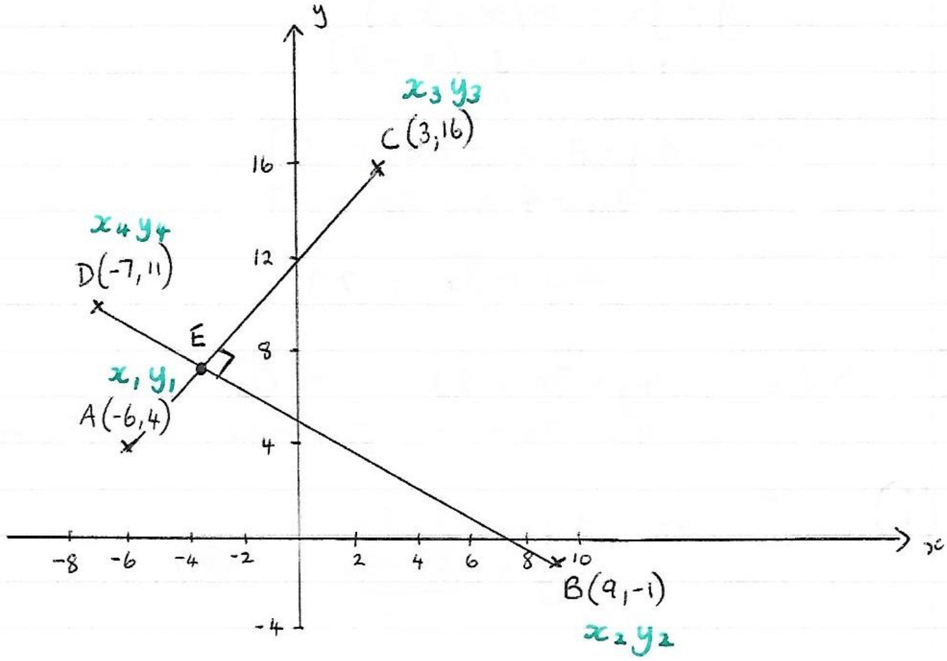
Coordinate Geometry 4 : Answers

9)



a) (i) AC

$$m = \frac{y_3 - y_1}{x_3 - x_1}$$

$$m = \frac{16-4}{3+6} = \frac{12}{9} = +\frac{4}{3}$$

(ii) Eqn AC use $A(-6,4)$

$$y - y_1 = m(x - x_1)$$

$$y - 4 = \frac{4}{3}(x+6)$$

$\times 3$

$$3y - 12 = 4(x+6)$$

$$3y - 12 = 4x + 24$$

$$0 = 4x - 3y + 36 \quad \ldots \quad \text{QED}$$

(iii) BD

$$m = \frac{y_4 - y_2}{x_4 - x_2}$$

$$m = \frac{11+1}{-7-9} = \frac{12}{-16} = -\frac{3}{4}$$

$\therefore$ BD is $\perp$ to AC

because $M_1 \times M_2 = \left(+\frac{4}{3}\right) \times \left(-\frac{3}{4}\right) = -1$

(iv) BD Eqn. Use $B(9,-1)$

$$y - y_2 = m(x - x_2)$$
$$y + 1 = -\frac{3}{4}(x - 9)$$
$$\times 4 \quad 4y + 4 = -3(x - 9)$$
$$4y + 4 = -3x + 27$$
$$4y + 3x = 23$$

b) Solve $4y + 3x = 23$ — ①
$4x - 3y + 36 = 0$ — ② simultaneously

(i) ① $\Rightarrow$ $4y = 23 - 3x$

$$y = \frac{23 - 3x}{4} \quad (*)$$

Sub $(*)$ into ②

$$② \Rightarrow 4x - 3\left(\frac{23-3x}{4}\right) = -36$$
$$\times 4 \quad 16x - 3(23 - 3x) = -144$$
$$16x - 69 + 9x = -144$$
$$25x = -144 + 69$$
$$25x = -75$$
$$x = -3$$

