CO-ORDINATE GEOMETRY

Amalgamation of algebra and geometry

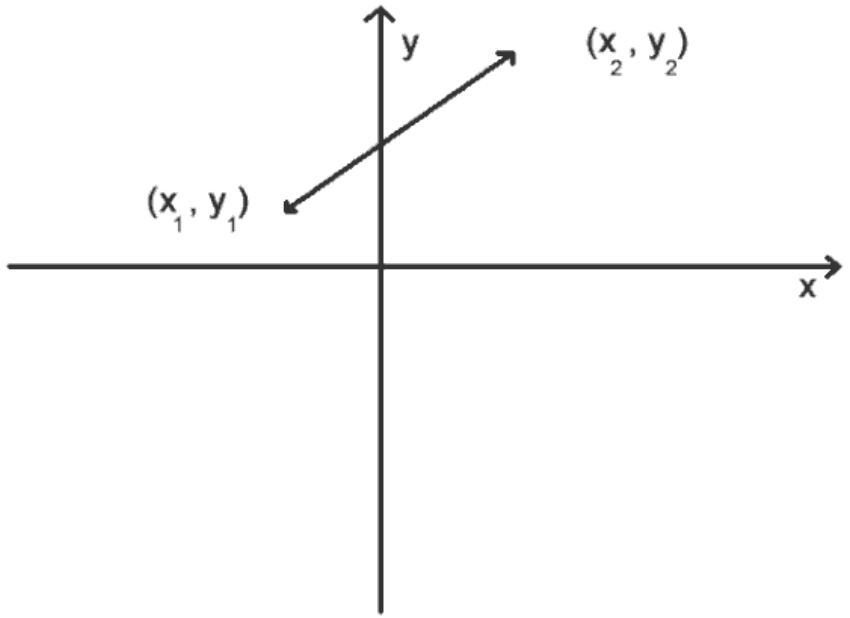
Basics of Co-ordinate Plane

- The 2 Axes
- Co-Ordinates and their other names
  - X Co-ordinate is a.k.a abscissa and Y Co-ordinate a.k.a. ordinate
- Quadrants (in 1 both +ve, in 2 x –ve, in 3 both –ve, in 4 y –ve)
- Equation of the axes (y=0 and x=0)
- Equation of lines Parallel to the axes (y=k and x=k)

Some Basic Formulae

- Distance Formula

$$d=\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$



- Section Formula-
  - Internal Division

Section Formula

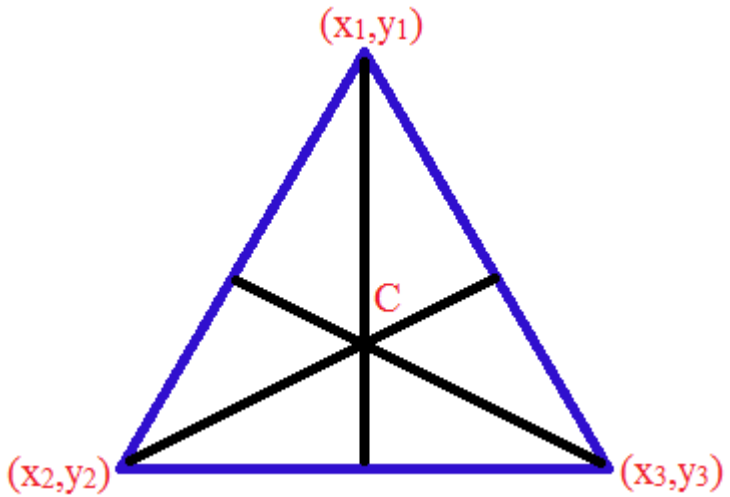
So, the coordinates of the point **P**(x, y) which divides the line segment joining the points **A**(x_1, y_1) and **B**(x_2, y_2), internally, in the ratio **m1: m2** are

$$\left(\frac{m_1x_2 + m_2x_1}{m_2 + m_1}, \frac{m_1y_2 + m_2y_1}{m_2 + m_1}\right)$$

This is known as the **section formula**.

