PENANG SANGAM HIGH SCHOOL
DEPARTMENT OF MATHEMATICS/PHYSICS
YEAR 11 MATHEMATICS - WEEK 23

STRAND 5 **COORDINATE GEOMETRY**

Sub – Strand 5.1 **COORDINATES**

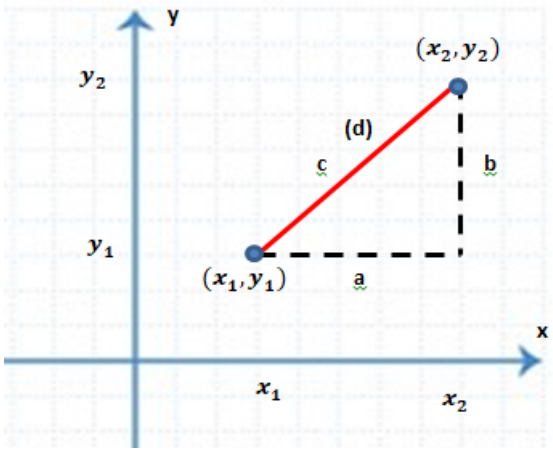
Learning Objective

At the end of this lesson, students should be able to:

- Find distance between two points
- Find the midpoint
- Determine equation of a line

Coordinates: (x,y)

Distance between two Points/ Length of Line Segment



$$c^2 = a^2 + b^2$$

$$d^2 = (x_2 - x_1)^2 + (y_2 - y)^2$$

Example: **Find the distance between two points A = (2, 1) , B = (5, 3)**

A = (2 , 1) , B = (5 , 3)

(x_1, y_1) (x_2, y_2)

$d = 3.61$ *units*

Exercise

1. **Find the distance between two points (-4, -5) and (1, -2)**

2. **Find the length of the line segment whose endpoints are (-3,4) and (5,4)**

Midpoint of the Line Segment

$$m(x,y)=[\frac{x_1+x_2}{2},\frac{y_1+y_2}{2}]$$

Example

1. **Find the midpoint of the segment connecting the points (6, 4) and (3, -4).**

(6 , 4) and (3 , -4)

(x_1, y_1) (x_2, y_2)

$$m(x,y)=[\frac{x_1+x_2}{2},\frac{y_1+y_2}{2}]$$

$$m(x,y)=[\frac{6+3}{2},\frac{4+-4}{2}]$$

$$m(x,y)=[\frac{9}{2},\frac{0}{2}]$$

2. **M is the midpoint of $\overline{AB}$. The coordinates of A are (-2, 3) and the coordinates of M are (1, 0). Find the coordinates of B**

A = (-2, 3) B = (x_2, y_2)

(x_1, y_1) (x_2, y_2)

M = (1, 0)

(x , y)

$$m(x,y)=\left[\frac{x_1+x_2}{2},\frac{y_1+y_2}{2}\right]$$

$$m(1,0)=\left[\frac{-2+x_2}{2},\frac{3+y_2}{2}\right]$$

$$\frac{-2+x_2}{2}=1 \qquad \frac{3+y_2}{2}=0$$

$$\frac{-2+x_2}{2}\times 2=1\times 2 \qquad \frac{3+y_2}{2}\times 2=0\times 2$$

$$-2+x_2=2 \qquad 3+y_2=0$$

$$-2+2+x_2=2+2 \qquad 3-3+y_2=0-3$$

∴ the coordinates of B are (4, −3)

Exercise

1. **Find the midpoint of the segment connecting the points (a, b) and (3a, c).**

2. **M is the midpoint of $\overline{AB}$. The coordinates of A are (2, 3) and the coordinates of M are (4.5, 6). Find the coordinates of B**

3.

Gradient of Line (Slope = m)

$$m = \frac{\Delta y}{\Delta x}$$

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

Equation of a Line

$$y = mx + c$$

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

Example

1. **Find the equation of line passing through the points A(2,1) and B(5,3).**

(2, 1) and (5 , 3)

(x_1, y_1) (x_2, y_2)

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

$$m = \frac{3-1}{5-2}$$

$$m = \frac{2}{3}$$

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

$$y - 1 = \frac{2}{3}(x - 2)$$

$$y - 1 = \frac{2}{3}x - \frac{4}{3}$$

$$y - 1 + 1 = \frac{2}{3}x - \frac{4}{3} + 1$$

$$2 \quad 1$$

Exercise

1. **Find the equation of line passing through the points A(2, 4) and B(-3, -6).**

Review Exercise

1. **The point (5, 4) lies on a circle. What is the length of the radius of the circle if the center is located at (3, 2)**

2. $\overline{CD}$ **is the diameter of a circle whose center is the point (2, 1). If the coordinates of C are (0, -2), find the coordinates of D.**