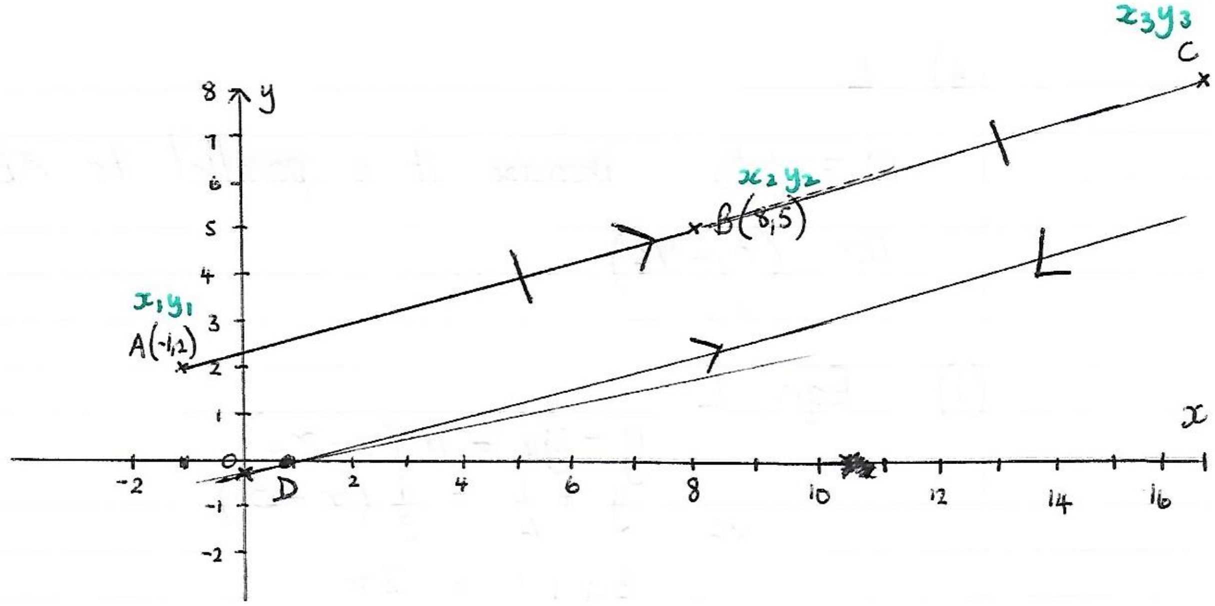
$\therefore$ $(*)$
$$y = \frac{23 - 3(-3)}{4}$$
$$y = \frac{32}{4} = 8$$

$\therefore E(-3, 8)$
$x_5 \; y_5$

(ii) BE

$$BE = \sqrt{(x_5 - x_1)^2 + (y_5 - y_1)^2}$$
$$= \sqrt{(-3+6)^2 + (8-4)^2}$$
$$= \sqrt{3^2 + 4^2}$$
$$= \sqrt{25}$$
$$= 5 \text{ units}$$

10)



a) AB

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m = \frac{5-2}{8-(-1)}$$

$$m = \frac{3}{9} = +\frac{1}{3}$$

b) Eqn AB Use $A(-1,2)$

$$y - y_1 = m(x - x_1)$$
$$y - 2 = \frac{1}{3}(x + 1)$$
$$3y - 6 = x + 1$$
$$3y = x + 7$$

