

Coordinate Geometry

CHAPTER 6 : Coordinate Geometry

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

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

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

Solution:

$$\begin{aligned} \text{Distance} &= \sqrt{(1-4)^2 + (2-6)^2} \\ &= \sqrt{25} \\ &= \underline{\underline{5}} \end{aligned}$$

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

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

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

Solution:

$$\begin{aligned} \text{Midpoint} &= \left(\frac{1+5}{2}, \frac{2+8}{2} \right) \\ &= \underline{\underline{(3,5)}} \end{aligned}$$

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

Solution:

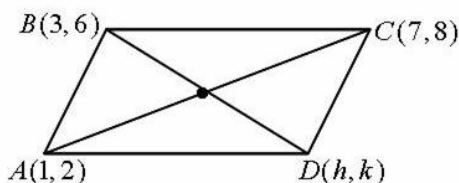
$$\begin{aligned} \left(\frac{1+x_2}{2}, \frac{2+y_2}{2} \right) &= (3,4) \\ \frac{1+x_2}{2} = 3 & \quad \left| \quad \frac{2+y_2}{2} = 4 \right. \\ 1+x_2 = 6 & \quad \left| \quad 2+y_2 = 8 \right. \\ \underline{x_2 = 5} & \quad \left| \quad \underline{y_2 = 6} \right. \end{aligned}$$

therefore the coordinate of point B is $\underline{\underline{(5,6)}}$

- 3) Parallelogram \rightarrow 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

$$\begin{aligned} \left(\frac{3+h}{2}, \frac{6+k}{2} \right) &= \left(\frac{1+7}{2}, \frac{2+8}{2} \right) \\ 3+h=8 & \quad 6+k=10 \\ \underline{h=5} & \quad \underline{k=4} \end{aligned}$$

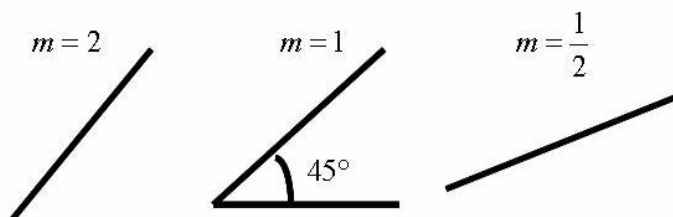
Notes: Find the midpoint of "pepenjuru" to proof the parallelogram

D(5,4)

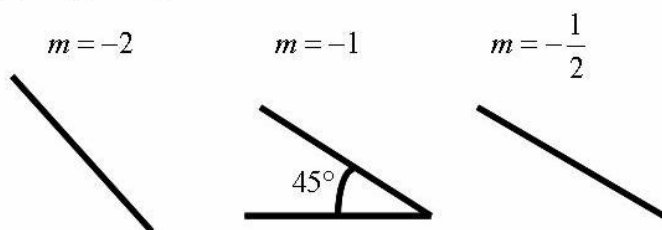
Coordinate Geometry

a) Introduction:

(i) *positive gradient*



(ii) *negative gradient*



(iii) $m = 0$



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



b) If got 2 points:

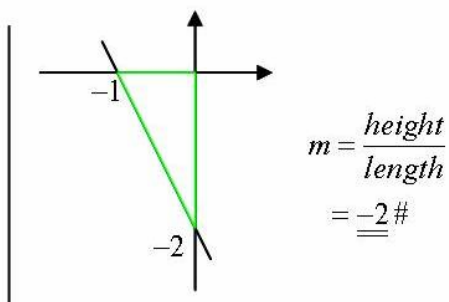
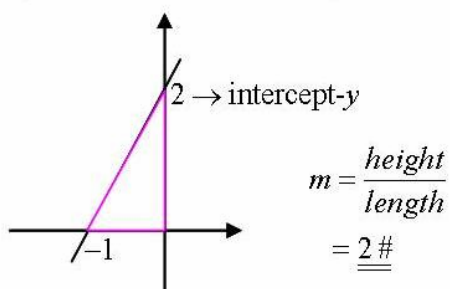
$$m = \frac{y_1 - y_2}{x_1 - x_2} \Rightarrow \frac{y - y_1}{x - x_1} = m \Rightarrow \frac{y - y_1}{x - x_1} = \frac{y_1 - y_2}{x_1 - x_2}$$

