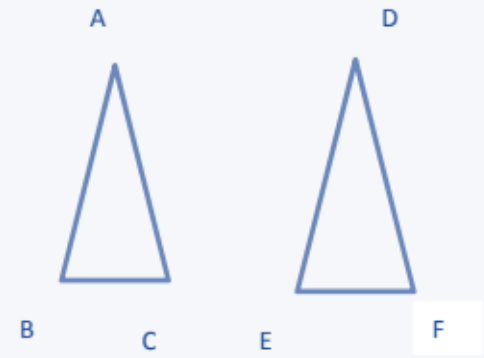
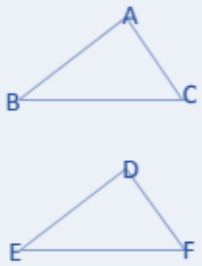
CHAPTER – 6

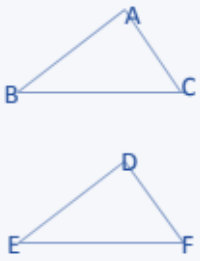
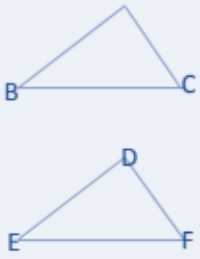
TRIANGLES

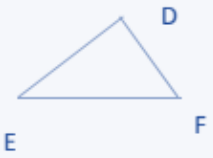
S.no	Terms	Descriptions
1	Congruence	Two Geometric figure are said to be congruence if they are exactly same size and shape Symbol used is $\cong$ Two angles are congruent if they are equal Two circle are congruent if they have equal radii Two squares are congruent if the sides are equal
2	Triangle Congruence	• Two triangles are congruent if three sides and three angles of one triangle is congruent to the corresponding sides and angles of the other  • Corresponding sides are equal AB=DE , BC=EF ,AC=DF • Corresponding angles are equal $\angle A = \angle D, \angle B = \angle E, \angle C = \angle F$ • We write this as $ABC \cong DEF$ • The above six equalities are between the corresponding parts of the two congruent triangles. In short form this is called **C.P.C.T** • We should keep the letters in correct order on both sides

3	Inequalities in Triangles	1) In a triangle angle opposite to longer side is larger 2) In a triangle side opposite to larger angle is larger 3) The sum of any two sides of the triangle is greater than the third side
		In triangle ABC AB +BC > AC

Different Criterion for Congruence of the triangles:

N	Criterion	Description	Figures and expression
1	Side angle Side (SAS) congruence	• Two triangles are congruent if the two sides and included angles of one triangle is equal to the two sides and included angle • It is an axiom as it cannot be proved so it is an accepted truth • ASS and SSA type two triangles may not be congruent always	 **If following condition** **AB=DE, BC=EF** $\angle B = \angle E$ **Then** $ABC \cong DEF$

2	Angle side angle (ASA) congruence	• Two triangles are congruent if the two angles and included side of one triangle is equal to the corresponding angles and side • It is a theorem and can be proved	 **If following condition** **BC=EF** $\angle B = \angle E, \angle C = \angle F$ **Then** $ABC \cong DEF$
3	Angle angle side(AAS) congruence	• Two triangles are congruent if the any two pair of angles and any side of one triangle is equal to the corresponding angles and side • It is a theorem and can be proved	 **If following condition** **BC=EF** $\angle A = \angle D, \angle C = \angle F$ **Then** $ABC \cong DEF$

4	Side-Side-Side (SSS) congruence	• Two triangles are congruent if the three sides of one triangle is equal to the three sides of the another	  **If following condition** **BC=EF,AB=DE,DF=AC** **Then** $ABC \cong DEF$
5	Right angle – hypotenuse-side(RHS) congruence	• Two right triangles are congruent if the hypotenuse and a side of the one triangle are equal to corresponding hypotenuse and side of the another	 **If following condition** **AC=DF,BC=EF** **Then** $ABC \cong DEF$

Some Important points on Triangles:

Terms	Description
Orthocenter	Point of intersection of the three altitude of the triangle
Equilateral	triangle whose all sides are equal and all angles are equal to 60^0
Median	A line Segment joining the corner of the triangle to the midpoint of the opposite side of the triangle
Altitude	A line Segment from the corner of the triangle and perpendicular to the opposite side of the triangle
Isosceles	A triangle whose two sides are equal
Centroid	Point of intersection of the three median of the triangle is called the centroid of the triangle
In center	All the angle bisector of the triangle passes through same point
Circumcenter	The perpendicular bisector of the sides of the triangles passes through same point
Scalene triangle	Triangle having no equal angles and no equal sides
Right Triangle	Right triangle has one angle equal to 90^0
Obtuse Triangle	One angle is obtuse angle while other two are acute angles
Acute Triangle	All the angles are acute

SIMILARITY OF TRIANGLES

S.no	Points
1	Two figures having the same shape but not necessarily the same size are called similar figures.
2	All the congruent figures are similar but the converse is not true.
3	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
4	If a line divides any two sides of a triangle in the same ratio, then the line is parallel to the third side.

Different Criterion for Similarity of the triangles:

N	Criterion	Description	Expression
1	Angle Angle angle(AAA) similarity	• Two triangles are similar if corresponding angle are equal	***If following condition*** $\angle A = \angle D$ $\angle B = \angle E$ $\angle C = \angle F$ ***Then*** $\frac{AB}{DE} = \frac{BC}{EF} = \frac{AC}{DF}$
			Then $ABC \sim DEF$
2	Angle angle (AA) similarity	• Two triangles are similar if the two corresponding angles are equal as by angle property third angle will be also equal	***If following condition*** $\angle A = \angle D$ $\angle B = \angle E$ ***Then*** $\angle C = \angle F$ ***Then*** $\frac{AB}{DE} = \frac{BC}{EF} = \frac{AC}{DF}$ ***Then*** $ABC \sim DEF$

3	Side side side(SSS) Similarity	Two triangles are similar if the sides of one triangle is proportional to the sides of other triangle	**If following condition** $\frac{AB}{DE}=\frac{BC}{EF}=\frac{AC}{DF}$ **Then** $\angle A=\angle D$ $\angle B=\angle E$ $\angle C=\angle F$ **Then** $ABC \cong DEF$
4	Side-Angle-Side (SAS) similarity	• Two triangles are similar if the one angle of a triangle is equal to one angle of other triangles and sides including that angle is proportional	**If following condition** $\frac{AB}{DE}=\frac{AC}{DF}$ ***And*** $\angle A=\angle D$ **Then** $ABC \cong DEF$

Area of Similar triangles:

If the two triangle ABC and EDF are similar

$$ABC \cong DEF$$

Then

$$\frac{Area\ of\ Triangle\ ABC}{Area\ of\ Triangle\ DEF}=\left(\frac{AB}{DE}\right)^2=\left(\frac{BC}{EF}\right)^2=\left(\frac{AC}{DF}\right)^2$$

Pythagoras Theorem:

S.no	Points
1	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.
2	In a right triangle, the square of the hypotenuse is equal to the sum of the squares of the other two sides (Pythagoras Theorem). $(hyp)^2 = (base)^2 + (perp)^2$
3	If in a triangle, square of one side is equal to the sum of the squares of the other two sides, then the angle opposite the first side is a right angle