# Coordinate Geometry

## CHAPTER 6 : Coordinate Geometry

**Topic 6 Coordinate Geometry ::::::::::: v 6.01  Straight Line ::::::: v 6.011  Distance**

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

1) Find the distance of $AB$ if $A(1,2)$ and $B(4,6)$.

*Solution*:

$$Distance = \sqrt{(1-4)^2 + (2-6)^2}$$
$$= \sqrt{25}$$
$$= \underline{\underline{5}}\#$$

**Topic 6 Coordinate Geometry ::::::::::: v 6.01  Straight Line ::::::: v 6.012  Midpoint**

$$\boxed{Midpoint = \left( \frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)}$$

1) Find the midpoint of $AB$ if $A(1,2)$ and $B(5,8)$.

*Solution*:

$$Midpoint = \left( \frac{1+5}{2}, \frac{2+8}{2} \right)$$
$$= \underline{\underline{(3,5)}}\#$$

2) If $m(3,4)$ is a midpoint of $AB$ and given that $A(1,2)$, find the coordinate of point $B$.
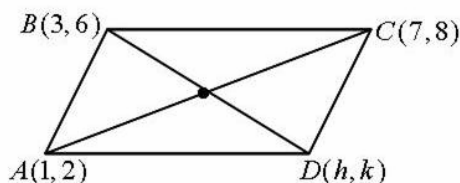
*Solution*:

$$\left( \frac{1+x_2}{2}, \frac{2+y_2}{2} \right) = (3,4)$$

$$\frac{1+x_2}{2} = 3 \quad \bigg| \quad \frac{2+y_2}{2} = 4$$
$$1+x_2 = 6 \quad \bigg| \quad 2+y_2 = 8$$
$$x_2 = 5 \quad \bigg| \quad y_2 = 6$$

therefore the coordinate of point $B$ is $(5,6)\#$

3) Parallelogram → *midpoint of "pepenjuru" for parallelogram is same*

Find the coordinate of point $D$ if $ABCD$ is a parallelogram where $A(1,2)$, $B(3,6)$ and $C(7,8)$.

*Solution*:



Let $D = (h,k)$

midpoint of $BD$ = midpoint of $AC$

$$\left( \frac{3+h}{2}, \frac{6+k}{2} \right) = \left( \frac{1+7}{2}, \frac{2+8}{2} \right)$$

$$3+h = 8 \quad 6+k = 10$$
$$h = 5 \quad\quad k = 4$$

*Notes: Find the midpoint of "pepenjuru" to proof the parallelogram*

$$\underline{\underline{D(5,4)}}\#$$

# Coordinate Geometry

a) *Introduction*:

(*i*) *positive gradient*

$m = 2$          $m = 1$          $m = \dfrac{1}{2}$

$45°$
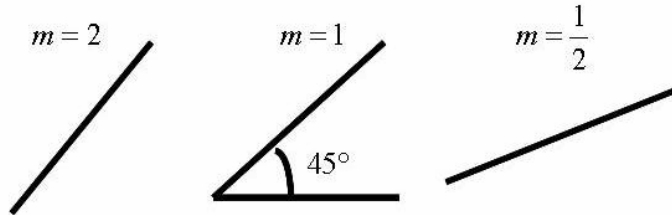
(*ii*) *negative gradient*

$m = -2$          $m = -1$          $m = -\dfrac{1}{2}$

$45°$
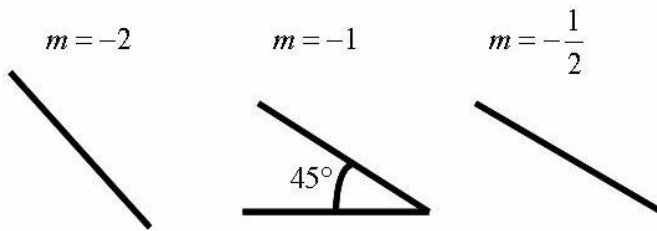
(*iii*) $m = 0$

(*iv*) $m = \infty (infinity\ gradient)$

---

b) *If got 2 points*:

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

Find the $m_{AB}$ if $A(1, 2)$ and $B(3, 8)$.

