Coordinates geometry

Straight lines

Gradient of a line

Two points $A(x_1, y_1)$ and $B(x_2, y_2)$ form a line AB

The gradient of the line AB is $m_{AB} = \dfrac{y_2 - y_1}{x_2 - x_1}$

Equation of a line

An equation of the line going through $A(x_1, y_1)$ with gradeint m is

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

After re-arranging this equation, you could have the forms:

$\qquad\qquad y = mx + c \qquad\qquad$ explicit eqaution

or $\qquad\qquad ax + by = c \qquad\qquad$ implicit equation

Parallel and perpendicular lines

Consider two lines $L_1 : y = m_1 x + c_1$ and $L_2 : y = m_2 x + c_2$

- L_1 and L_2 are *parallel* when $m_1 = m_2$

- L_1 and L_2 are *perpendicular* when $m_1 \times m_2 = -1$

$$m_1 = -\frac{1}{m_2}$$

Mid-point of a line segment

The mid-point of $A(x_1, y_1)$ and $B(x_2, y_2)$ is $I\left(\dfrac{x_1 + x_2}{2}, \dfrac{y_1 + y_2}{2} \right)$

Distance between two points

The distance between $A(x_1, y_1)$ and $B(x_2, y_2)$ is

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