EXERCISES [MAI 2.1]

LINES

SOLUTIONS

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A. Paper 1 questions (SHORT)

1. (a) $m_{AB} = \frac{4}{3}$

(b) $m_{AB} = -\frac{3}{4}$

(c) M($\frac{7}{2}$,9)

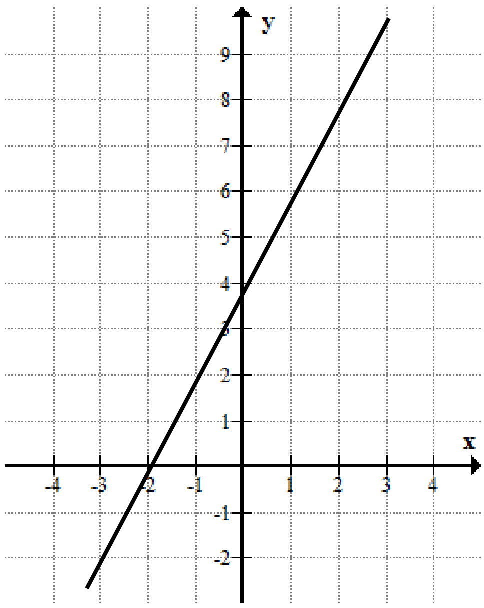
(d) $d = 5$

(e) C(8,15)

2. (a) $a = 1$ (b) $a = 11$ (c) $a = 5$ (d) $a = 0$ or $a = 6$

3. (a) (i) $m = 2$ (ii) $y = 4$ (iii) $x = -2$

(b)



(c) A does not lie on the line since 2×7+4 =18 ≠ 19 while B lies on the line since 2×8+4 =20

4. (a) (i) $m = -2$ (ii) $y = 5$ (iii) $x = 2.5$ (= $\frac{5}{2}$)

(b) $y = -2x + 5$

(c) $y = 3$, $x = 2$ (d) $a = 5$, $b = 15$

5. (a) $m_{AB} = \frac{3}{2}$, $y - 4 = \frac{3}{2}(x-3)$ (b) $y = \frac{3}{2}x - \frac{1}{2}$ (c) $3x - 2y = 1$

6. (i) $3x + 2y = 18$, For x=0 $2y = 18 \Rightarrow y = 9$ therefore A (0,9)

(ii) For $y = 0$, $3x = 18 \Rightarrow x = 6$ therefore B (6,0)

(iii) midpoint between (0, 9) and (6, 0): $\left(\frac{0+6}{2}, \frac{9+0}{2}\right)$ = (3, 4.5)

7. (a) $y = -2x + 3$ gradient of line $L_1 = -2$

(b) **METHOD 1**

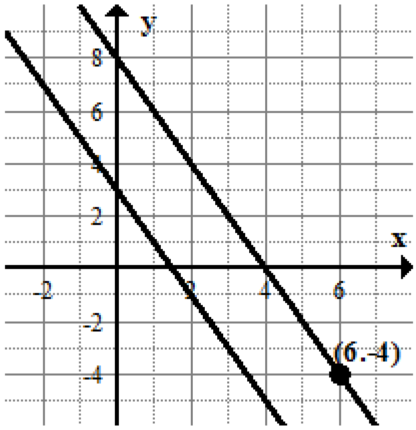
$(y - y_1) = m(x - x_1) \Rightarrow (y - (-4)) = -2(x - 6)$

$y + 4 = -2x + 12 \Rightarrow y = -2x + 8$

METHOD 2

Substituting the point $(6, -4)$ in $y = mx + c \Rightarrow c = 8$ so $y = -2x + 8$

(c) when line L_1 cuts the x-axis, $y = 0 \Rightarrow y = -2x + 8 \Rightarrow x = 4$

