



Triangles - Points to Remember

1. Similar Shapes:

Two figures having the same shape but not necessarily the same size are called similar figures.

2. Similarity and Congruence:

All congruent figures are similar, but the converse is not true.

3. Criterion for Similarity of Polygons:

Two polygons having the same number of sides are similar if their corresponding angles are equal and their corresponding sides are proportional (i.e., in the same ratio).

4. Basic Proportionality Theorem:

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.

5. Converse of Basic Proportionality Theorem:

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

6. Angle Bisector Theorem:

The internal bisector of an angle of a triangle divides the opposite side internally in the ratio of the sides containing the angle.

7. Converse of Angle Bisector Theorem:

If a line through one vertex of a triangle divides the opposite side in the ratio of the other two sides, then the line bisects the angle at the vertex.

8. Exterior Angle Bisector Theorem:

The external bisector of an angle of a triangle divides the opposite side externally in the ratio of the sides containing the angle.

9. Some Special Cases of Angle Bisector Theorem:

- (i) The line drawn from the mid-point of one side of a triangle is parallel of another side bisects the third side.
- (ii) The line joining the mid-points of two sides of a triangle is parallel to the third side.
- (iii) The diagonals of a trapezium divide each other proportionally.
- (iv) If the diagonals of a quadrilateral divide each other proportionally, then it is a trapezium.
- (v) Any line parallel to the parallel sides of a trapezium divides the non-parallel sides proportionally.
- (vi) If three or more parallel lines are intersected by two transversals, then the intercepts made by them on the transversals are proportional.

10. Similarity Criterion of Triangles:

- (i) AAA Similarity criterion: If in two triangles, corresponding angles are equal, then the triangles are similar.
- (ii) AA Similarity criterion: If in two triangles, two angles of one triangle are respectively equal to the two angles of the other triangle, then the two triangles are similar.
- (iii) SSS Similarity criterion: If in two triangles, corresponding sides are in the same ratio, then the two triangles are similar.
- (iv) SAS Similarity criterion: If one angle of a triangle is equal to one angle of another triangle and the sides including these angles are in the same ratio, then the triangles are similar.

**11. Properties of Equiangular Triangles:**

- (i) The ratio of the corresponding sides is the same as the ratio of corresponding medians.
- (ii) The ratio of the corresponding sides is the same as the ratio of the corresponding angle bisector segments.
- (iii) The ratio of the corresponding sides is the same as the ratio of the corresponding altitudes.

12. Some Special Criteria of Similarity:

- (i) If one angle of a triangle is equal to one angle of another triangle and the bisectors of these equal angles divide the opposite side in the same ratio, then the triangles are similar.
- (ii) If two sides and a median bisecting one of these sides of a triangle are respectively proportional to the two sides and the corresponding median of another triangle, then the triangles are similar.
- (iii) If two sides and a median bisecting the third side of a triangle are respectively proportional to the two sides and the corresponding median of another triangle, then the triangles are similar.
- (iv) If one angle of a triangle is equal to one angle of another triangle and the sides including these angles are in the same ratio, then the triangles are similar.

13. Areas of Similar Triangles:

The ratio of the areas of two similar triangles is equal to the ratio of

- (i) the squares of any two corresponding sides.
- (ii) the squares of the corresponding altitudes.
- (iii) the squares of the corresponding medians.
- (iv) the squares of the corresponding angle bisector segments.

14. If the areas of two similar triangles are equal, then the triangles are congruent.

15. If a perpendicular is drawn from the vertex of the right angle of a right triangle to the hypotenuse, then the triangles on both sides of the perpendicular are similar to the whole triangle and also to each other.

16. Pythagoras Theorem:

In a right triangle, the square of the hypotenuse is equal to the sum of the squares of the other two sides.

17. Converse of Pythagoras Theorem:

If in a triangle, the square of one side is equal to the sum of the squares of the other two sides, then the angle opposite to the first side is a right angle.

18. In any triangle, the sum of the squares of any two sides is equal to twice the square of half of the third side together with the twice of the square of the median which bisects the third side.

19. Three times the sum of the squares of the sides of a triangle is equal to four times the sum of the squares of the medians of the triangle.

20. Three times the square of any side of an equilateral triangle is equal to four times the square of the altitude.