THE LINE (Q 2, PAPER 2)

1998

2 (a) The point (-3, 4) is on the line whose equation is $5x + y + k = 0$. Find the value of k.
 (b) a(2, -1), b(-2, 3), c(-1, -1) and d(4, -6) are points. (i) Show that ab is parallel to cd.
(ii) Investigate if <i>abcd</i> is a parallelogram.Give a reason for your answer.
 (c) The equation of the line L is x-2y+10=0. <i>L</i> contains the point t(2, 6). (i) Find the equation of the line <i>N</i> which passes through <i>t</i> and which is perpendicular to <i>L</i>.
(ii) The line <i>N</i> cuts the <i>x</i> -axis at <i>r</i> and it cuts the <i>y</i> -axis at <i>s</i> . Calculate the ratio $\frac{ rt }{ rt }$
ts
Solution 2 (a) Is a POINT ON A LINE?
To show a point is on a line, put the point into the equation.
$(-3, 4) \in 5x + y + k = 0$
$\Rightarrow 5(-3) + (4) + k = 0$
$\Rightarrow -15 + 4 + k = 0$
$\Rightarrow -11 + k = 0$
$\therefore k = 11$
2 (b) (i) $m = \frac{y_2 - y_1}{x_2 - x_1} \dots 3$ REMEMBER IT AS: Slope $m = \frac{\text{Difference in } y's}{\text{Difference in } x's}$
$a(2, -1) b(-2, 3) \\ \downarrow \downarrow \downarrow \downarrow \\ x_1 y_1 x_2 y_2 $ Slope of <i>ab</i> : $m_1 = \frac{3 - (-1)}{-2 - 2} = \frac{3 + 1}{-4} = \frac{4}{-4} = -1$
$c(-1, -1) d(4, -6) \\ \downarrow \downarrow \downarrow \downarrow \\ x_1 y_1 x_2 y_2$ Slope of <i>cd</i> : $m_2 = \frac{-6 - (-1)}{4 - (-1)} = \frac{-6 + 1}{4 + 1} = \frac{-5}{5} = -1$ Parallel lines have the same slope. $m_1 = m_2 \Rightarrow ab \parallel cd$

2 (b) (ii)

To prove *abcd* **is a parallelogram**: Find the slopes of each side and show opposite sides have the same slopes.

b(-2, 3)

You have shown in part (i) that $ab \parallel cd$. To show *abcd* is a parallelogram you need to also show that *ad* $\parallel bc$.



ad is not parallel to bc. Therefore, abcd is not a parallelogram.

2 (c) (i) L: x - 2y + 10 = 0GENERAL FORM OF A STRAIGHT LINE Every straight line can be written in the form: ax + by + c = 0. You can read off the slope of a straight line from its equation. Slope: $m = -\left(\frac{a}{b}\right)$ 5 REMEMBER IT AS: Slope $m = -\left(\frac{\text{Number in front of } x}{\text{Number in front of } y}\right)$

Slope of *L*:
$$m = \frac{1}{2}$$

FINDING THE PERPENDICULAR SLOPE: Invert the slope and change its sign.

Equation of *N*: Point t(2, 6), slope m = -2

The equation of a line is a formula satisfied by every point (x, y) on the line. Equation of a line: $y - y_1 = m(x - x_1)$ $\Rightarrow y - 6 = -2(x - 2)$ $\Rightarrow y - 6 = -2x + 4$ $\therefore 2x + y - 10 = 0$