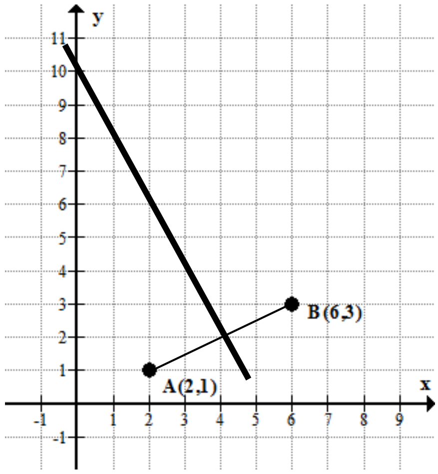


8. (a) $x = 2$ (b) $y = 5$ (c) P(2,5)

9. (a) $y = 3$ (b) $x = 2$ (c) $y = \frac{3}{2}x$

10. (a) $m_{AB} = \frac{2}{4} = \frac{1}{2}$, $m_{\perp} = -2$, Midpoint (4,2), $y - 2 = -2(x - 4)$ or $y = -2x + 10$

(b) $y = 10$

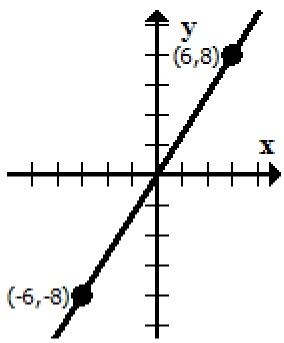


11. (a) For $x = 3k$, we obtain $y = 4k$

(b) $\sqrt{(3k)^2 + (4k)^2} = 10 \Leftrightarrow 25k^2 = 100 \Leftrightarrow k^2 = 4 \Leftrightarrow k = \pm 2$ (or by GDC)

(c) (6,8) and (-6,-8)

(d)



B. Paper 2 questions (LONG)

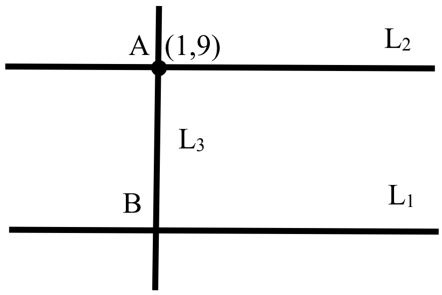
12. (a) $L_2: \ y = 2x + 7$

(b) $L_2: y = -\frac{1}{2}x + \frac{19}{2}$

(c) B(5,7)

(d) $d = \sqrt{20} = 2\sqrt{5}$

(e) In fact the distance from A to the line L_1 is $2\sqrt{5}$



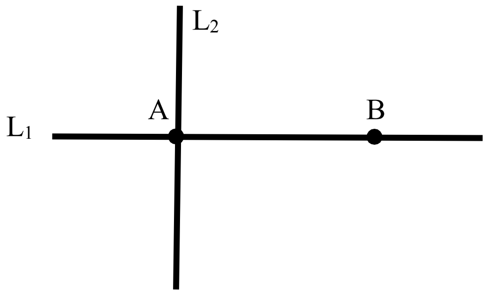
13. (a) $m_{AB} = 3$

(b) (i) $L_1: \ y = 3x - 1 \quad \Rightarrow 3x - y = 1$

(ii) $L_2: \ y = -\frac{1}{3}x + \frac{17}{3} \quad \Rightarrow x + 3y = 17$

(c) The solution is (2,5)

(d) The solution is in fact the point of intersection which is A as expected.



14. (a) $m_{AB} = \frac{2}{3}$

(b) M(1,7)

(c) $y = -\frac{3}{2}x + \frac{17}{2}$

(d) $d = \sqrt{52} = 2\sqrt{13}$

(e) $\sqrt{13}$

15. (a) $x = 5$ (b) $y = 5$ (c) $P(5,5)$ $\frac{3+7}{2} = 5$ $\frac{2+8}{2} = 5$

(d) (i) 12 (ii) 6 (iii) 6

(e) $m_{BC} = -\frac{3}{2}$, $m_{\perp} = \frac{2}{3}$, Midpoint (5,5), $y - 5 = \frac{2}{3}(x - 5) \Rightarrow 2x - 3y = -5$

(f) For $x = 3$, $y = \frac{11}{3} \neq 2$

16. (a) A(6,-1) (b) B(-2,7) (c) C(-2,-5) (c) Area = $\frac{12 \times 8}{2} = 48$