Straight Lines and Shape Problems

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1) Straight Lines and Shape Problems: Easier

1) A and B are straight lines.

Line A has equation $2y = 3x + 8$. Line B goes through the points $(-1, 2)$ and $(2, 8)$

Do lines A and B intersect?

You must show all your working.

$A = y = \frac{3x}{2} + 4 \quad m = \frac{3}{2}$

$B = (-1, 2), (2, 8)$

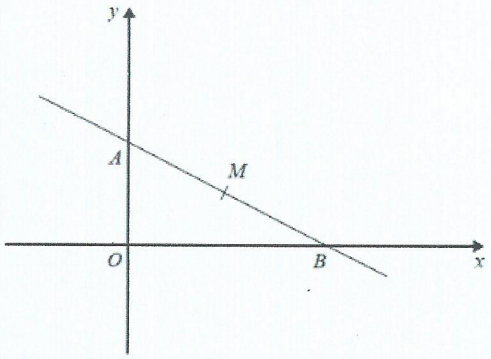
$\frac{8-2}{2--1} = \frac{6}{3} = 2 \quad m = 2$

Different gradient so they will intersect

Yes.

(2 Marks)

2)



In the diagram

A is the point $(0, 4)$

B is the point $(6, 0)$

M is the midpoint of AB.

Find an equation of the line that passes through M and is perpendicular to AB.

$M = \left(\frac{0+6}{2}, \frac{4+0}{2}\right) = (3, 2)$

gradient of line through A and B $= \frac{0-4}{6-0} = \frac{-2}{3}$

$y = -\frac{2}{3}x + c$ sub in 0, 4

$4 = 0 + c$

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

Perpendicular to line, $m = \frac{3x}{2}$

$y = \frac{3x}{2} + c$, sub in $m(3, 2)$

$2 = \frac{9}{2} + c$

$2 - \frac{9}{2} = c$

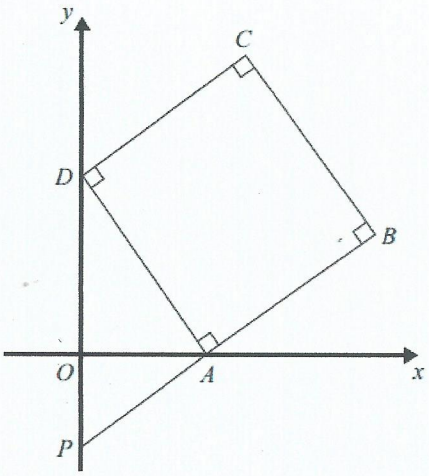
$-\frac{5}{2} = c$

$y = \frac{3x}{2} - \frac{5}{2}$

(2 Marks)

1) Straight Lines and Shape Problems: Medium

3)



ABCD is a square
P and *D* are points on the *y*-axis
PAB is a straight line.

The equation of the line that passes through the points *A* and *D* is $y = -2x + 5$

Find the length of *PD*.

Perpendicular to $y = -2x + 5 \Rightarrow y = \frac{1}{2}x + c$.

$D = (0, 5)$

Point $A \Rightarrow (x, 0)$ $\quad -2 = \frac{0-5}{x-0}$

$-2 = \frac{-5}{x}$

$x = \frac{-5}{-2}$

$x = 2.5$

$\therefore A(2.5, 0)$

Sub A into $y = \frac{1}{2}x + c$.

$0 = \frac{1}{2}(2.5) + c$.

$= \frac{5}{4} + c$

$-\frac{5}{4} = c$.

$\therefore P(0, -\frac{5}{4})$

distance $PD = 5 - -\frac{5}{4}$

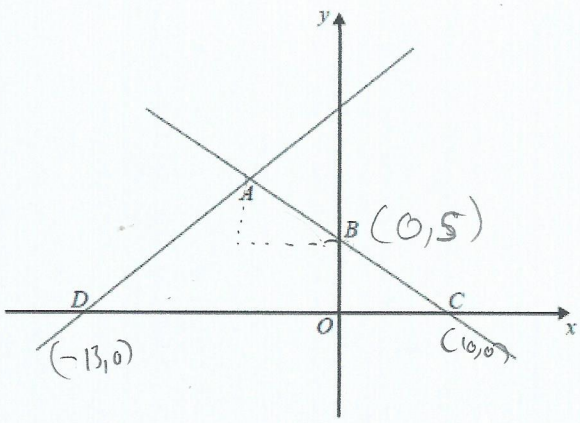
$= \frac{25}{4}$

25/4 or 6.25

(2 Marks)

1) Straight Lines and Shape Problems: Harder

4)



In the diagram, ABC is the line with equation $y = -\frac{1}{2}x + 5$

$AB = BC$

D is the point with coordinates (-13, 0)

Find an equation of the line through A and D

Coordinates of C $(x,0)$ $\Rightarrow$ $0 = -\frac{1}{2}x + 5$ $\Rightarrow (10,0)$

$\frac{1}{2}x = 5$

$x = 10$

$AB = BC$

$A(-10, 10)$

Equation of line through A and D.

$A(-10,10)$, $D(-13,0)$ $\Rightarrow m = \frac{0-10}{-13--10} = \frac{-10}{-3} = \frac{10}{3}$.

$y = \frac{10}{3}x + c$.

Sub in D

$0 = \frac{10}{3}(-13) + c$

$= -\frac{130}{3} + c$

$\frac{130}{3} = c$

$y = \frac{10}{3}x + \frac{130}{3}$

or $3y = 10x + 130$.

(2 Marks)