*Solution*:

$$m = \frac{8 - 2}{3 - 1}$$

$$= \underline{\underline{3}}\#$$

---

c) *If got an intercept*:

$2 \rightarrow$ intercept-$y$

$-1$

$$m = \frac{height}{length}$$

$$= \underline{\underline{2}}\#$$

$-1$

$-2$

$$m = \frac{height}{length}$$

$$= \underline{\underline{-2}}\#$$

---
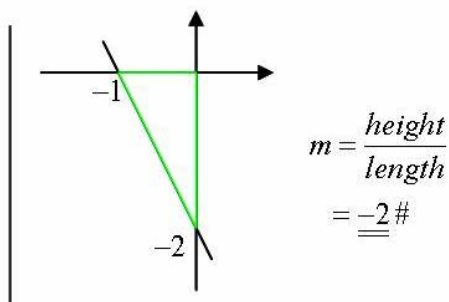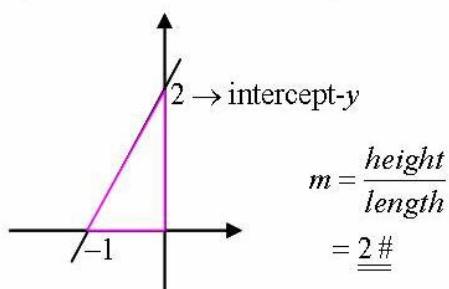
# Coordinate Geometry

**SPM Additional Mathematics 3472 ::::::  Coordinate Geometry**

*d)*  *If given an equation:*

Find the gradient for the equation $3x + 2y = 6$.

*Solution:*
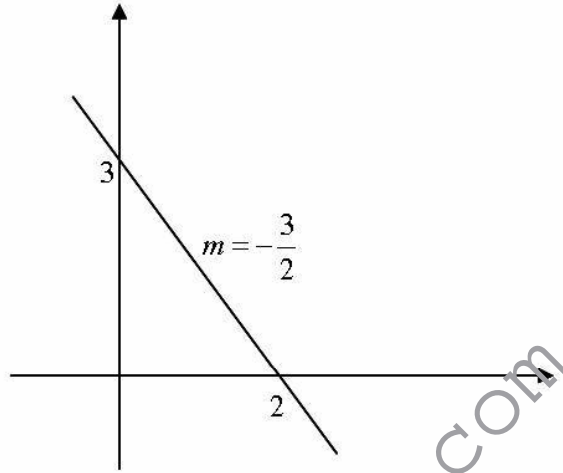
$$3x + 2y = 6$$

$$2y = 6 - 3x$$

$$y = \frac{6 - 3x}{2}$$
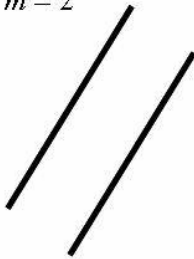
$$y = 3 - \frac{3}{2}x$$

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

$$\downarrow \quad \downarrow \quad \downarrow$$

$$y = m\ x + C$$

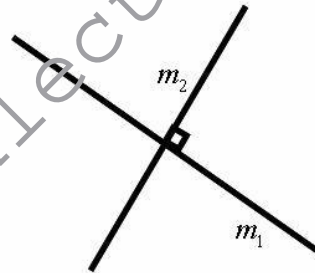$$\therefore\ m = -\frac{3}{2}\ \#$$

*e)*  *2 Parallel lines:*

$m = 2$

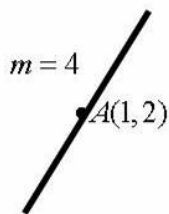*f)*  *2 Perpencular lines:*

$m_2$

$m_1$

$$m_1 \times m_2 = -1$$

Topic 6 Coordinate Geometry :::::::::: v 6.01  Straight Line ::::::: v 6.014  Equation Of Straight Line ::::::  v 6.0141   Form of $y = mx + C$

1)  Find the equation of $A$ if given that $m = 4$ and $A(1, 2)$.

