


**Definitions**

**Geometry:** words GEOMETRY has been derived from two Greek words "Geo" (Earth) & "Metron" (Measurement)

Geometry means the measurement of earth

**Line segment** 

If A and B are any two points then line segment  $\overline{AB}$

**Ray** 

If line segment produced beyond B in the same direction

**Line** 

If line segment produced beyond A and B

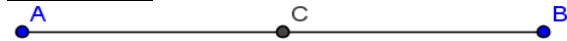
**Collinear Points:** If more than two points lie on a line

**Non-collinear points:**

If more than two points do not lie on a line

**Midpoint of a line segment**

Or Point C is the Bisector of the line segment AB

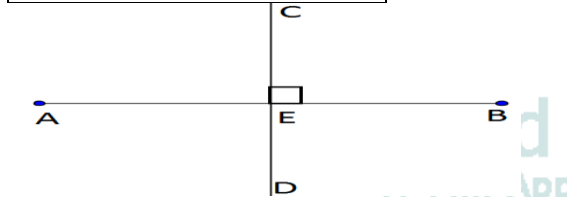


If a point C lie on line such that  $m\overline{AC} = m\overline{CB}$

or  $m\overline{AB} = 2m\overline{AC} = 2m\overline{CB}$

**Bisector of line segment:** A line passing through the midpoint of a segment is called bisector of the segment.

**Right bisector of a line segment:**



A perpendicular line to the segment passing through its midpoint is called right bisector of the segment.

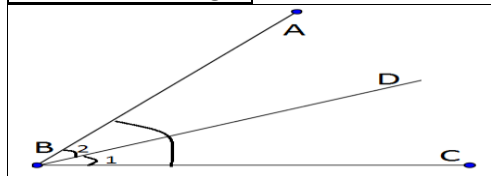
Perpendicular means  $\overline{CD} \perp \overline{AB}$  or

$$m\angle E = 90^\circ$$

Bisector means  $\overline{AE} = \overline{EB}$

We can say that  $\overline{CD}$  is the perpendicular bisector of  $\overline{AB}$

**Bisector of an angle:**



A ray that bisects an angle is called bisector of an angle.

$\overline{BD}$  is angle bisector of  $\angle B$

Here  $m\angle 1 = m\angle DBC$  and  $m\angle 2 = m\angle ABD$

Similarly we can say that

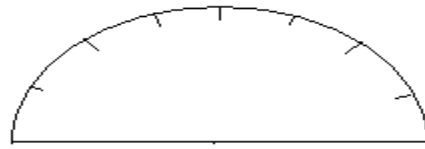
$$2m\angle 1 = 2m\angle 2 = m\angle B$$

**Altitude of a Triangle:**

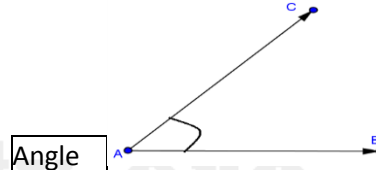
A perpendicular line segment from vertex of a triangle to the side facing the vertex is called altitude of the triangle.

**Medians of a triangle** line segment from a vertex of a triangle to midpoint of the side facing the vertex is called a median of triangle.

**Use of Protractor:**



Measurement of an angle is done with the help of protractor. We know that the curved surface of the protractor is divided into 180 equal parts and each part represent one degree  $1^\circ$



**Angle**

Union of two rays  $\overline{AB}$  and  $\overline{AC}$  with common end points A

The rays which constitute an angle are called arms or side of an angle and their common end point is called vertex of an angle

We can write  $m\angle CAB$  or  $m\angle BAC$

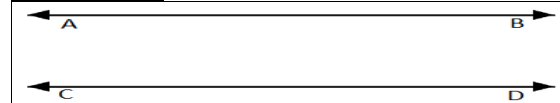
**Supplementary angles**

If the sum of measure of two angles is  $180^\circ$  then they are called supplementary angles and each of the angle is called the supplement of the other angle

