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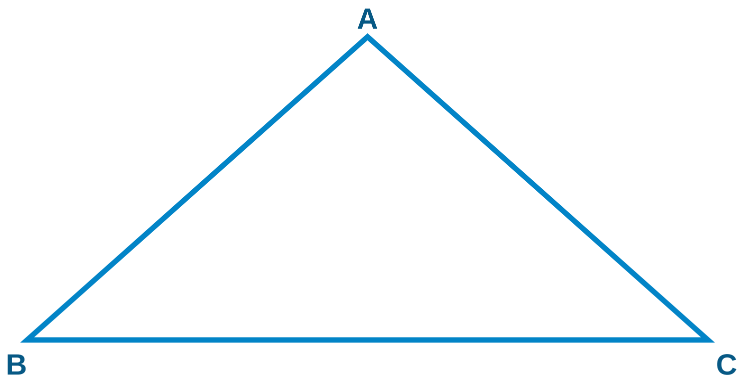
CLASS 10 • MATHEMATICS

CHAPTER 6 — TRIANGLES

Similarity • Proportionality • Similarity Criteria • Exam Toolkit



CORE IDEA
Similar figures have the same shape, but not necessarily the same size. This chapter uses similarity to solve indirect-measurement and geometric problems.

CHAPTER MAP
6.1 Introduction → 6.2 Similar Figures → 6.3 Similarity of Triangles → 6.4 Criteria for Similarity → 6.5 Summary

1. Similar Figures — The Foundation

A figure is **similar** to another when both have the same shape, even if their sizes are different. The NCERT chapter uses photographs, circles, squares and triangles to build this idea.

Definition
Two polygons of the same number of sides are similar if:
① their corresponding angles are equal, and
② their corresponding sides are in the same ratio (proportion).

Quick comparison

Congruent	Similar
Same shape **and** same size	Same shape, size may differ
Every congruent figure is similar	Similar need not be congruent

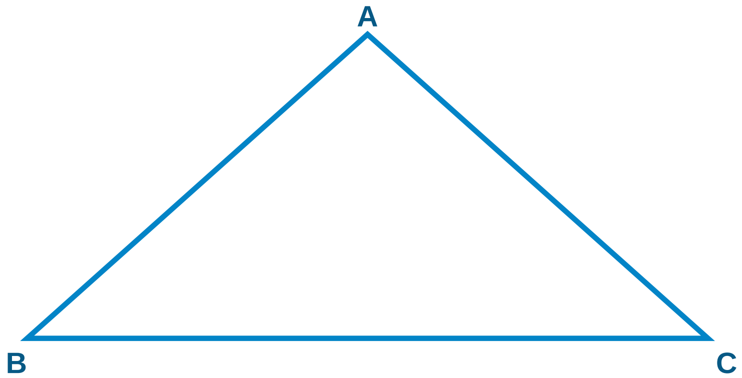
Scale factor

The common ratio of corresponding sides is called the **scale factor** (or Representative Fraction). It is the idea behind maps, blueprints and enlargement/reduction of photographs.

Remember: Equal angles alone are not enough for general polygons. Proportional sides alone are also not enough. For polygons, both conditions are required.

2. Basic Proportionality Theorem (BPT)

Also called the **Thales Theorem** in the chapter.



Theorem 6.1 — BPT
If a line is drawn parallel to one side of a triangle to intersect the other two sides in distinct points, then the other two sides are divided in the same ratio.

Standard setup

In ∆ABC, if D lies on AB, E lies on AC and **DE ■ BC**, then:

AD / DB = AE / EC

Converse — Theorem 6.2
If a line divides any two sides of a triangle in the same ratio, then the line is parallel to the third side.

Pattern: Ratio given → prove parallel.

Fast exam trigger

See ■? Think BPT. **See equal side ratios?** Think converse of BPT.

3. Similarity of Triangles — The 3 Main Criteria

For triangles, fewer conditions are enough. Learn these as a decision tree.

Criterion	What is given?	Conclusion
AA / AAA	Two corresponding angles equal	Triangles are similar
SSS	All 3 corresponding sides proportional	Triangles are similar
SAS	One included angle equal + including sides proportional	Triangles are similar

AA / AAA
If two angles of one triangle are respectively equal to two angles of another triangle, the triangles are similar. The third angle is automatically equal by angle-sum property.

SSS
If corresponding sides are in the same ratio, corresponding angles are equal and the triangles are similar.

SAS
If one angle is equal and the two sides including that angle are proportional, the triangles are similar.

4. Correspondence — The #1 Source of Mistakes

When writing similarity, the order of vertices matters. If ΔABC ~ ΔDEF, then:

A ↔ D, B ↔ E, C ↔ F

Therefore: AB/DE = BC/EF = CA/FD and ∠A=∠D, ∠B=∠E, ∠C=∠F.

Do NOT write ΔABC ~ ΔEDF unless the correspondence actually matches. The chapter specifically warns that symbolic similarity must use the correct vertex order.

