🔶 1. Calculate Lengths of Similar Shapes

Definition: Two shapes are **similar** if they have the same shape but not necessarily the same size. Corresponding angles are equal, and corresponding sides are **in proportion**.

🔹 Scale Factor (SF)

If two shapes are similar:

- **Length scale factor (k)**:

$$\frac{\text{Length of shape B}}{\text{Length of shape A}} = k$$

✅ Example:

Triangle A and Triangle B are similar. A side in Triangle A is 4 cm, and the corresponding side in Triangle B is 10 cm.

- Scale factor from A to B = $\frac{10}{4} = 2.5$
- If another side in A is 6 cm, the corresponding side in B = $6 \times 2.5 = 15$ cm

🔶 2. Relationships Between Lengths, Areas, Surface Areas & Volumes

🔹 Lengths

If shapes are similar and scale factor = k,

- Lengths are multiplied by k

🔹 Areas

- Area scale factor = k^2

🔹 Volumes (and surface areas for 3D shapes)

- Volume scale factor = k^3

$$\frac{\text{Area of B}}{\text{Area of A}} = k^2, \quad \frac{\text{Volume of B}}{\text{Volume of A}} = k^3$$

✅ Example:

Two similar cylinders have a height ratio of 2:3.

- Area ratio = $2^2 : 3^2 = 4 : 9$
- Volume ratio = $2^3 : 3^3 = 8 : 27$

🔶 3. Solve Problems and Give Simple Explanations Involving Similarity

✅ **Example:**

A small cube has a volume of 125 cm³. A similar larger cube has edges twice as long.

- Volume scale factor = $2^3 = 8$
- Volume of larger cube = $125 \times 8 = 1000$ cm³

🔶 4. Showing Two Triangles Are Similar (Geometric Reasons)

To show triangles are similar, use:

- **AA (Angle-Angle)**: If two angles are equal
- **SSS (Side-Side-Side)**: If all sides are in the same ratio
- **SAS (Side-Angle-Side)**: If one angle is equal and the sides including the angle are in the same ratio

✅ Example:

Triangle A has angles 40°, 60°, 80°,

Triangle B has angles 40°, 60°, 80° → Triangles are similar by **AA**

📝 Summary Table

Property	Scale Factor (k)	Relation Formula
Length	k	$\frac{\text{Length B}}{\text{Length A}} = k$
Area	k^2	$\frac{\text{Area B}}{\text{Area A}} = k^2$
Volume	k^3	$\frac{\text{Volume B}}{\text{Volume A}} = k^3$