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:



Coordinate Geometry

SPM Additional Mathematics 3472 ::::: Coordinate Geometry

d) If given an equation:

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

Solution:

$$3x + 2y = 6$$

$$2y = 6 - 3x$$

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

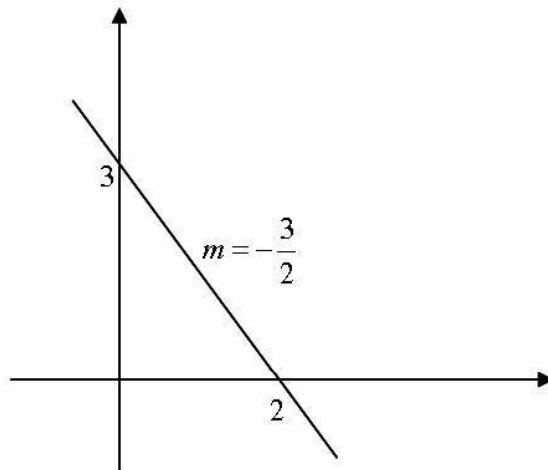
$$y = 3 - \frac{3}{2}x$$

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

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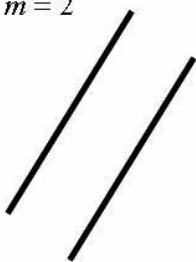
$$y = m x + C$$

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

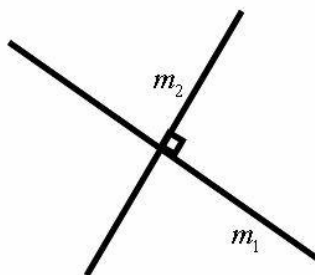


e) 2 Parallel lines:

$$m = 2$$



f) 2 Perpendicular lines:



$$m_1 \times m_2 = -1$$

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 $A(1, 2)$.

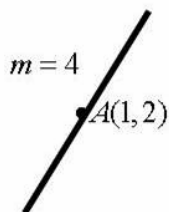
Solution:

$$y = mx + C$$

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

$$C = -2$$

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



Coordinate Geometry

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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:

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

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

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

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

$$y = 2x - 1$$

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

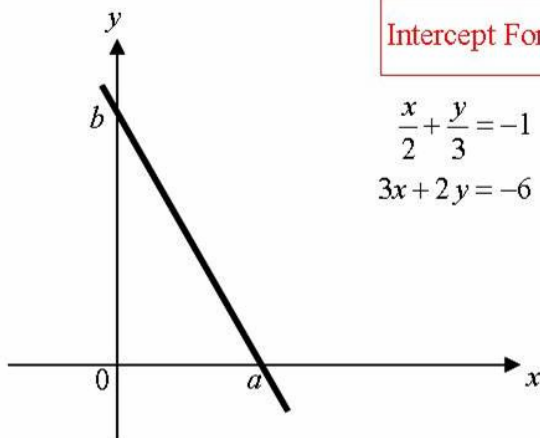
- 3) Find the equation if given that the intercept - x is 2 and the intercept- y is 3.