Example: SSS

If AB=3.8, BC=6, CA=3 and RQ=7.6, QP=12, PR=6, then the ratios match as AB/RQ = BC/QP = CA/PR = 1/2. Hence ΔABC ~ ΔRQP by SSS, so corresponding angles can be transferred.

In the source example, this gives ∠P = ∠C = 40°.

Example: SAS

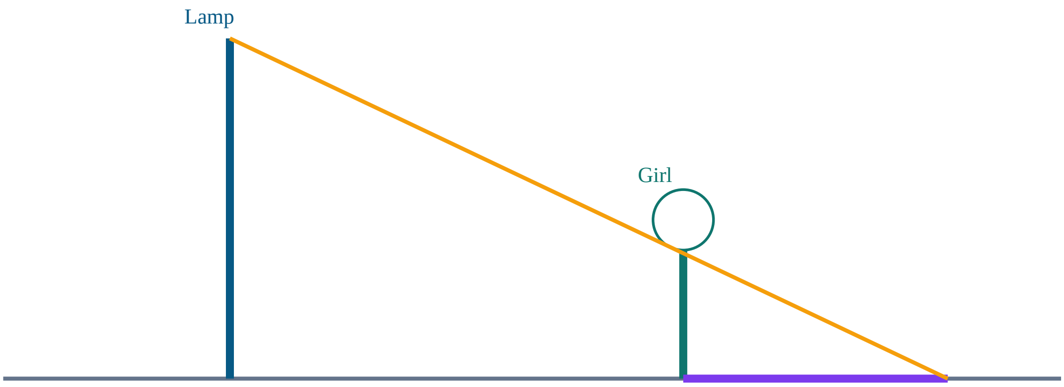
If OA·OB = OC·OD, then OA/OC = OD/OB. With the vertically opposite angles ∠AOD = ∠COB, SAS gives ΔAOD ~ ΔCOB. Hence corresponding angles are equal.

Exam habit: First write the correspondence. Then write the ratio in the same order. This prevents most wrong-angle and wrong-side substitutions.

5. Similarity in Real-Life Measurement

The chapter explains that similarity allows **indirect measurement** of heights and distances that are difficult to measure directly.

Lamp-post & shadow model



> **Source example**
> **A girl of height 90 cm walks away from a 3.6 m lamp-post at 1.2 m/s. After 4 seconds she is 4.8 m from the lamp-post. Using AA similarity of the two right triangles, the shadow length is 1.6 m.**

Why AA works here

Both triangles have one right angle, and they share the angle at the tip of the shadow. Hence AA similarity applies.

Typical setup: (distance from lamp + shadow) / shadow = lamp height / person height

> **Application idea: If two objects cast shadows at the same time, their heights and shadow lengths are proportional.**

6. High-Yield Results from Similar Triangles

The chapter's worked examples repeatedly use the same core move: prove two smaller triangles similar, then transfer side ratios or angles.

Median result

If $\Delta ABC \sim \Delta PQR$ and CM, RN are corresponding medians, the chapter proves:

$$CM / RN = AB / PQ$$

and also establishes similarity between the corresponding half-triangles formed by the medians.

Useful chain for proofs

1	Identify the two triangles you want to compare.
2	Look for equal angles: parallel lines, vertically opposite angles, right angles, common angles.
3	Look for proportional sides if SSS/SAS is intended.
4	Write the criterion explicitly: AA / SSS / SAS.
5	Write the similarity in correct vertex order.
6	Transfer the required side/angle relation.

RHS note from the chapter: In two right triangles, if the hypotenuse and one corresponding side are proportional, the triangles are similar. The text refers to this as the RHS Similarity Criterion.

7. Eduvista Exam-Ready One-Page Revision

MEMORISE THESE 9 LINES

①	Similar figures → same shape, size may differ.
②	Congruent ⇒ similar, but similar ■ congruent.
③	Polygon similarity → corresponding angles equal + corresponding sides proportional.
④	BPT: DE ■ BC ⇒ AD/DB = AE/EC.
⑤	Converse BPT: AD/DB = AE/EC ⇒ DE ■ BC.
⑥	AA/AAA: equal corresponding angles ⇒ similar.
⑦	SSS: all corresponding sides proportional ⇒ similar.
⑧	SAS: included angle equal + including sides proportional ⇒ similar.
⑨	Correct correspondence is compulsory when writing ΔABC ~ ΔDEF.

Common exam mistakes

- Using a side ratio without checking correspondence
- Writing the wrong order of vertices in similarity
- Applying SAS when the angle is not the included angle
- Forgetting that BPT needs a parallel line
- Using polygon similarity logic blindly instead of the triangle criteria

FINAL MIND-MAP
Parallel line → BPT → ratios → similarity
Equal angles → AA/AAA
3 proportional sides → SSS
Included equal angle + 2 proportional sides → SAS
Right triangle + proportional hypotenuse & side → RHS note

Source basis: uploaded NCERT Mathematics, Chapter 6 — Triangles (Reprint 2026–27).