  - External Division
    - Same formula with – sign in between for both Numerator and Denominator

- Centroid Formula



$$\left[\frac{x_1 + x_2 + x_3}{3} \;,\; \frac{y_1 + y_2 + y_3}{3}\right]$$

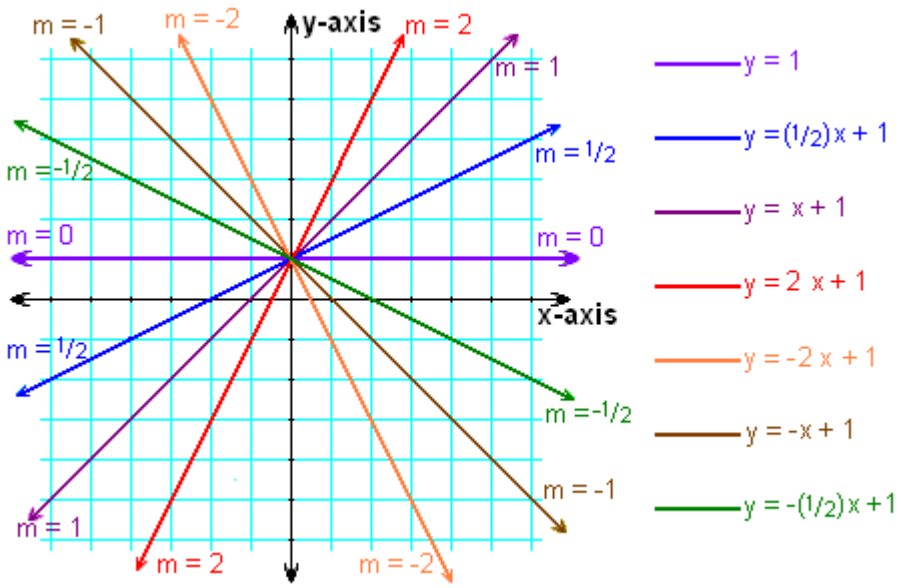
- Area of Triangle

$= 1/2\,[x_1(y_2-y_3) + x_2(y_3-y_1) + x_3(y_1-y_2)]$

$$\Delta = \frac{1}{2}\begin{vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{vmatrix} \qquad \ldots (1)$$

Concept of Slope

- m = (y2-y1)/(x2-x1)
  =tan (Theta)



- For Parallel Lines, Slopes are equal
- For Perpendicular Lines, m1Xm2=-1

Equation of a Line

- General Form $Ax+By+C=0$
  - Slope = $-A/B$

- Point Slope Form $y-y1=m(x-x1)$
- Two-Point Form Substitute m in above
- Slope Intercept Form $y=mx+c$
- Two-Intercept Form $x/(x\ intercept) + y/(y\ intercept)=1$

Circles and Parabolas

- Circle whose centre is origin $x^2+y^2=r^2$
- Circle whose centre is (h,k) $(x-h)^2+(y-k)^2=r^2$
- Parabola $y=x^2$, $y=(x-h)^2$
- $y=a(x-h)^2 + k$ Vertex is (h,k)
- Effects of change of co-efficients in std. quadratic function

Extra Practice Questions

1. Which of the foll. Could be the slope of a line that passes thru

(-2,-3) and crosses y-axis above the origin (multi-correct ans)

-2/3, 3/7, 3/2,5/3,9/4,4

2.Points P (1,5), Q(1,1) and R(7,y). How many different integer values for y can be chosen to form triangle PQR such that none of the angles in Triangle PQR are obtuse?

3. Line M is $y=3x+10$ and Line N is $2y=5x-6$. Line P has a y-intercept of 6 and point (6,4) lies on it. (Q.C.)

A-> Measure of Largest angle created by the intersection of lines M and N

B-> Measure of the largest angle created by the intersection of lines M and P

Solutions

- Q1
  - Draw a line passing thru origin and (-2,-3). Its slope will be 3/2. If a line crosses Y axis above origin and passes thru (-2,-3), its slope will be greater than 3/2. So all options greater than 3/2 are correct (options 4,5,6)

Solutions

- Q2

  P and Q will lie on vertical line x=1 and R will lie on vertical line x=7. Above y=5 and below y=1 the angles will be obtuse. Hence all values including and between 1,5 are ok (for 1,5 the angle will be a right angle and for other values it will be acute)

Solutions

- Q3
  - Slope of Line M=3, Slope of Line N=-5/2 and Slope of Line P=-1/3
  - As product of slopes of Lines M and P is -1, these lines are perpendicular and both the angles when they intersect will be right angles. Lines M and N are not perpendicular and hence when they intersect, there will be one acute and one obtuse angle formed. Hence, quantity in Column A is greater. Answer A

THANK YOU ☺