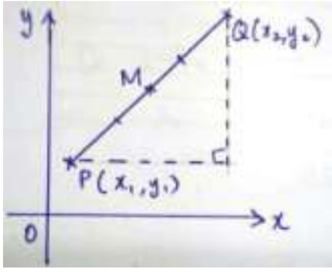
Geometry : Coordinate Geometry

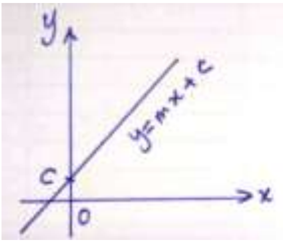
Given two points, $P(x_1, y_1)\ and\ Q(x_2, y_2)$



(a) Gradient of $PQ, m = \frac{y_2-y_1}{x_2-x_1}$

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

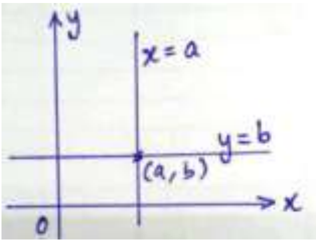
(c) Coordinates of $M\ (midpoint\ of\ PQ) = (\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2})$



(d) Equation of straight line is $y = mx + c, c$ is a constant and m is gradient

Or, given coordinates of $P\ and\ Q$, equation of straight line passing through $P\ and\ Q\ is$

$$\frac{y - y_1}{x - x_1} = \frac{y_2 - y_1}{x_2 - x_1}$$



Equation of line passing through point (a, b) and parallel to y-axis is $x = a$

Equation of line passing through point (a, b) and parallel to x-axis is $y = b$

<u>Properties of gradient</u>

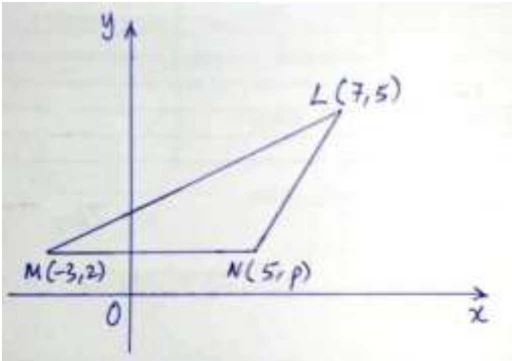
- A positive gradient means value of y increases as x increases
- A negative gradient means value of y decreases as x increases
- The gradient of a horizontal line = 0
- The gradient of a vertical line is undefined or infinity
- Gradient of parallel lines are equal
- Product of gradient of perpendicular lines, $m_1 \times m_2 = -1$
- Points A, B and C are collinear points if (i) gradient of $AB =$ gradient of BC, or (ii) they lie on a straight line

Try these questions :

(1) Given that $A(p, 9)$ and $B(0, q)$ pass through the straight line $2y - 3x = 3$. Find
  (a) Values of p and q
  (b) Length of AB
  (c) Gradient of line perpendicular to AB
  (d) Equation of line perpendicular to AB and passing through point A

(2) The coordinates of A, B and C are $(-6, p), (2,1)and$ $(q, 4)$ respectively.
  (a) If A, B and C are collinear points, prove that $q - pq + 2p = 26$
  (b) If $p = -3$, find the midpoint of AC

(3) The points of L, M and N are $(7,5), (-3,2)and$ $(5, p)$ respectively. Given that MN is parallel to the x –axis. Find



  (a) Value of p
  (b) Gradient of NL
  (c) Equation of NL
  (d) Area of triangle LMN