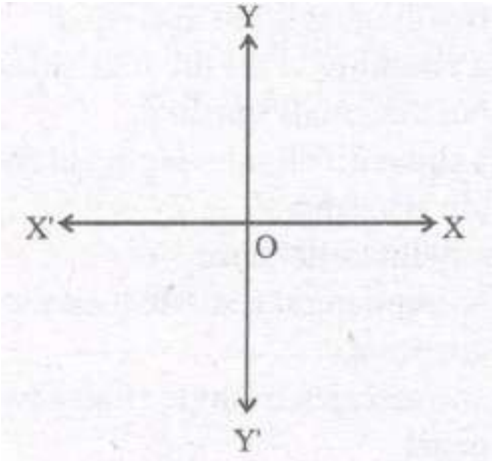
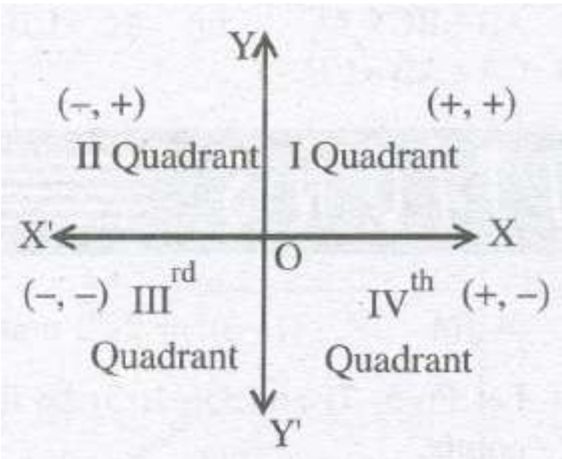
THE CARTESIAN CO-ORDINATE SYSTEM

Let X'OX and YOY' be two perpendicular straight lines meeting at fixed point 0 then X'OX is called the x—axis and Y'OY is called the axis of y or y axis. Point '0' is called the origin. x axis is known as **abscissa** and y—axis is known as **ordinate.**



NOTE : The x- axis and y— axis are mutually perpendicular to each,other that is why, this system of coordinates is also called Rectangular cartesian coordinate system.

QUADRANTS



The coordinate axes X'OX and Y'OY devide the plane into four parts, called quadrants, numbered I, II, III and IV anti-clockwise from OX.

NOTE : The coordinates of a point on the x-axis are of the form (x, 0), and of a point on they— axis are of the from (0,y).

DISTANCE FORMULA

The distance between two points whose co—ordinates are P (x_1, y_1) and Q (x_2, y_2) given by the formula $\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

DISTANCE FROM ORIGIN

$\sqrt{(x - 0)^2 + (y - 0)^2} = \sqrt{x^2 + y^2}$

NOTE : Since, distance is always non-negative (Positive), we take only the positive square root.

SECTION FORMULA

The coordinates of the point p (x, y) which divides the line segment joining the points A (x_1, y_1) and B (x_2, y_2)

internally in the ratio $m_1 : m_2$ are $x = m_1x_2 + m_2x_1 / m_1 + m_2$

and $y = m_1y_2 + m_2y_1 / m_1 + m_2$

m_1 m_2 / A(x_1. , yx_1) P(x, y) B(x_2, y_2)

NOTE : If the ratio in which P (x, y) divides AB is K : 1, then the coordinates of the point P will be

$(kx_2/k + 1 , ky_2 + y_1 / k + 1)$

COORDINATES OF MID-POINT

(Special case of section formula)

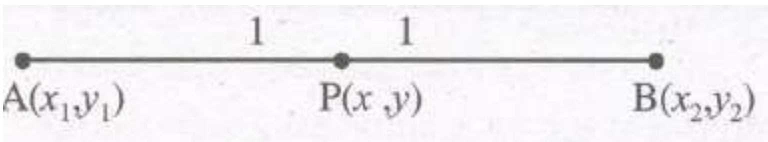
The mid-point of a line segment divides the line segment in the ratio 1 : 1

.*. The coordinates of the mid-point P of the join of the points A (x_1, y_1) and B (x_2, y_2) is

$(1.x_1 + 1.x_2 / 1 + 1 , 1.y_1 + 1 \cdot y_2 / 1 + 1) =$

$(x_1 + x_2 / 2 , y_1 + y_2 / 2)$

(using section- formula $m_1 = 1$, $m_2 = 1$)



AREA OF A TRIANGLE

Area of AABC, formed by the points $A(x_1 , y_1)$, $B(x_2,y_2)$, $C(x_3, y_3)$ is given by the numerical value of the expression

$1/2 [x_1(y_2 – y_3 + x_2(y_3 – y_1) + x_3(y_1 – y_2)]$

NOTE:

(1) Area cannot be negative so, we shall ignore negative sign if it occurs in a problem.

(2) To find the area of quadrilateral we shall divide it into two triangles by joining two opposite vertices, find their areas and add them.

(3) If the area of triangle is zero sq. units then the vertices of triangle are collinear.

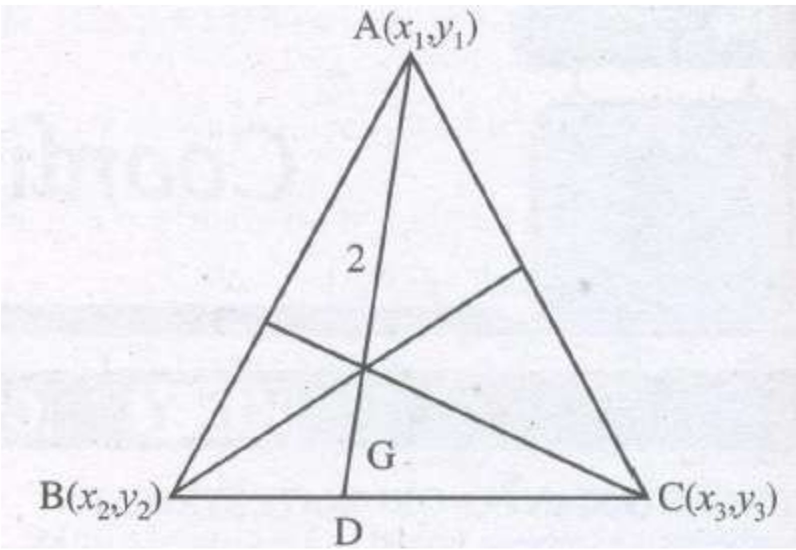
CENIROID OF A TRIANGLE

The point where the medians of a triangle meet is called the centroid of the triangle.

"If AD is a mediam of the triangle ABC and G is its centroid, then AG/GD = 2/1."

The coordinates of the point G are

$(x_1 + x_2 + x_3 / 3 ,y_1 + y_2 + y_3 / 3)$



REMARKS:

(I) Four points will form :

(a) a **parallelogram** if its opposite sides are equal, but diagonals are unequal.

(b) a **rectangle** if opposite sides are equal and two diagonals are also equal.

(c) a **rhombus** if all the four sides are equal, but diagonals unequal,

(d) a **square** if all sides are equal and diagonals are also equal.

(II) Three points will form:

(a) an equilateral triangle if all the three sides are equal.

(b) an isosceles triangle if any two sides are equal.

(c) a right angled triangle if sum of square of any two sides is equal to square of the third side.

(d) a triangle if sum of any two sides (distances) is greater than the third side (distance).

(III) Three points A, B and C are collinear or lie on a line if one of the following holds

(i) AB + BC — AC

(ii) AC + CB AB

(iii) CA + AB CB.