Unit 12 · Perimeter, Area and Volume

STUDY NOTES

Key terms

Perimeter: the distance all the way round the edge of a flat shape; a length (cm, m).

Area: how much flat surface a shape covers, counted in squares (sq. cm, sq. m).

1 sq. cm: the area of a square 1 cm on each side (later written 1 cm^2).

Volume: how much space a solid takes up, counted in cubes (cubic cm, cubic m).

1 cubic cm: the volume of a cube 1 cm on each side (later 1 cm^3); a little smaller than a sugar cube.

Formulas

Perimeter

- rectangle: **2 × length + 2 × breadth**
- square: **4 × length of a side**

Area

- rectangle: **length × breadth**
- square: **length × length**

Volume

- cuboid: **length × breadth × height**
- cube: **length × length × length**

Three questions, three measures

Question	Measure	Unit
wire **round** it? fence, ribbon, border	perimeter	cm, m
how much ground does it **cover**? tiles, carpet, grass	area	sq. cm, sq. m
how much **fills** it? soil, water, cubes	volume	cubic cm

- fence → round
- carpet → cover
- box → fill
- vegetable bed 6 m by 4 m: wire 2 × 6 + 2 × 4 = **20 m**; ground 6 × 4 = **24 sq. m**
- seedling box 30 cm × 20 cm × 10 cm: soil 30 × 20 × 10 = **6,000 cubic cm** = 6 liters

Perimeter

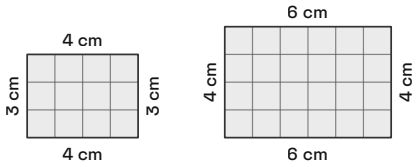


Figure A: 4 + 3 + 4 + 3 = 14 cm round; 3 rows of 4 = 12 sq. cm inside. Figure B: 20 cm round; 24 sq. cm inside.

- a rectangle has **two lengths and two breadths**: no need to count squares
- 7 cm by 4 cm: 2 × 7 + 2 × 4 = 14 + 8 = **22 cm**
- square of 3 cm sides: 4 × 3 = **12 cm**
- photo frame 25 cm by 20 cm: ribbon 2 × 25 + 2 × 20 = **90 cm**
- wire 3 times round a 30 m by 20 m field: perimeter 100 m; 3 × 100 = **300 m**
- 5 by 1 and 3 by 3: both perimeter 12, very different shapes
- decimal sides: 6.8 cm by 3 cm → 2 × 6.8 + 2 × 3 = 13.6 + 6 = **19.6 cm**
- a square of 5½ cm sides: 5½ = 5.5 → 4 × 5.5 = **22 cm**

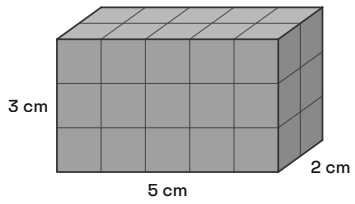
Area

- squares in **rows**: each row as many squares as the length; as many rows as the breadth
- so multiply instead of counting one by one
- 5 cm by 2 cm: 5 × 2 = **10 sq. cm**; square of 4 cm sides: 4 × 4 = **16 sq. cm**
- field 30 m by 20 m: 30 × 20 = **600 sq. m**
- floor 8 m by 6 m: 48 sq. m → **48 tiles** of 1 m by 1 m
- perimeter and area change differently: 6 by 1 → area 6, perimeter 14; 3 by 2 → area 6, perimeter 10
- 50 m by 20 m → 60 m by 10 m: perimeter still 140 m; area 1,000 → **600 sq. m**
- decimals: multiply as whole numbers, then count the decimal places: 10.3 × 6.5 → 103 × 65 = 6,695 → **66.95 sq. cm**
- a 4 by 4 square: perimeter 16 and area 16, but one is a length, the other a number of squares

- land in the hills: 1 ropani = 16 aana; 1 ropani = a square of 74 feet, about 509 sq. m

Volume

- **length × breadth** = cubes in **one layer**; **height** = how many layers
- 7 cm × 4 cm × 2 cm: 28 cubes a layer, 2 layers: **56 cubic cm**
- box of chalk 10 cm × 8 cm × 9 cm: 80 × 9 = **720 cubic cm**
- cube of 6 cm sides: 6 × 6 × 6 = 216 cubic cm; three in a row: 18 × 6 × 6 = 648 = 3 × 216
- a box 10 cm × 10 cm × 10 cm holds **1,000 cubic cm = 1 liter**; 1 cubic cm = 1 milliliter



5 cubes long, 2 broad, 3 high: one layer 5 × 2 = 10 cubes; 3 layers = **30 cubic cm**.

Units at a glance

Measure	Counts	Example
Length, perimeter	steps along a line	24 cm
Area	squares	24 sq. cm
Volume	cubes	24 cubic cm

Where it is used

- wire for fences, bricks for compound walls: by the perimeter
- by the area
  - tiles
  - carpet
  - paint
  - land (ropani, aana, square feet)
- volleyball court 18 m by 9 m: area 162 sq. m
- water in a tank, boxes in a truck: by the volume

COMMON MISTAKES

✗ square of 5 cm sides: perimeter 10 cm
✓ 4 equal sides: 4 × 5 = 20 cm.

✗ 5 × 5 = 25 given as the perimeter
✓ 25 sq. cm is the area.

✗ perimeter of a rectangle = length × breadth
✓ 2 × length + 2 × breadth.

✗ area written in cm
✓ area in sq. cm; volume in cubic cm.

✗ volume = length × breadth
✓ times the height too: the number of layers.

✗ wire 3 times round = the perimeter
✓ 3 × the perimeter.