Solution:

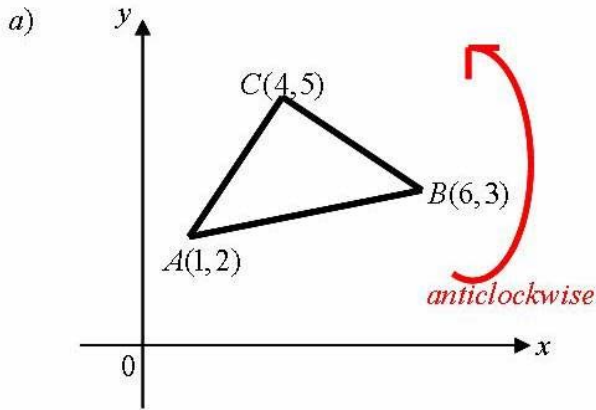
$$\text{Intercept Form, } \frac{x}{a} + \frac{y}{b} = -1$$

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

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



Coordinate Geometry



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

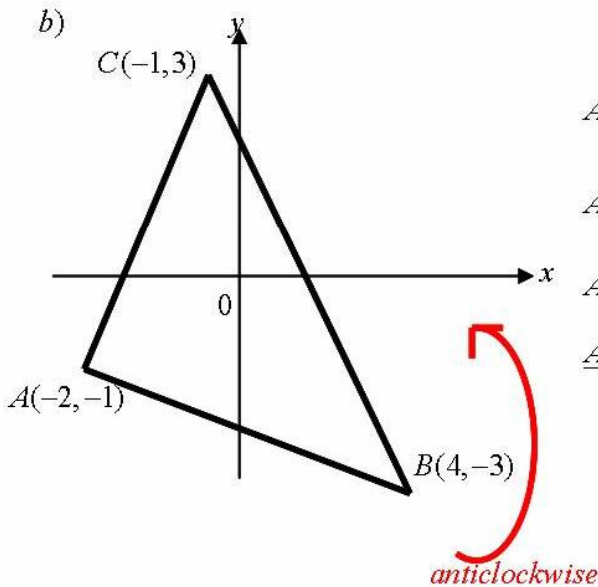
$$Area = \frac{1}{2} \left[x_1y_2 + x_2y_3 + x_3y_1 \right] - \left[y_1x_2 + y_2x_3 + y_3x_1 \right]$$

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

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

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

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



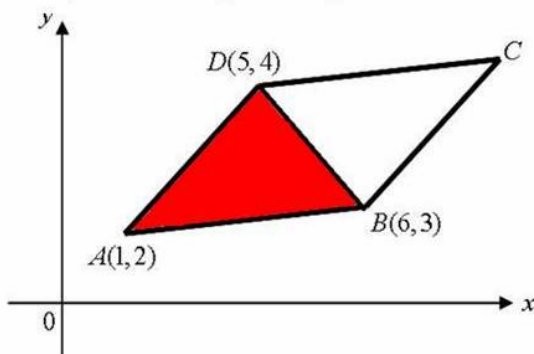
$$Area = \frac{1}{2} \begin{vmatrix} -2 & 4 & -1 & -2 \\ -1 & -3 & 3 & -1 \end{vmatrix}$$

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

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

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

***c) Find the parallelogram ABCD.



$$Area \text{ ABCD} = 2 \text{ Area } ABD$$

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

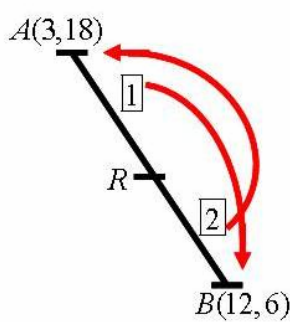
$$Area \text{ ABCD} = \left[1(3) + 6(4) + 5(2) \right] - \left[2(6) + 3(5) + 4(1) \right]$$

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

Coordinate Geometry

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

Solution:



$$m:n = 1:2$$

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

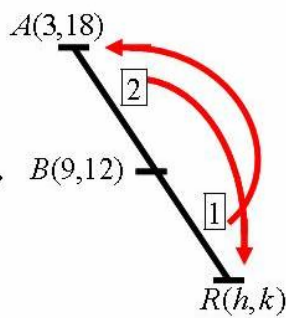
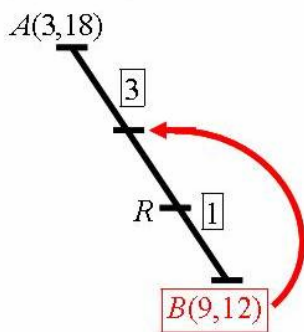
$$R = \left(\frac{1(2) + 2(3)}{1+2}, \frac{1(6) + 2(18)}{1+2} \right)$$