*Solution:*

$$y = mx + C$$

$$2 = (4)(1) + C$$

$$C = -2$$

$m = 4$

$A(1, 2)$

$\therefore$ The equation of $A$  $y = 4x - 2 \#$

www.youtube.com/megalecture

# Coordinate Geometry

**SPM Additional Mathematics 3472 ::::::  Coordinate Geometry**

**Topic 6 Coordinate Geometry ::::::::::: v 6.01  Straight Line :::::: v 6.014  Equation Of Straight Line :::::: v 6.0142   General Form**

2)  Find the equation if given that $A(2,3)$ and $B(4,7)$, hence convert your answer to the general form.

*Solution*:

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

$$\frac{y-3}{x-2} = \frac{3-7}{2-4}$$

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

$$y - 3 = 2x - 4$$

$$y = 2x - 1$$

The general form is $y - 2x + 1 = 0$ #

---

**Topic 6 Coordinate Geometry ::::::::::: v 6.01  Straight Line :::::: v 6.014  Equation Of Straight Line :::::: v 6.0143   Intercept Form**
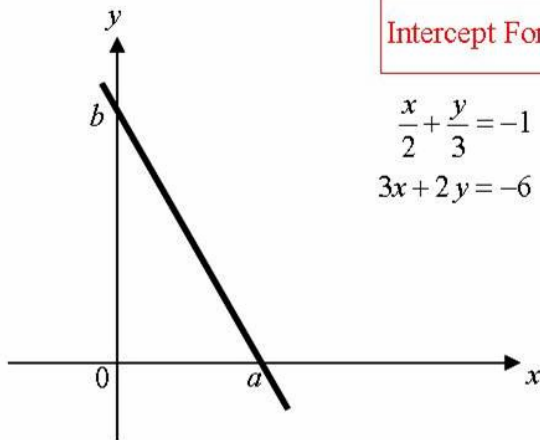
3)  Find the equation if given that the intercept-$x$ is 2 and the intercept-$y$ is 3.

*Solution*:
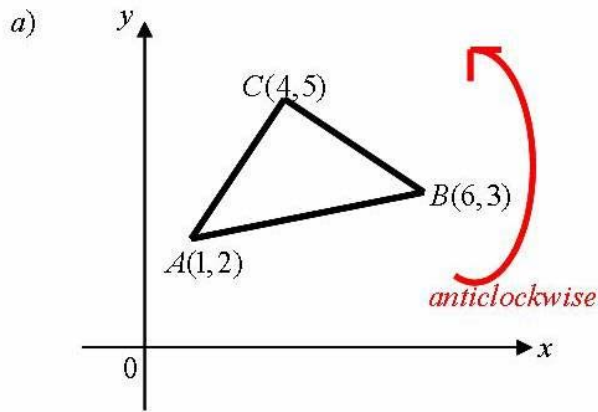
$$\boxed{\text{Intercept Form, } \frac{x}{a} + \frac{y}{b} = -1}$$

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

$$3x + 2y = -6$$

# Coordinate Geometry

a)

$$Area = \frac{1}{2}\begin{vmatrix} x_1 & x_2 & x_3 & x_1 \\ y_1 & y_2 & y_3 & y_1 \end{vmatrix}$$

$$Area = \frac{1}{2}\left|\left[x_1 y_2 + x_2 y_3 + x_3 y_1\right] - \left[y_1 x_2 + y_2 x_3 + y_3 x_1\right]\right|$$

anticlockwise

$$Area = \frac{1}{2}\begin{vmatrix} 1 & 6 & 4 & 1 \\ 2 & 3 & 5 & 2 \end{vmatrix}$$

$$Area = \frac{1}{2}\left|\left[1(3) + 6(5) + 4(2)\right] - \left[2(6) + 3(4) + 5(1)\right]\right|$$

