MM12 Coordinate Geometry Test 2019 **Name:** ANSWERS.

Section A: Short Answer (15 minutes) **No Calculator Allowed**

Exact answers are required unless instructed otherwise within the question

Skills (A+B) = ... / 20 **Analysis (C)= .... / 27**

1. Consider the line passing through the points (–1, 5) and (6, 3).

(a) Find the gradient of the line

$m = \frac{5-3}{-1-6}$

$m = -\frac{2}{7}$

(2 marks)

(b) Find the equation of the line in the form $ax + by = c$, where a, b and c are integers.

$y - 5 = -\frac{2}{7}(x+1)$

$y = -\frac{2}{7}x + \frac{33}{7}$

$2x + 7y = 33$

(2 marks)

2. The point with coordinates (4, -6) is the midpoint of the line segment AB. The coordinates of the endpoints are (1, a) and (b, -4). Find the values of a and b.

$\frac{1+b}{2} = 4$ $\frac{a-4}{2} = -6$

$b = 7$

$a = -8$

(2 marks)

3. Find the distance between the points (1, 2) and (11, -3) in the form $m\sqrt{m}$

$d = \sqrt{(1-11)^2 + (2+3)^2}$

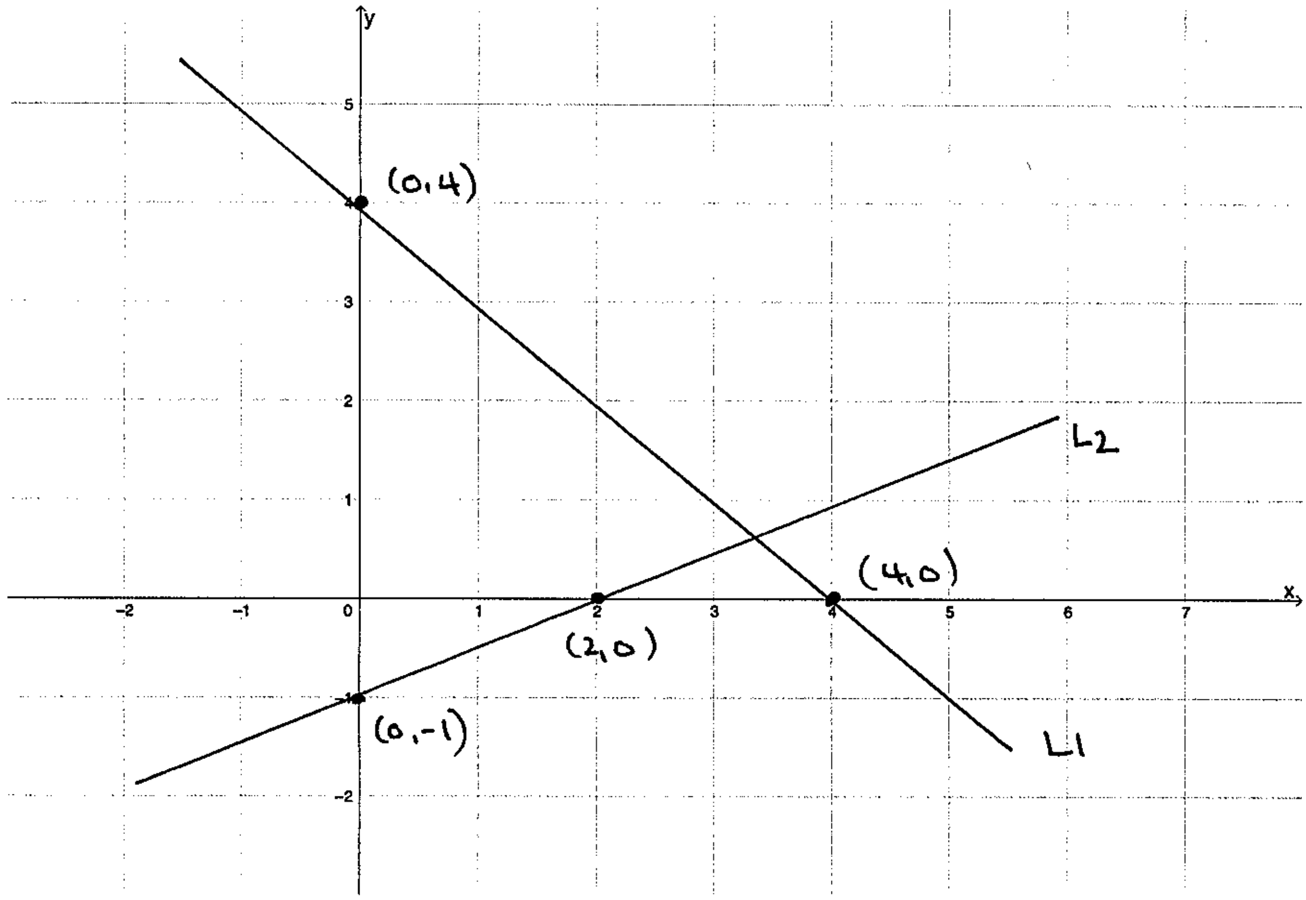
$= \sqrt{125}$

$= 5\sqrt{5}$

(3 marks)

