^2$
$= 6(5)^2$

= 6 × 5 × 5
= 150 sq. cm

3. Total surface area of a cube = $6l^2$
= $6(7.2)^2$
= 6 × 7.2 × 7.2
= 311.04 sq. m

4. Total surface area of a cube = $6l^2$
= $6(6.8)^2$
= 6 × 6.8 × 6.8
= 277.44 sq. m

5. Total surface area of a cube = $6l^2$
= $6(9.3)^2$
= 6 × 9.3 × 9.3
= 518.94 sq. cm

6. Total surface area of a cube = $6l^2$
= $6(5.8)^2$
= 6 × 5.8 × 5.8
= 201.84 sq. cm

7. Total surface area of a cube = $6l^2$
= $6(8.6)^2$
= 6 × 8.6 × 8.6
= 443.76 sq. cm

Solution 2:
Side of the cube (l) = 5.5 cm
Total surface area = $6l^2$
= $6(5.5)^2$
= 6 × 5.5 × 5.5
= 181.5 sq. cm

Solution 3:
Side of the safe (l) = 0.5 m
Total surface area = $6l^2$
= $6(0.5)^2$
= 6 × 0.5 × 0.5
= 1.5 sq. m
Cost of painting 1 sq. m = Rs. 60
∴ Cost of painting 1.5 sq. m = Rs. (60 × 1.5)

= Rs. 90

Thus, the cost to paint all sides of the safe is Rs. 90.

Solution 4:

Total surface area of a cube = 294 sq. m

But,

Total surface area of a cube = $6l^2$

$\therefore \quad 294 = 6l^2$

$\therefore \quad l^2 = \frac{294}{6}$

$\therefore \quad l^2 = 49$

$\therefore \quad l = 7$ m

Volume of a cube = $l^3 = (7)^3 = 7 \times 7 \times 7 = 343$ cu. m

Thus, the volume of the cube is 343 cu. m.

Solution 5:

Total surface area of a cube = 150 sq. cm

But,

The total surface area of a cube = $6l^2$

$\therefore \quad 150 = 6l^2$

$\therefore \quad l^2 = \frac{150}{6}$

$\therefore \quad l^2 = 25$

$\therefore \quad l = 5$ cm

Volume of a cube = $l^3 = (5)^3 = 5 \times 5 \times 5 = 125$ cu. cm

Thus, the volume of the cube is 125 cu. cm.

Solution 6:

Total surface area of a cube = 216 sq.cm

But,

The total surface area of a cube $= 6l^2$

$\therefore 216 = 6l^2$

$\therefore l^2 = \frac{216}{6}$

$\therefore l^2 = 36$

$\therefore l = 6$ cm

Volume of a cube $= l^3 = (6)^3 = 6 \times 6 \times 6 = 216$ cu.cm

Thus, the volume of the cube is 216 cu.cm.

Solution 7:

Total surface area of the wooden cube-shaped box = 486 sq.cm

But,

The total surface area of a cube $= 6l^2$

$\therefore 486 = 6l^2$

$\therefore l^2 = \frac{486}{6}$

$\therefore l^2 = 81$

$\therefore l = 9$ cm

Volume of the box $= l^3 = (9)^3 = 9 \times 9 \times 9 = 729$ cu. cm

Cost to laminate 1 sq.cm = Rs. 1.50

$\therefore$ Cost to laminate 729 sq.cm = Rs. (1.50×486)

= Rs. 729

Volume of the box is 729 cu.cm.

Cost to laminate 486 sq.cm is Rs. 729.

Exercise-88

Solution 1:

1. l = 14 cm, b = 12 cm, h = 8 cm

Volume of a cuboid = l × b × h

= 14 × 12 × 8

= 1344 cu. cm

2. l = 20.5 cm, b = 16 cm, h = 10 cm

Volume of a cuboid = l × b × h

= 20.5 × 16 × 10
= 3280 cu. cm

3. l = 7.5 cm, b = 5.2 cm, h = 4.5 cm
Volume of a cuboid = l × b × h
= 7.5 × 5.2 × 4.5
= 175.5 cu. cm

4. l = 1.4 cm, b = 1.1 cm, h = 0.6 cm
Volume of a cuboid = l × b × h
= 1.4 × 1.1 × 0.6
= 0.924 cu. cm

5. l = 2.2 cm, b = 1.5 cm, h = 0.9 cm
Volume of a cuboid = l × b × h
= 2.2 × 1.5 × 0.9
= 2.97 cu. cm

Solution 2:

