1 Basic Proportionality Theorem

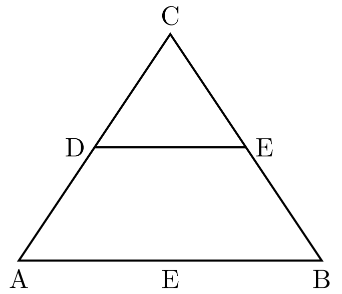
Statement: If a line is drawn parallel to one side of a triangle, it divides the other two sides proportionally.

Mathematical Form:

$$\frac{AD}{DB} = \frac{AE}{EC}$$

Example: In $\triangle ABC$, if DE is parallel to BC, then:

$$\frac{AD}{DB} = \frac{AE}{EC}$$



Converse of Basic Proportionality Theorem: If a line divides two sides of a triangle proportionally, then it is parallel to the third side.

—

2 What are Similar Triangles?

Two triangles are said to be similar if their corresponding angles are equal and their corresponding sides are in proportion.

Conditions for similarity:

- Corresponding angles are equal.
- Corresponding sides are proportional.

Example: If $\triangle ABC \sim \triangle DEF$, then:

$$\frac{AB}{DE} = \frac{BC}{EF} = \frac{CA}{FD}$$

—

3 Criteria for Similarity of Triangles

3.1 SSS (Side-Side-Side) Similarity

If the corresponding sides of two triangles are in proportion, then the triangles are similar.

Example:

$$\frac{AB}{DE} = \frac{BC}{EF} = \frac{CA}{FD}$$

3.2 SAS (Side-Angle-Side) Similarity

If one angle of a triangle is equal to one angle of another triangle and the sides including these angles are in proportion, then the triangles are similar.

Example:

$$\frac{AB}{DE} = \frac{BC}{EF}, \quad \angle B = \angle E$$

Mandeep Education Academy

3.3 AAA or AA (Angle-Angle) Similarity

If two angles of a triangle are equal to two angles of another triangle, then the triangles are similar.
Example: If $\angle A = \angle D$ and $\angle B = \angle E$, then $\triangle ABC \sim \triangle DEF$.

3.4 Example Problems

1. Show that triangles with sides in proportion are similar.

$$\text{Given } \triangle ABC \text{ and } \triangle PQR, \quad \frac{AB}{PQ} = \frac{BC}{QR} = \frac{CA}{RP}$$

$$\text{Since the sides are proportional, } \triangle ABC \sim \triangle PQR$$

2. Find the missing side if $\triangle XYZ \sim \triangle ABC$ and $AB = 6$, $BC = 9$, $AC = 12$, $XY = 4$, $YZ = 6$.

$$\frac{AB}{XY} = \frac{BC}{YZ}$$

$$\frac{6}{4} = \frac{9}{6}$$

$$\text{Therefore, the missing side is } \frac{12}{8}$$

Mandeep Education Academy