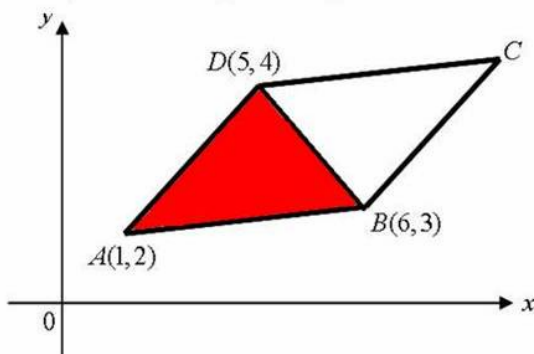$$Area = \frac{1}{2}|12|$$

$$\underline{Area = 6\ unit^2}\ \#$$

b)
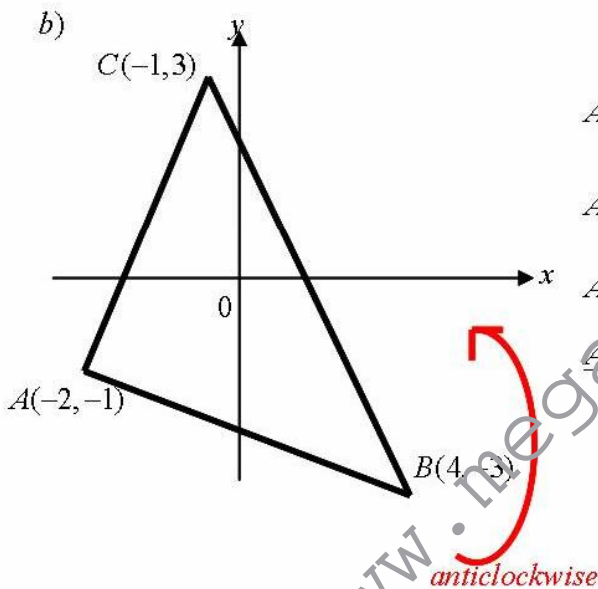
$$Area = \frac{1}{2}\begin{vmatrix} -2 & 4 & -1 & -2 \\ -1 & -3 & 3 & -1 \end{vmatrix}$$

$$Area = \frac{1}{2}\left|\left[(-2)(-3) + 4(3) + (-1)(-1)\right] - \left[(-1)(4) + 3(4) + 5(1)\right]\right|$$

$$Area = \frac{1}{2}|26|$$

$$\underline{Area = 13\ unit^2}\ \#$$

anticlockwise

***c)   Find the parallelogram ABCD.

$$Area\ ABCD = 2\,Area\ ABD$$

$$Area\ ABCD = 2 \times \frac{1}{2}\begin{vmatrix} 1 & 6 & 5 & 1 \\ 2 & 3 & 4 & 2 \end{vmatrix}$$

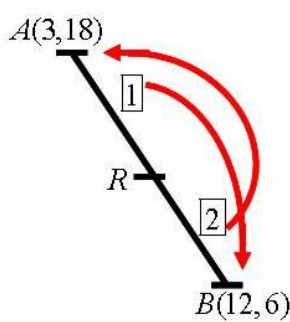$$Area\ ABCD = \left|\left[1(3) + 6(4) + 5(2)\right] - \left[2(6) + 3(5) + 4(1)\right]\right|$$

$$\underline{Area\ ABCD = 6\ unit^2}\ \#$$

# Coordinate Geometry

1)  If $R$ divides $AB$ *intenally* in the ratio $1:2$ and $A(3,18)$ and $B(12,6)$, find $R$.

   <u>Solution :</u>

$m:n = 1:2$

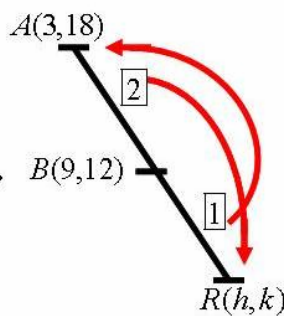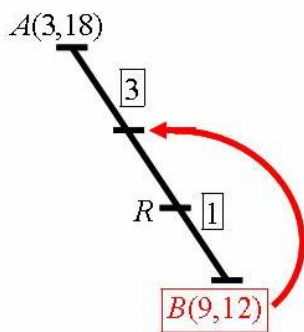$$\boxed{R = \left( \frac{mx_2 + nx_1}{m+n}, \frac{my_2 + ny_1}{m+n} \right)}$$

