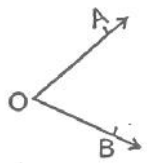
CHAPTER – 6
LINES AND ANGLES

6.1 INTRODUCTION OF LINES AND ANGLES

LINE
A line has length but no width and no thickness.

ANGLE
An angle is the union of two non-collinear rays with a common initial point. The common initial point is called the **'vertex'** of the angle and two rays are called the **'arms'** of the angles.



REMAK :

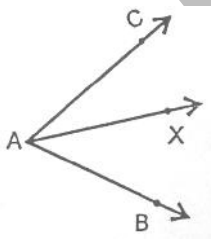
Every angle has a measure and unit of measurement is degree.

One right angle = 90^0

$1^0 = 60'$ (minutes)

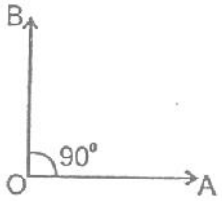
$1' = 60''$ (Seconds)

Angle addition axiom : If X is a point in the interior of $\angle BAC$, then m $\angle BAC$ = m $\angle BAX$ + m $\angle XAC$

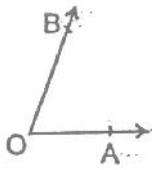


(a) Types of Angles :

(i) Right angles : An angle whose measure is 90^0 is called a right angle.

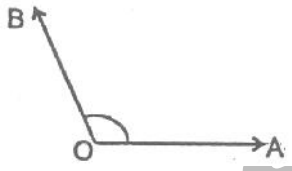


(ii) Acute angle : An angle whose measure is less than 90^0 is called an acute angle.



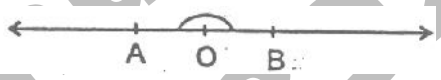
$0^0 < \angle BOA < 90^0$

(iii) Obtuse angle : An angle whose measure is more than 90^0 but less than 180^0 is called an obtuse angle.

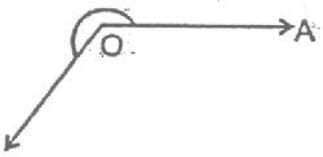


$90^0 < \angle AOB < 180^0$

(iv) Straight angle : An angle whose measure is 180^0 is called a straight angle.

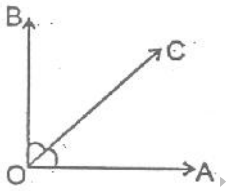


(v) Reflex angle : An angle whose measure is more than 180^0 is called a reflex angle.



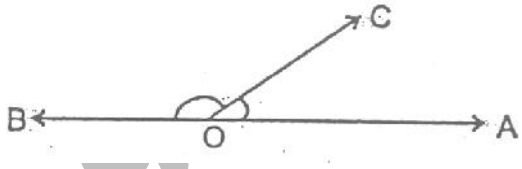
$180^0 < \angle AOB < 360^0$

(vi) Complementary angles : Two angles, the sum of whose measures is 90^0 are called complementary angles.



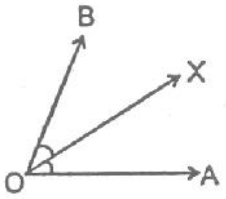
$\angle AOC$ & $\angle BOC$ are complementary as $\angle AOC + \angle BOC = 90^0$

(vii) Supplementary angles : Two angles, the sum of whose measures is 180^0, are called the supplementary angles.



$\angle AOC$ & $\angle BOC$ are supplementary as their sum is 180^0.

(viii) Angle Bisectors : A ray OX is said to be the bisector of ∠AOB, if X is a point in the interior of ∠AOB, and ∠AOX = ∠BOX.

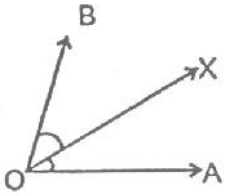


(ix) Adjacent angles : Two angles are called adjacent angles, it

(A) they have the same vertex,

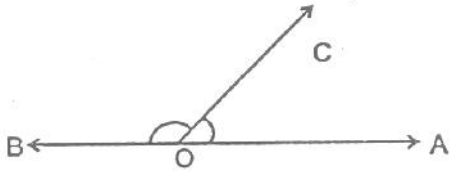
(B) they have a common arm,

(C) non common arms are on either side of the common arm.

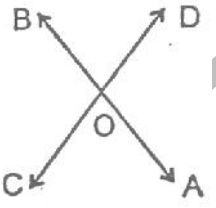


∠AOX and ∠BOX are adjacent angles, OX is common arm, OA and OB are non common arms and lies on either side of OX.

(x) Linear pair of angles : Two adjacent angles are said to form a linear pair of angles, if their non common arms are two opposite rays.



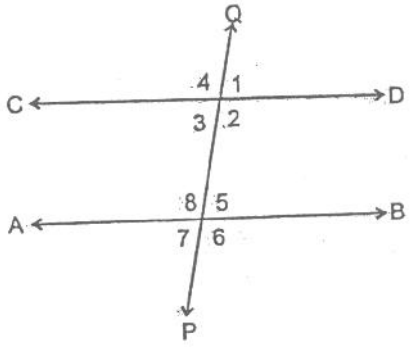
(xi) Vertically opposite angles : Two angles are called a pair of vertically opposite angles, if their arms form two pairs of opposite rays.



∠AOC & ∠BOD from a pair of vertically opposite angles. Also ∠OD & ∠BOC form a pair of vertically opposite angles.

(b) Angles Made by a Transversal with two Parallel Lines :

(i) Transversal : A line which intersects two or more give parallel lines at distinct points is called a transversal of the given lines.



(ii) Corresponding angles : Two angles on the same side of transversal are known as the corresponding angles if both lie either above the two lines or below the two lines, in figure $\angle 1$ & $\angle 5$, $\angle 4$ & $\angle 8$, $\angle 2$ & $\angle 6$, $\angle 3$ & $\angle 7$ are the pairs of corresponding angles.

(iii) Alternate interior angles : $\angle 3$ & $\angle 5$, $\angle 2$ & $\angle 8$, are the pairs of alternate interior angles.

(iv) Consecutive interior angles : The pair of interior angles on the same side of the transversal are called pairs of consecutive interior angles. In figure $\angle 2$ & $\angle 5$, $\angle 3$ & $\angle 8$, are the pair of consecutive interior angles.

(v) Corresponding angles axiom :

It a transversal intersects two parallel lines, then each pair of corresponding angles are equal. Conversely, if a transversal intersects two lines, making a pair of equal corresponding angles, then the lines are parallel.

(c) Important Facts to Remember :

(i) If a ray stands on line, then the sum of the adjacent angles so formed is 180^0.

(ii) If the sum of two adjacent angles is 180^0, then their non common arms are two apposite rays.

(iii) The sum of all the angles round a point is equal to 360^0

(iv) If two lines intersect, then the vertically opposite angles are equal.

(v) If a transversal interests two parallel lines then the corresponding angles are equal, each pair of alternate interior angles are equal and each pair of consecutive interior angles are supplementary.

(vi) if a transversal intersects two lines in such a way that a pair of alternet interior angles are equal, then the two lines are parallel.

(vii) If a transversal intersects two lines in such a way that a pair of consecutive interior angles are supplementary, then the two lines are parallel.

(viii) If two parallel lines are intersected by a transversal, the bisectors of any pair of alternate interior angles are parallel and the bisectors of an two corresponding angles are also parallel.

(ix) If a line i s perpendicular to one or two given parallel, lines, then it is also perpendicular to the other line.

(x) Two angles which have their arms parallel are either equal or supplementary.

(xi) Two angles whose arms are perpendicular are either equal or supplementary.