4. The line L_1 has the equation $y = 4 - x$, and the line L_2 has the equation $x - 2y = 2$.

(a) Sketch the graph of each line on the same set of axes. Clearly label the coordinates of any axial intercepts



(4 marks)

(b) Calculate the coordinates of the point of intersection of L_1 and L_2.

$x - 2y = 2$

sub. $y = 4 - x$

$x - 2(4 - x) = 2$

$x = \frac{10}{3}$

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

$\left(\frac{10}{3}, \frac{2}{3}\right)$

(3 marks)

End of Section A

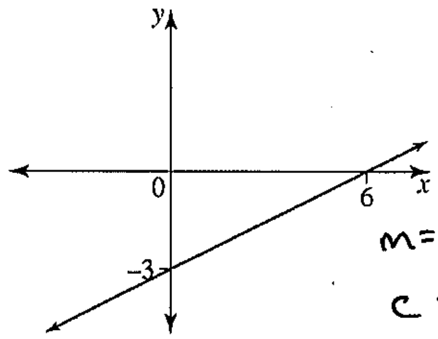
Name: ____________________

Section B: Multiple Choice (30 minutes) **Calculator Allowed**

Circle the correct answer (4 marks)

1. The equation of the graph shown is:

A. $x - 2y = 6$
B. $2y + x = 6$
C. $6x - 3y = 1$
D. $y = -\frac{1}{2}x - 3$
E. $y = 2x - 3$



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

$c = -3$

2. The angle of inclination to the positive direction of the x-axis made by the line with equation $\frac{x}{3} - \frac{y}{2} = 1$ is closest to:

A. 26.6°
B. 33.7°
C. 56.3°
D. 123.7°
E. 146.3°

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

$m = \tan\theta$

$\theta = \tan^{-1}(2/3)$

$= 33.69°$

3. For the points $(-1,-2)$, $(4,3)$ and $(9,b)$ to be collinear, b would equal:

A. -3
B. -2
C. -1
D. 8
E. 10

$m = \frac{-2-3}{-1-4}$

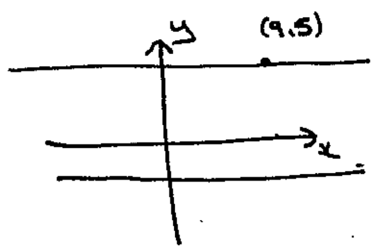
$= 1$

$1 = \frac{b+2}{9+1}$

$b = 8$

4. The equation of the line through $(9,5)$ parallel to $y = -2$ is:

A. $y = -2x + 13$
B. $2y = x + 1$
C. $x = 9$
D. $y = 9$
E. $y = 5$



End of Section B

Section C: Analysis **Calculator Allowed**

Exact answers are required unless instructed otherwise within the question

1. For the two lines given below;

L_1: $3x + ky = 5$ $\quad y = -\frac{3}{k}x + \frac{5}{k}$

L_2: $(k+2)x + 5y = k$ $\quad y = -\frac{(k+2)}{5} + \frac{k}{5}$

(a) Complete the table

Line	Gradient	y intercept
L_1	$m_1 = -\frac{3}{k}$	$c_1 = \frac{5}{k}$
L_2	$m_2 = -\frac{(k+2)}{5}$	$c_2 = \frac{k}{5}$

(4 marks)

(b) Find the value(s) of k for which the simultaneous equations will have infinitely many solutions

Infinite solutions if $m_1 = m_2$ and $c_1 = c_2$

$-\frac{3}{k} = -\frac{(k+2)}{5}$ $\quad \frac{5}{k} = \frac{k}{5}$

$15 = -k^2 - 2k$ $\quad k^2 = 25$

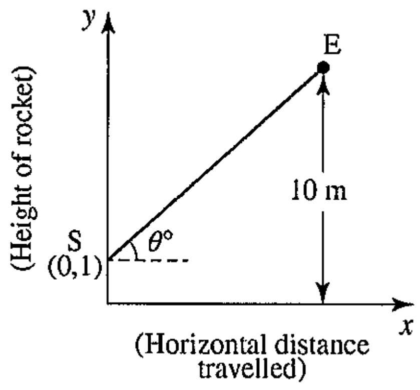
$k^2 + 2k - 15 = 0$ $\quad k = \pm 5$

$k = -5$ or 3

$k = -5$ will give infinite solutions

(5 marks)

2. A small fireworks rocket travels along a path that can be considered to be a straight line. On a Cartesian set of x- and y-axes where the units are in metres, the x-coordinates give the horizontal distance the rocket travels and the y-coordinates give the height of the rocket above the ground.