$$R = \left( \frac{1(2)+2(3)}{1+2}, \frac{1(6)+2(18)}{1+2} \right)$$

$$R = \left( \frac{18}{3}, \frac{42}{3} \right)$$

$$\underline{\underline{R = (6,14)\#}}$$

---

**2)  If $R$ divides $A(3,18)$ and $B(9,12)$ *extenally* in the ratio $3:1$ , find $R$.

   <u>Solution :</u>

$m:n = 2:1$

$$\boxed{R = \left( \frac{mx_2 + nx_1}{m+n}, \frac{my_2 + ny_1}{m+n} \right)}$$

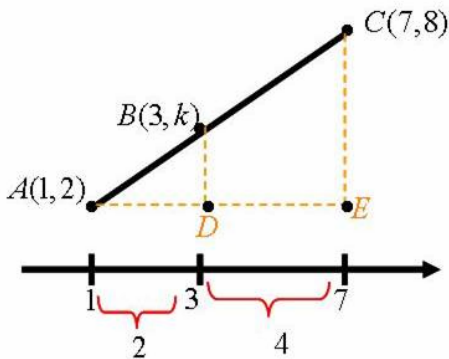$$R = \left( \frac{1(3)+2h}{1+2}, \frac{1(8)+2k}{1+2} \right) = (9,12)$$

$$\frac{3+2h}{3} = 9 \quad \Big| \quad \frac{18+2k}{3} = 12$$

$$3+2h = 27 \quad \Big| \quad 18+2k = 36$$

$$2h = 24 \quad \Big| \quad 2k = 18$$

$$h = 12 \quad \Big| \quad k = 9$$

$$\underline{\underline{R(12,9)\#}}$$

# Coordinate Geometry

**Topic 6 Coordinate Geometry :::::::::: v 6.01 Straight Line ::::::: v 6.016 Ratio' Theorems & Ratio ::::::: v 6.0161 Ratio**
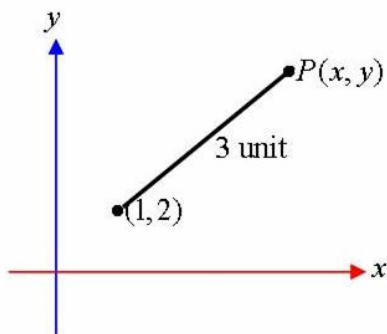
Find the ratio $AB : BC$.

$C(7,8)$

$B(3,k)$

$A(1,2)$

$D$   $E$

1   3   7

2   4

**Solution:**

$AB : BC$

$= AD : DE$

$= 2 : 4$

$= 1 : 2 \#$

**Topic 6 Coordinate Geometry :::::::::: v 6.02 The Equation Of The Locus**

*e.g.*:

Find the equation of the locus $P$ moves such that the distance from $(1,2)$ is 3 unit.

**Solution:**

$y$

$P(x,y)$

3 unit

$(1,2)$

$x$

$P(x,y), A(1,2)$

$PA = 3$

$PA^2 = 9$

$(x-1)^2 + (y-2)^2 = 9$
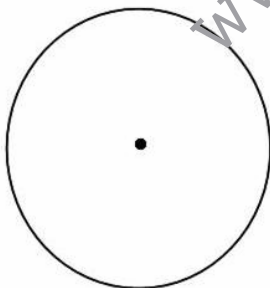
$(x^2 - 2x + 1) + (y^2 - 4y + 4) = 9$

$x^2 + y^2 - 2x - 4y + 5 = 9$

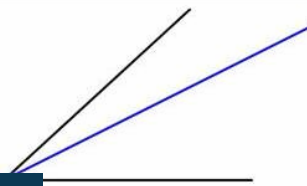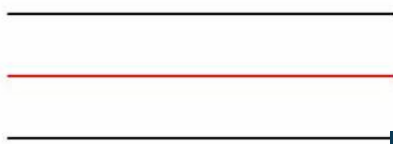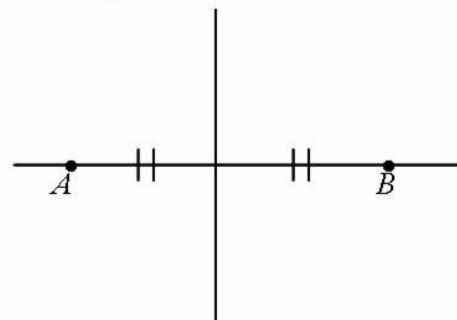$\underline{x^2 + y^2 - 2x - 4y - 4 = 0} \#$

Types Of Locus:

1) Fixed Point:

2) 2 Fixed Point:

$A$          $B$