**Complementary Angles**

If the sum of measure of two angles is  $90^\circ$  then they are called complementary angles and each of the angle is called the complement of the other angle

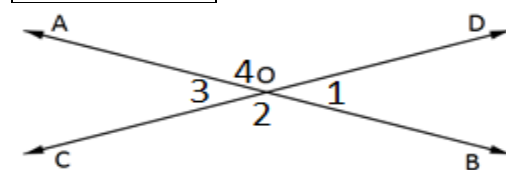
**Parallel lines**



Coplaner lines which do not intersect to each other are called parallel lines.

$$\text{i.e., } \overline{AB} \parallel \overline{CD}$$

**Intersecting lines**



## Theorems

Co-planer lines which intersect to each other are called intersecting lines

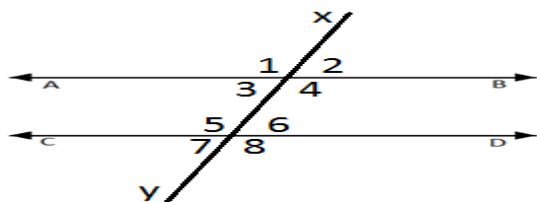
**Vertical Angles:**

If two lines intersect each other, then the two non-adjacent

angles so formed are called vertical angles

$$m\angle 1 \cong m\angle 3 \quad \& \quad m\angle 2 \cong m\angle 4$$

**Alternate and Corresponding Angles:**



When a line  $\overleftrightarrow{XY}$  intersects other two parallel lines  $\overleftrightarrow{AB}$  &  $\overleftrightarrow{CD}$ ,

**Alternate angles** are  $m\angle 3 \cong m\angle 6$  and  $m\angle 4 \cong m\angle 5$

**corresponding angles** are  $m\angle 1 \cong m\angle 5$ ,  $m\angle 3 \cong m\angle 7$ ,  $m\angle 2 \cong m\angle 6$  and  $m\angle 4 \cong m\angle 8$

**Triangle:**

Union of three non-collinear points is called triangle

**Elements of triangles:**

A triangle has six elements three sides and three angles/vertices

**Kinds of triangles:** There are three types of triangles three with respect to sides & three with respect to angles

**Equilateral Triangle:** A triangle in which the lengths of all three sides are equal and measures of all three angles are equal

**Isosceles Triangle:** A triangle in which the lengths of two sides are equal And measures of two opposite angle are equal

**Scalene Triangle:** A triangle in which the lengths of all three sides are different

**Acute Triangle:** A triangle in which all the angles are acute angles

**Right angled triangle:** A triangle in which one angles is the right angles

**Obtuse angled triangle:**

A triangle in which one angles is an obtuse angles

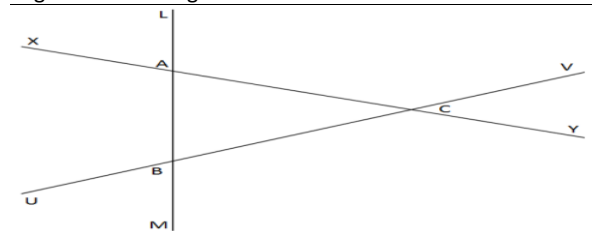
**Interior angles of triangles:**

In  $\triangle ABC$   $\angle ABC$ ,  $\angle BCA$  and  $\angle CAB$  are called exterior angles

**Exterior angles of triangles:**

If all the sides of  $\triangle ABC$  are produced in order the angles so formed are called exterior angles of triangle.