The fireworks rocket is launched from a point S $(0,1)$ at an angle of $\theta°$ with the horizontal. The fireworks explode on reaching a point E, which is at a height of 10 metres above the ground.

(a) The first rocket is launched at an angle of $45°$ to the horizontal. Find the equation of its path and the coordinates of point E.

$m = 1$

$y = x + 1$

(2 marks)

(b) After the explosion, part of the debris travels from point E along a line perpendicular to the rocket's path. Find the equation of this path, and work out how far horizontally from E the debris reaches the ground.

$y = x + 1$

Point E $y = 10 \Rightarrow x = 9$

Equation of path $m = -1$

$y - 10 = -(x - 9)$

$y = -x + 19$

Debris lands 10m right of E.

(4 marks)

(c) The angle at which the rockets are launched from S $(0,1)$ is varied and the fireworks explode at E $(k,10)$, $k > 0$. Show that the equation of the paths of all possible rockets is given by $9x - ky + k = 0$.

Gradient of line segment b/w $(k, 10)$ and $(0,1)$

$m = \frac{9}{k}$

Equation $y = \frac{9}{k}x + 1$

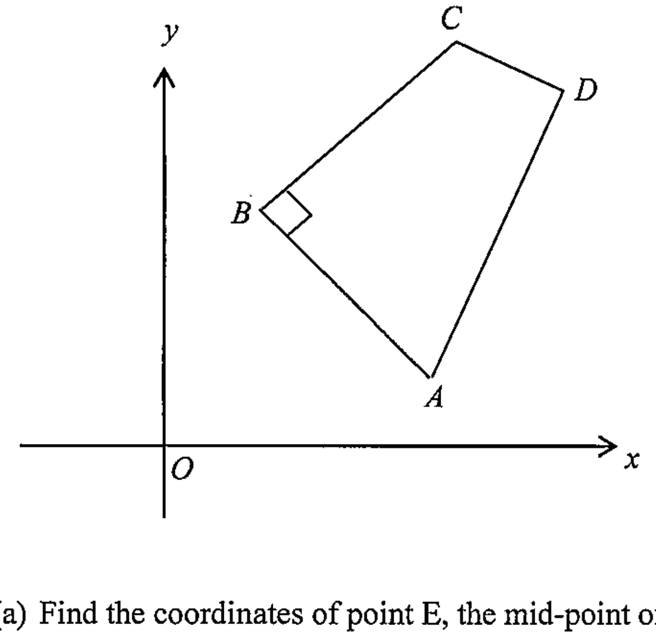
$ky = 9x + k$

$9x - ky + k = 0$

(2 marks)

3. *ABCD* is a quadrilateral with angle *ABC* a right angle. *D* lies on the perpendicular bisector of *AB*. (The line through the midpoint of *AB* which is perpendicular to *AB*). The coordinates of *A* and *B* are (7, 2) and (2, 5) respectively.

The equation of line *AD* is $y = 4x - 26$.



(a) Find the coordinates of point E, the mid-point of *AB*.

E $\left(\frac{9}{2}, \frac{7}{2}\right)$

(1 mark)

(b) Find the equation of the line *ED* which is perpendicular to *AB*

$$m_{AB} = \frac{5-2}{2-7}$$

$$= -\frac{3}{5}$$

$$m_{ED} = \frac{5}{3}$$

Equation $y - \frac{7}{2} = \frac{5}{3}\left(x - \frac{9}{2}\right)$

$$y = \frac{5}{3}x - 4$$

(2 marks)

(c) Find the coordinates of point *D*

$$4x - 26 = \frac{5}{3}x - 4$$

$$x = \frac{66}{7}$$

$$y = \frac{82}{7}$$

(3 marks)

(d) Find the gradient of the line *BC*

$$m_{BC} = \frac{5}{3}$$

(1 mark)

(e) Find the value of the y coordinate of the point $C(8, c)$

Line CB $\quad y - 5 = \frac{5}{3}(x - 2)$

$$y = \frac{5}{3}x + \frac{5}{3}$$

Sub. $x = 8$

$$y = \frac{45}{3}$$

$\Rightarrow \quad c = 15$

(3 marks)

End of Section C

End of Test