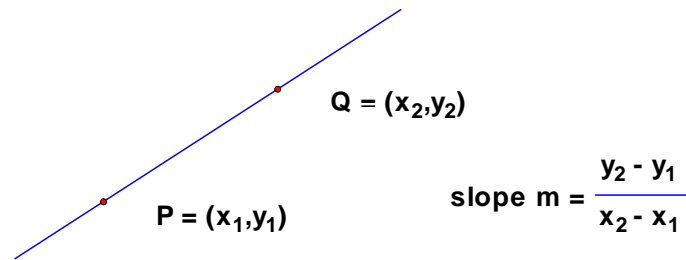Given points $P=(-3,4)$ and $Q=(1,6)$, find

(a) The slope of the line containing P and Q.

(b) The coordinates of the midpoint M of the segment PQ.

(c) The slope of the line through M and perpendicular to segment PQ.

(d) The equation of the line through M and perpendicular to segment PQ.
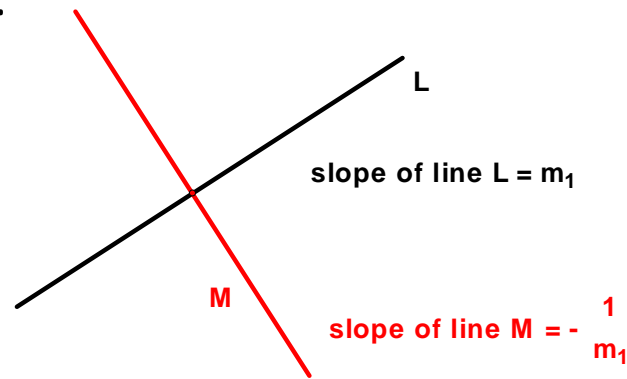
- Given two points on a line the slope is given by

$Q = (x_2, y_2)$

$P = (x_1, y_1)$

$$\text{slope m} = \frac{y_2 - y_1}{x_2 - x_1}$$

So the slope of the line containing P and Q is $\dfrac{6-4}{1-(-3)} = \dfrac{2}{4} = \dfrac{1}{2}$

- Given two points on a line, the midpoint is given by

Q = (x_2, y_2)

P = (x_1, y_1)

midpoint = $\left(\dfrac{x_1+x_2}{2}, \dfrac{y_1+y_2}{2} \right)$
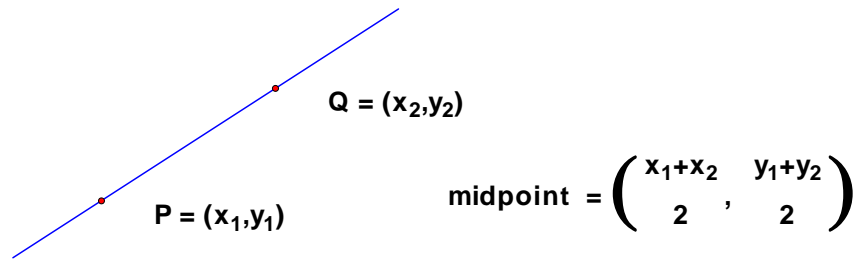
- So the midpoint of the segment PQ is $\left(\dfrac{-3+1}{2}, \dfrac{4+6}{2} \right) = (-1, 5)$.

- Given two non-vertical perpendicular lines, their slopes are negative reciprocals on each other.

L

slope of line L = m_1

M

slope of line M = $-\dfrac{1}{m_1}$

Since the slope of the line through PQ is ½ , the slope of the perpendicular line is -2.

- The point-slope form for the equation of a line with slope *m* and passing through the point (x_1, y_1) is given by

$$y - y_1 = m(x - x_1)$$

- We now obtain the equation of the line through M and perpendicular to segment PQ. Its slope is -2 and it passes through M = (-1,5). So,

$$y - 5 = -2(x+1) \ \ or \ \ y = -2x + 3$$