Thus  $\angle ACV$ ,  $\angle BAX$  and  $\angle CBM$  are the exterior angles of the triangle



**One to One correspondence:**

In the triangles ABC and DEF, there can be the following one to one correspondence

- 1  $\triangle ABC \leftrightarrow \triangle DEF$
- 2  $\triangle ABC \leftrightarrow \triangle EDF$
- 3  $\triangle ABC \leftrightarrow \triangle FDE$
- 4  $\triangle ABC \leftrightarrow \triangle DFE$
- 5  $\triangle ABC \leftrightarrow \triangle EFD$
- 6  $\triangle ABC \leftrightarrow \triangle FED$

Note that  $\triangle ABC \leftrightarrow \triangle DEF$  Means that

Corresponding angles

- 1  $\angle A$  to the angle  $\angle D$
- 2  $\angle B$  to the angle  $\angle E$
- 3  $\angle C$  to the angle  $\angle F$

Corresponding sides

- 4  $\overline{AB}$  to the side  $\overline{DE}$
- 5  $\overline{BC}$  to the side  $\overline{EF}$
- 6  $\overline{CA}$  to the side  $\overline{FD}$

**Congruent Triangles:**

All the three sides and angles of one triangle are congruent to all the three sides and angles of other triangle

**Congruency Triangles:** Two triangles are said to be congruent if their corresponding sides and angles are congruent. For example, if  $\triangle ABC \cong \triangle DEF$ ,

Then angles are congruent

$$\begin{aligned} \angle A &\cong \angle D \\ \angle B &\cong \angle E, \\ \angle C &\cong \angle F \end{aligned}$$

And sides are congruent

$$\begin{aligned} \overline{AB} &\cong \overline{DE} \\ \overline{BC} &\cong \overline{EF} \\ \overline{CA} &\cong \overline{FD} \end{aligned}$$

**Similar Triangles:**

If one to one correspondence between two triangles:

## Theorems

All correspondence angles are congruent and  
All correspondence sides are proportional,  
then the triangles are said to be similar  
triangles.

For example  $\triangle ABC \sim \triangle DEF$

Then angle are congruent

$$\angle A \cong \angle D$$

$$\angle B \cong \angle E$$

$$\angle C \cong \angle F$$

And side are proportional

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

**Demonstrative Geometry:** The Branch of mathematics in which the theorems on geometry are proved through logical reasoning, is called demonstrative geometry.

Following are the basics of reasoning.

- 1). Some concepts are accepted without defining them for example, point, line plane.
- 2). Some statements are accepted true without proofs. These are called Basis Assumptions. These Assumptions are two types.

**Theorem:** Theorem is a statement that has been proven.

**Geometrical Theorem:** The theorems which can be proved with the help of principle of geometry are called geometrical theorems. For example, the opposite angles of a parallelogram are congruent.

**Corollary:** The results that can be deduced directly from the theorems are called corollaries.

**Riders:** Besides the corollaries with the use of theorems, some further geometrical facts called Riders can also be proved.

**Elements in proving the Geometrical theorems:**

**Statements:** Description of geometrical theorems in words is called its Statement.

**Given:** From the start to the breakup point

**Break up of statement** is are than ,

**To Prove:** After that breakup

**Figure:**

In the light of the statement, the complete drawing of all the points, lines, angles etc. is called figure.

**Construction:**

Sometimes, we require addition in the given figure, which is very much necessary for the

proof of the theorem, this addition in the figure is called construction.

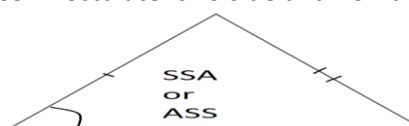
**Proof:** Proof consists of statements and facts through which we obtain the required results.

**Postulate between triangles**

**SSS Postulate; All sides are congruent**



**SSA Postulate: two side and non-adjacent angle**



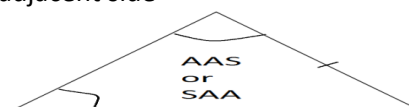
**SAS Postulate: Two sides and included angle**



**ASA Postulate: two angles and included side**



**AAS or SAA Postulate: Two angles and non-adjacent side**



**HS Postulate: One Right angle opposite side (hypotenuses) and other side**

