

Question 1

(25 marks)

The points $A(6, 1)$ and $B(2, -1)$ are shown on the diagram.

(a) Find the equation of the line AB .

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-1 - 1}{2 - 6} = \frac{-2}{-4} = \frac{1}{2}$$

$$\text{equation: } y - y_1 = m(x - x_1)$$

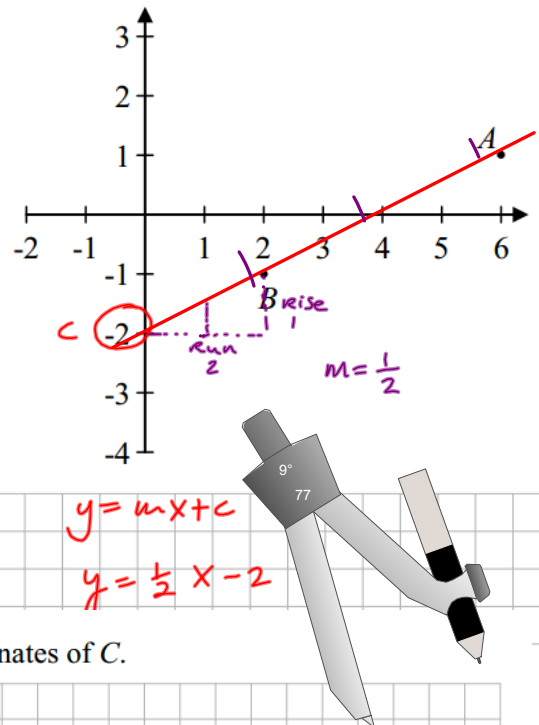
$$y - 1 = \frac{1}{2}(x - 6)$$

$$2(y - 1) = 1(x - 6)$$

$$2y - 2 = x - 6$$

$$x - 2y - 4 = 0$$

(-2y, +2)



(b) The line AB crosses the y -axis at C . Find the co-ordinates of C .

$C(0, -2)$

(c) Find the ratio $\frac{|AB|}{|AC|}$, giving your answer in the form $\frac{p}{q}$, where p and q are whole numbers.

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

$$A(6, 1)$$

$$B(2, -1)$$

$$C(0, -2)$$

$$|AB| = \sqrt{(2 - 6)^2 + (-1 - 1)^2} = \sqrt{(-4)^2 + (-2)^2} = \sqrt{16 + 4} = \sqrt{20} = 2\sqrt{5}$$

$$|AC| = \sqrt{(6 - 0)^2 + (1 - (-2))^2} = \sqrt{36 + 9} = \sqrt{45} = 3\sqrt{5}$$

$$\frac{|AB|}{|AC|} = \frac{2\sqrt{5}}{3\sqrt{5}} = \frac{2}{3}$$

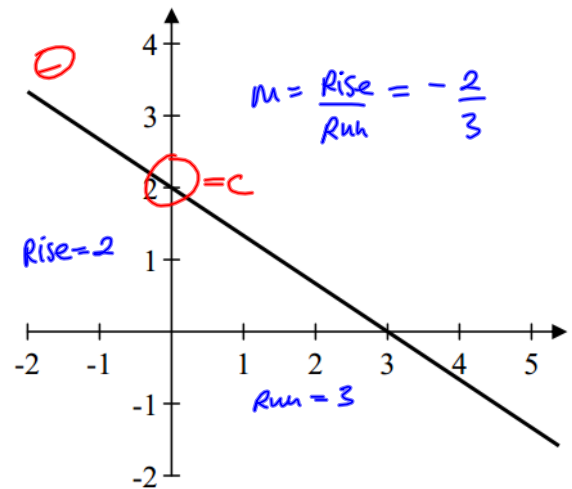
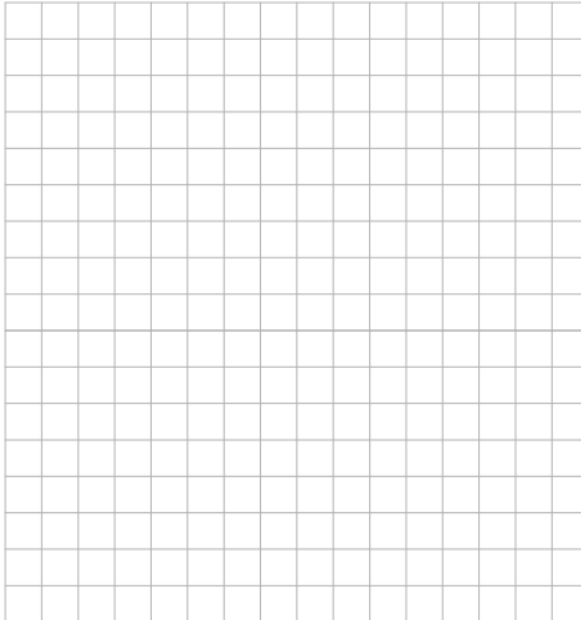
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Question 2

(25 marks)

- (a) A line crosses the x -axis at $x = 3$ and the y -axis at $y = 2$.

Find the equation of the line.



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

- (b) The equations of two lines l_1 and l_2 are:

$l_1: x + 3y = 8$

$l_2: 6x - 2y = 15$

$ax + by + c = 0$

$m = -\frac{a}{b} = m = -\frac{(\text{no. in front of } x)}{(\text{no. in front of } y)}$

Determine whether these lines are perpendicular. Justify your answer clearly.

Find the slopes, multiply them if \perp $m_1 \times m_2 = -1$

$m_1 = \frac{-1}{3}$ $m_2 = \frac{-6}{-2} = 3$

$(-\frac{1}{3})(3) = -1 \Rightarrow$ they are \perp

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Question 4

(25 marks)

The diagram shows two circles c_1 and c_2 of equal radius.

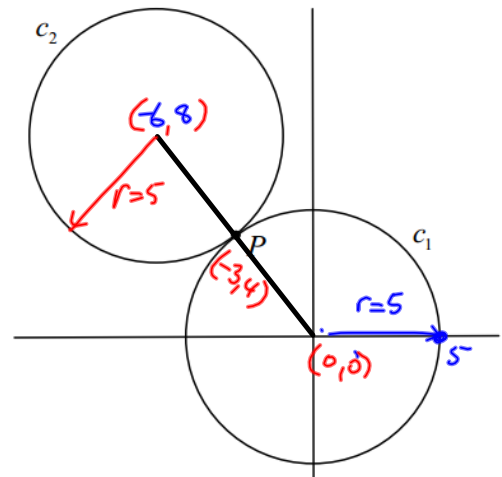
c_1 has centre $(0, 0)$ and it cuts the x -axis at $(5, 0)$.

- (a) Find the equation of c_1 .

$(x-h)^2 + (y-k)^2 = r^2$

h	k
Centre $(0, 0)$	
$r = 5$	

$$(x-0)^2 + (y-0)^2 = 5^2$$

$$x^2 + y^2 = 25$$


- (b) Show that the point $P(-3, 4)$ is on c_1 .

$$x^2 + y^2 = 25$$

Sub in $P(-3, 4)$

$$(-3)^2 + (4)^2 = 9 + 16 = 25 \quad \checkmark$$

- (c) The two circles touch at $P(-3, 4)$.
 P is on the line joining the two centres.
 Find the equation of c_2 .

Centre? $(0, 0) \xrightarrow{-3, +4} (-3, 4) \xrightarrow{-3, +4} (-6, 8)$

$(x-h)^2 + (y-k)^2 = r^2$

(h, k)
$-6, 8$
$r = 5$

$$(x+6)^2 + (y-8)^2 = 25$$