Name _____ Date _____

Unit 15 · Shapes, area and volume — revision sheet

Everything you need from every section. Read it before the end-of-unit test.

15.1 Perimeter and area of rectangles

- **Perimeter** is the distance round the edge. It is a length, measured in mm, cm, m or km.
- **Area** is the surface covered. It is measured in **square** units, because it is a length times a length.
- Rectangle: **perimeter = 2(l + w)** and **area = l × w**.
- Square of side s: **perimeter = 4s** and **area = s²**.
- To work backwards from an area, **divide**: width = area ÷ length.
- To work backwards from a perimeter, take off the two sides you know first, then halve what is left.
- Two shapes are **congruent** when corresponding sides and angles are equal — same shape **and** same size.
- Equal areas do not make shapes congruent: 6 × 4 and 12 × 2 both give 24 cm².
- Doubling both sides multiplies the area by 4, not by 2.

Key words: *perimeter · area · square centimetre · congruent · formula · dimension*

```
rectangle 8 cm by 5 cm
perimeter 8 + 5 + 8 + 5 = 26 cm
area 8 × 5 = 40 cm²
5 rows of 8 squares
5 × 8 = 40
area 40 cm²
l = 12, w = 7
```

15.2 Compound shapes

• A **compound shape** is built from rectangles, so it can always be handled with the rectangle formula.
• **Method 1 — split.** Cut it into rectangles and **add** the areas.
• **Method 2 — subtract.** Take the missing piece away from the enclosing rectangle.
• Both methods must give the same answer. Doing one and checking with the other is free insurance.
• Write every side length on the diagram first, including the ones you have to work out by subtracting.
• For the **perimeter**, walk right round the outline. Inside joins are not part of it.
• Cutting a rectangular corner out changes the area but **not** the perimeter.
• A border of width b round an l by w picture makes the outside (l + 2b) by (w + 2b).

Key words: *compound shape · split · enclosing rectangle · L-shape · border*

```
an L-shape
= two rectangles
or one rectangle with a bite out
lower 10 × 4 = 40
upper 6 × 3 = 18
total 40 + 18 = 58 cm²
whole 10 × 7 = 70
```

15.3 Units of area

• An area conversion factor is the **square** of the length one.
• 1 cm = 10 mm, so **1 cm² = 100 mm²**.
• 1 m = 100 cm, so **1 m² = 10 000 cm²**.
• 1 km = 1000 m, so **1 km² = 1 000 000 m²**.
• **1 hectare = 10 000 m²** — a square 100 m by 100 m.
• **1 km² = 100 hectares.**
• Big unit → small unit: **multiply**. Small → big: **divide**.
• Choose a unit that keeps the numbers sensible: mm² for a stamp, hectares for a farm.
• When a shape has mixed units, convert **before** multiplying.

Key words: *square millimetre · square centimetre · square metre · hectare · square kilometre · convert*

```
length: × 10
area: × 10 × 10 = × 100
1 cm² = 100 mm²
10 rows × 10 squares
= 100 mm² in 1 cm²
1 m² = 10 000 cm²
1 km² = 1 000 000 m²
```

15.4 Area of a triangle

- **Area of a triangle = ½ × base × perpendicular height.**
- It works because **two copies of the triangle make a parallelogram** of base × height.
- The height must be **perpendicular** to the base — not a sloping side.
- In an **obtuse** triangle the height falls outside the triangle. Extend the base and measure to it; the formula is unchanged.
- Triangles with the **same base and height have the same area**, however different they look.
- The answer may end in .5 — that is real, not a rounding error.
- **Area of a parallelogram = base × height**, with no halving.
- To find a missing base or height: **double the area first**, then divide.
- Split a compound shape into rectangles and triangles and add.

Key words: *base · perpendicular height · triangle · parallelogram · derive*

```
parallelogram = b × h
triangle = ½ × b × h
b = 8, h = 5
8 × 5 = 40, then 40 ÷ 2 = 20 cm²
base 12 cm
sloping side 13 cm ✗
perpendicular height 5 cm ✓
```

15.5 Volume of cubes and cuboids

- **Volume of a cuboid = l × w × h.**
- It is also **base area × height** — one layer, stacked h times.
- **Volume of a cube = s × s × s = s³.**
- Volume is measured in **cubic** units, because three lengths are multiplied.
- **1 litre = 1000 cm³**, a cube 10 cm on each edge.
- **1 m³ = 1 000 000 cm³** — the length factor is **cubed**.
- For a compound solid, split it into cuboids and **add** the volumes; for a hole, **subtract**.
- To find a missing dimension, divide the volume by the other two.
- Doubling every edge multiplies the volume by 8, not by 2.

Key words: *volume · cuboid · cube · cubic centimetre · capacity · litre*

```
5 × 3 = 15 in a layer
4 layers
15 × 4 = 60 cm³
5 × 3 × 4 = 60 cm³
cube of edge 4: 4 × 4 × 4 = 64 cm³
base 8 × 5 = 40 cm²
height 3 cm
```

15.6 Surface area, nets and views

- **Surface area** is the total area of all the faces. It is measured in **cm²**, not cm³.
- A cuboid has **6 faces, 12 edges and 8 vertices**.
- The six faces come in **three matching pairs**.
- **Surface area of a cuboid = 2(lw + lh + wh).**
- **Surface area of a cube = 6s².**
- The **net** lays all six faces out flat, so none can be forgotten.
- For an **open** box, work out the closed one and subtract the missing face.
- The total edge length of a cuboid is **4(l + w + h)**.
- The **front, side and top views** are flat rectangles: l × h, w × h and l × w.
- Equal volume does not mean equal surface area — a cube is the most economical box.

Key words: *surface area · face · edge · vertex · net · front view*

```
volume 5 × 3 × 4 = 60 cm³
surface 2(15 + 20 + 12) = 94 cm²
different questions, different units
l = 5, w = 3, h = 4
15 + 20 + 12 = 47
47 × 2 = 94 cm²
top and bottom
```