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

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

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

Solution:



$$m:n = 2:1$$

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

$$R = \left(\frac{1(3) + 2h}{1+2}, \frac{1(18) + 2k}{1+2} \right) = (9, 12)$$

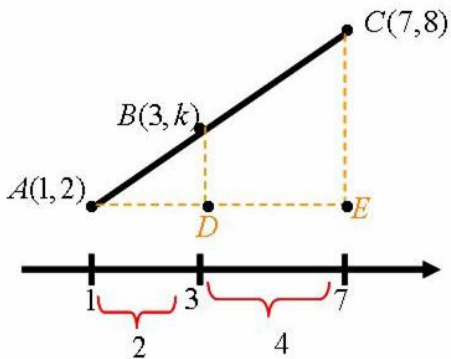
$$\begin{array}{l|l} \frac{3+2h}{3} = 9 & \frac{18+2k}{3} = 12 \\ 3+2h = 27 & 18+2k = 36 \\ 2h = 24 & 2k = 18 \\ h = 12 & k = 9 \end{array}$$

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

Coordinate Geometry

Topic 6 Coordinate Geometry ::::: v 6.01 Straight Line ::::: v 6.016 Ratio' Theorems & Ratio ::::: v 6.0161 Ratio

Find the ratio $AB : BC$.



Solution:

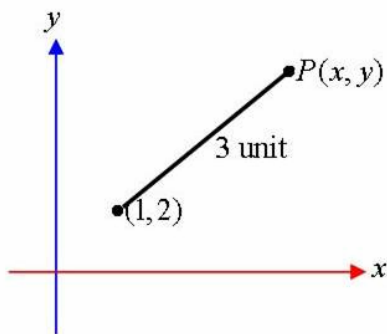
$$\begin{aligned} AB : BC &= AD : DE \\ &= 2 : 4 \\ &= 1 : 2 \# \end{aligned}$$

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:



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

$$PA = 3$$

$$PA^2 = 9$$

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

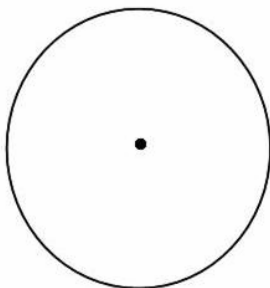
$$(x^2 - 2x + 1) + (y^2 - 4y + 4) = 9$$

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

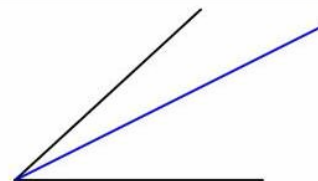
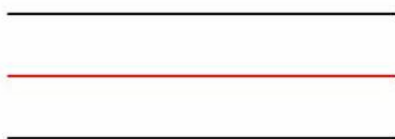
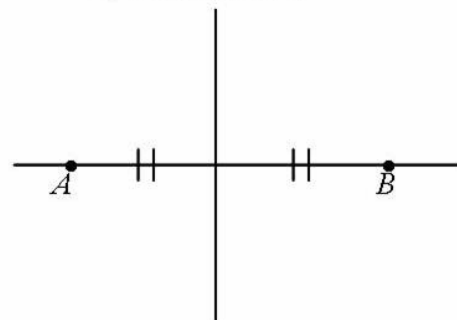
$$\underline{\underline{x^2 + y^2 - 2x - 4y - 4 = 0 \#}}$$

Types Of Locus:

1) Fixed Point:



2) 2 Fixed Point:



The End