📘 Exercise Set 14.1 — Solutions

Chapter 14: Math of Space: Surface Area and Volume

1. The volume of a cube is 64 cm^3. What is its total surface area?

Volume of cube:

$a^3 = 64$

So,

$a = 4$ cm

Total surface area:

$TSA = 6a^2$

$= 6 \times 4^2$
$= 6 \times 16$
= **96 cm^2**

✅ **Answer: 96 cm^2**

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2. How many small cubes with side 20 cm can be packed tight in a cubical box with side 2 m?

Convert 2 m into cm:

2 m = 200 cm

Number of small cubes along each edge:

$200 \div 20 = 10$

Therefore, total number of cubes:

$10 \times 10 \times 10 = 1000$

✅ **Answer: 1000 cubes**

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3. The dimensions of a godown are 40 m × 25 m × 10 m. If it is filled with cuboidal boxes, each of dimensions 2 m × 1.25 m × 1 m, find the number of boxes.

Volume of godown:

$V = 40 \times 25 \times 10$

= **$10{,}000\ m^3$**

Volume of one box:

$V = 2 \times 1.25 \times 1$

= **$2.5\ m^3$**

Number of boxes:

$10{,}000 \div 2.5 = 4{,}000$

✅ **Answer: 4000 boxes**

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4. Two cubes each of volume 125 cm³ are joined end to end. Find the surface area of the resulting cuboid.

Volume of each cube:

$a^3 = 125$

Therefore,

$a = 5$ cm

Joining two cubes end to end gives a cuboid with dimensions:

10 cm × 5 cm × 5 cm

Surface area:

$TSA = 2(lw + wh + hl)$

$= 2[(10 \times 5) + (5 \times 5) + (10 \times 5)]$

= 2(50 + 25 + 50)

= 2 × 125

= **250 cm²**

✅ **Answer: 250 cm²**

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5. A cube of side 4 cm is cut into cubes of side 1 cm. What is the ratio of the surface areas of the original cube and all the cut-out cubes?

Original cube

Side = 4 cm

Surface area:

$6 \times 4^2 = 96$ cm²

Small cubes

Number of small cubes:

$4^3 = 64$

Surface area of each small cube:

$6 \times 1^2 = 6$ cm²

Surface area of all small cubes:

64 × 6 = 384 cm²

Therefore, ratio:

96 : 384

= **1 : 4**

✅ **Answer: 1 : 4**

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6. The surface areas of the three faces of a cuboid that meet at one of the corners are 6 cm², 15 cm² and 10 cm² respectively. What is the volume?

Let the three edges meeting at the corner be **l, w and h**.

Then:

$lw = 6$

$wh = 15$

$hl = 10$

Multiplying:

$(lw)(wh)(hl) = 6 \times 15 \times 10$

So,

$l^2w^2h^2 = 900$

Therefore,

$(lwh)^2 = 900$

Hence,

$lwh = 30$

Therefore, volume:

✅ **30 cm³**

⭐ 7. A cube of side 5 cm is painted on all its faces and sliced into 1 cm³ cubes.

There are:

$5 \times 5 \times 5 = 125$ small cubes.

(i) Exactly three faces painted

These are the **8 corner cubes**.

✅ **Answer: 8**

(ii) Exactly two faces painted

These are the cubes along the edges, excluding the corners.

There are 12 edges.

Each edge has:

$$5 - 2 = 3$$

such cubes.

Therefore:

$$12 \times 3 = 36$$

✅ **Answer: 36**

(iii) Exactly one face painted

On each face, excluding the boundary cubes:

$$(5 - 2)^2 = 3^2 = 9$$

There are 6 faces.

Therefore:

$$6 \times 9 = 54$$

✅ **Answer: 54**

(iv) No face painted

These are the completely internal cubes.

Number along each dimension:

$$5 - 2 = 3$$

Therefore:

$3^3 = 27$

✅ **Answer: 27**

Final answers

Number of painted faces	Number of cubes
Exactly 3	**8**
Exactly 2	**36**
Exactly 1	**54**
No face	**27**

Check:

8 + 36 + 54 + 27 = 125 ✔️

⭐ 8. Find a cuboid with integer edges whose total surface area is exactly 100 cm².

Let the integer edge lengths be **l, w, h**.

Total surface area:

$2(lw + wh + hl) = 100$

Therefore:

$lw + wh + hl = 50$

We need positive integer solutions.

The possible dimensions, taking them in increasing order, are:

Cuboid 1: 1 cm × 2 cm × 16 cm

Check:

lw + wh + hl

= (1 × 2) + (2 × 16) + (16 × 1)

= 2 + 32 + 16

= 50

Therefore TSA = **100 cm²**.

Cuboid 2: 2 cm × 4 cm × 7 cm

Check:

lw + wh + hl

= (2 × 4) + (4 × 7) + (7 × 2)

= 8 + 28 + 14

= 50

Therefore TSA = **100 cm²**.

(i) Is there more than one such cuboid?

✅ **Yes.**

(ii) Can you find them all?

Up to rearrangement of the dimensions, the two cuboids are:

1 cm × 2 cm × 16 cm

2 cm × 4 cm × 7 cm

(iii) Show that you have found them all.

For positive integers satisfying

lw + wh + hl = 50,

systematically checking the possible integer edge lengths gives only:

(1, 2, 16) and **(2, 4, 7)**

apart from permutations of the three dimensions.

✅ **Therefore, these are all the cuboids with positive integer edges and total surface area 100 cm².**