1. Volume of a cuboid = l × b × h = 7 × 5 × 3 = 105 cu.cm

2. Volume of a cuboid = l × b × h = 15 × 10 × 4 = 600 cu.cm

3. Volume of a cuboid = l × b × h

   ∴ l × 12 × 8 = 1920

   $\therefore l = \frac{1920}{12 \times 8}$

   ∴ l = 20 cm

4. Volume of a cuboid = l × b × h

   ∴ 3.5 × b × 2 = 21

   $\therefore l = \frac{21}{3.5 \times 2}$

   ∴ l = 3 cm

5. Volume of a cuboid = l × b × h

   ∴ 4.8 × 3.5 × h = 42

   $\therefore h = \frac{42}{4.8 \times 3.5}$

   ∴ h = 2.5 m

6. Volume of a cuboid = l × b × h

   ∴ l × 1.6 × 0.5 = 2

   $\therefore l = \frac{2}{1.6 \times 0.5}$

   ∴ l = 2.5 m

Sr. No	(1)	(2)	(3)	(4)	(5)	(6)
Length	7 cm	15 cm	20 cm	3.5 cm	4.8 m	2.5 m
Breadth	5 cm	10 cm	12 cm	3 cm	3.5 m	1.6 m
Height	3 cm	4 cm	8 cm	2 cm	2.5 m	0.5 m
Volume	105 cu. cm	600 cu. cm	1920 cu. cm	21 cu. cm	42 cu. m	2 cu. m

Solution 3:

Volume of a room = 64 cu.m

b = 4 m, h = 2 m

Volume of a room = l × b × h

64 = l × 4 × 2

$$l = \frac{64}{4 \times 2}$$

l = 8 m

Thus, the length of the room is 8 m.

Solution 4:

l = 8 m, b = 7 m, h = 3 m

Volume of the classroom = l × b × h = 8 × 7 × 3 = 168 cu.m

Volume of the air = Volume of the classroom = 168 cu.m

$$\text{Average volume of air available to each child} = \frac{\text{Volume of the air}}{\text{number of children}}$$

$$= \frac{168}{42}$$

= 4 cu.m

Thus, the average volume of air available to each child is 4 cu.m.

Solution 5:

l = 1.8 km = 1.8 × 1000 = 1800 m, b = 8 m,
h = 15 cm = (15 ÷ 100) m = 0.15 m
Volume of the required metal = l × b × h
= 1800 × 8 × 0.15
= 2160 cu. m
Thus, the required volume of the metal is 2160 cu. m.

Solution 6:

l = 7.5 m, b = 2.4 m, h = 3 m
Volume of the tank = l × b × h
= 7.5 × 2.4 × 3
= 54 cu. m
Thus, the tank will hold 54 cu. m of water.

Solution 7:

For the wall :

$l = 4.8\ m = 480\ cm,\ b = 30\ cm,\ h = 3\ m = 300\ cm$

For the brick :

$l = 20\ cm,\ b = 12\ cm,\ h = 7.5\ cm$

Volume of the wall $= l \times b \times h = (480 \times 30 \times 300)$ cu. cm

Volume of each brick $= l \times b \times h = (20 \times 12 \times 7.5)$ cu. cm

$$\text{Number of bricks} = \frac{\text{Volume of the wall}}{\text{Volume of the brick}}$$

$$= \frac{480 \times 30 \times 300}{20 \times 12 \times 7.5}$$

$$= 2400$$

2400 bricks will be the required to build the wall.

Exercise-89

Solution 1:

l = 1.5 m, b = 1.2 m, h = 1.3 m

Total surface area of the trunk

= 2(l × b + b × h + h × l)

= 2(1.5 × 1.2 + 1.2 × 1.3 + 1.3 × 1.5)

= 2(1.80 + 1.56 + 1.95)

= 2 × 5.31

= 10.62 sq. m

Solution 2:

l = 12 cm, b = 10 cm, h = 5 cm

Metal sheet required

= 2(l × b + b × h + h × l)

= 2(12× 10 + 10 × 5 + 5 × 12)

= 2(120 + 50 + 60)

= 2 × 230

= 460 sq. cm

Solution 3:

l = 4 cm, b = 2.5 cm, h = 1.5 cm

Paper required = Total surface area of the matchbox

= 2(l × b + b × h + h × l)

= 2(4 × 2.5 + 2.5 × 1.5 + 1.5 × 4)

= 2(10.00 + 3.75 + 6.0)

= 2 × 19.75

= 39.5 sq. cm

Solution 4:

l = 2.5 m, b = 2 m, h = 2.4 m

Metal sheet required

= 2(l × b + b × h + h × l)

= 2(2.5 × 2 + 2 × 2.4 + 2.4 × 2.5)

= 2(5 + 4.8 + 6)

= 2 × 15.8

= 31.6 sq. m

Cost of constructing 1 sq. m = Rs. 10

∴ Cost of constructing 31.6 sq. m = Rs. (31.6 × 10)

= Rs. 316

Volume of the tank = l × b × h

= 2.5 × 2 × 2.4

= 12 cu. m