c) B is Mid Point

$$\frac{x_1 + x_3}{2} = 8 \qquad \frac{y_1 + y_3}{2} = 5$$

$$\frac{-1 + x_3}{2} = 8 \qquad \frac{2 + y_3}{2} = 5$$

$$-1 + x_3 = 16 \qquad 2 + y_3 = 10$$

$$x_3 = 17 \qquad y_3 = 8$$

$$\therefore C(17, 8)$$

d) L

$m = +1/3$ because it is parallel to AB

Use $(0, -1/6)$
$\quad x_4 \quad y_4$

(i) Eqn L

$$y - y_4 = m(x - x_4)$$

$$\times 6 \quad y + \frac{1}{6} = \frac{1}{3}(x - 0)$$

$$6y + 1 = 2x$$

(ii) $6y + 1 = 2x$ crosses x axis when $y = 0$

$$0 + 1 = 2x$$

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

$\therefore D(1/2, 0)$
$\quad x_5 \quad y_5$

(iii) <u>AD</u>

$$AD = \sqrt{(x_5 - x_1)^2 + (y_5 - y_1)^2}$$

$$= \sqrt{\left(\frac{1}{2} + 1\right)^2 + (0 - 2)^2}$$

$$= \sqrt{\left(\frac{3}{2}\right)^2 + (-2)^2}$$

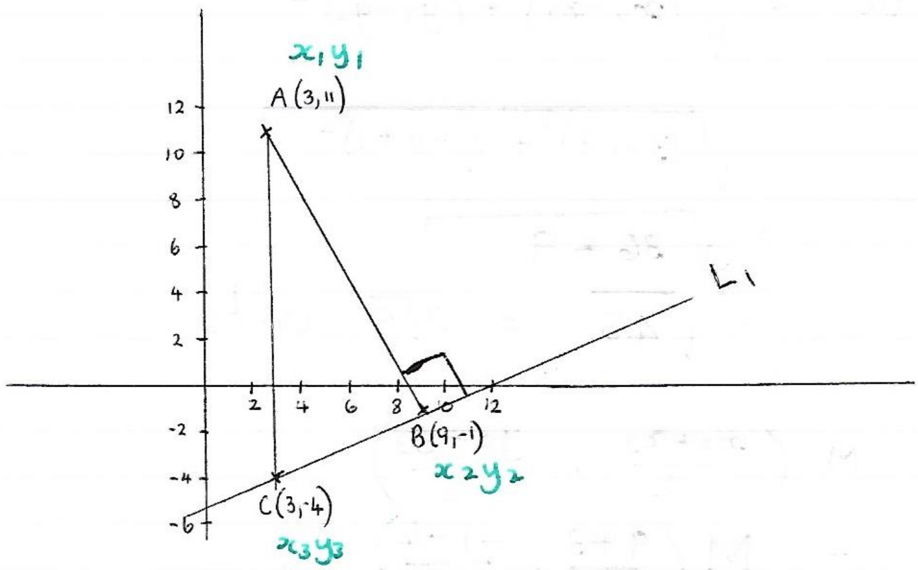
$$= \sqrt{\frac{9}{4} + 4}$$

$$= \sqrt{\frac{9 + 16}{4}}$$

$$= \sqrt{\frac{25}{4}}$$

$$= \frac{5}{2} \text{ units}$$

11)



a) AB

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m = \frac{-1 - 11}{9 - 3}$$

$$m = -\frac{12}{6} = -2$$

b) L_1

Gradient $= +\frac{1}{2}$ because parallel to AB

$$\left(+\tfrac{1}{2}\right) \times (-2) = -1$$

Eqn L_1 use $B(9, -1)$

$$y - y_2 = m(x - x_2)$$

$$y + 1 = \frac{1}{2}(x - 9)$$

$$2y + 2 = x - 9$$

$$2y = x - 11$$

c) (i) Solve

$$6x + 7y + 10 = 0 \quad - (1)$$

$$2y = x - 11 \quad - (2)$$

(2) $\Rightarrow$ $2y + 11 = x$ (*)

Sub (*) into (1)

$$6(2y + 11) + 7y + 10 = 0$$

$$12y + 66 + 7y + 10 = 0$$

$$19y = -76$$

$$y = -4$$

(*) $2(-4) + 11 = x$

$$-3 = x$$

$\therefore$ $C(3, -4)$

$x_3 \; y_3$

(ii) $BC = \sqrt{(x_3 - x_2)^2 + (y_3 - y_2)^2}$

$= \sqrt{(3-9)^2 + (-4+1)^2}$

$= \sqrt{36 + 9}$

$= \sqrt{45} = 3\sqrt{5}$ units

(iii) $M\left(\frac{x_2+x_3}{2}, \frac{y_2+y_3}{2}\right)$

$= M\left(\frac{9+3}{2}, \frac{-1-4}{2}\right)$

$= M\left(6, \frac{-5}{2}\right)$

(iv) Eqn AC

first gradient AC

$m = \frac{y_3 - y_1}{x_3 - x_1} = \frac{-4-11}{3-3} = \frac{-15}{0} \to \infty$

??

This means
it is VERTICAL
with infinite slope.

* If you look at
the diagram AC is obviously vertical

∴ AC has equation $x = 3$