MEI CORE 1 — EXERCISE 2A COORDINATE GEOMETRY

2) Line through $P(3,-4)$ and $Q(q,0)$ has gradient 2

$$2 = \frac{y_2 - y_1}{x_2 - x_1} = \frac{0 - -4}{q - 3} = \frac{4}{q-3}$$

$$2(q-3) = 4$$

$$q - 3 = 2$$

$$q = 5$$

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4) $A(1,2)$

i) $B(7,5)$

$C(9,8)$

$D(3,5)$

gradient of AB $= \frac{5-2}{7-1} = \frac{3}{6} = \frac{1}{2}$

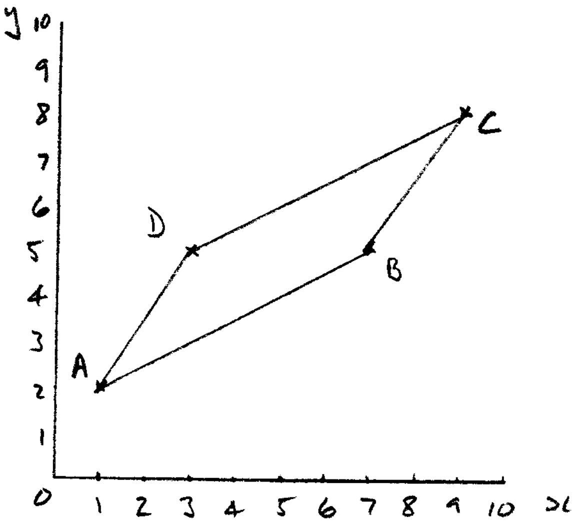
gradient of BC $= \frac{8-5}{9-7} = \frac{3}{2}$

gradient of CD $= \frac{8-5}{9-3} = \frac{3}{6} = \frac{1}{2}$

gradient of DA $= \frac{5-2}{3-1} = \frac{3}{2}$

ii) ABCD is a parallelogram since opposite sides have same gradient.

iii)



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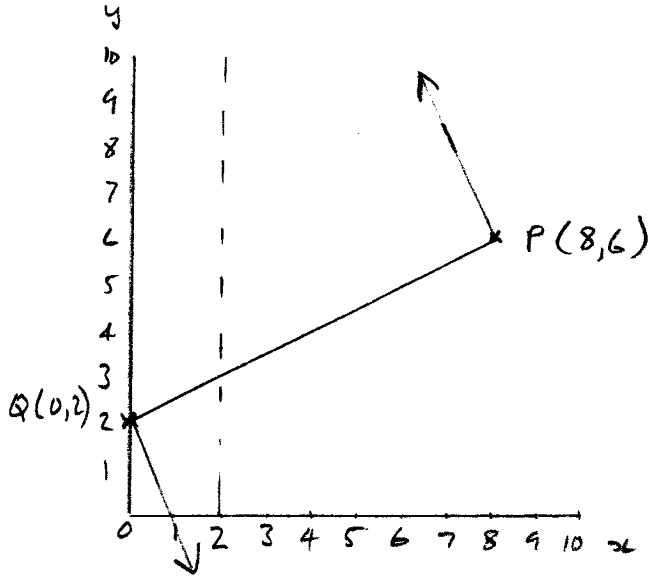
MEI CORE 1 EXERCISE 2A COORDINATE GEOMETRY

6)



R(2,r)

$$\text{Gradient } PQ = \frac{6-2}{8-0} = \frac{4}{8} = \frac{1}{2}$$

If right angle at P

$$\text{Gradient } PR = -2$$

i)

$$\therefore \quad \frac{r-6}{2-8} = -2$$

$$\frac{r-6}{-6} = -2$$

$$r-6 = 12$$

$$\underline{r = 18}$$

ii) If right angle at Q

$$\text{Gradient } QR = -2$$

$$\frac{r-2}{2-0} = -2$$

$$r-2 = -4$$

$$r = -4+2 \qquad \underline{r = -2}$$

iii) If right angle at R

gradient QR × gradient PR = −1

$$\frac{r-2}{2-0} \times \frac{r-6}{2-8} = -1$$

$$\left(\frac{r-2}{2}\right)\left(\frac{r-6}{-6}\right) = -1$$

$$(r-2)(r-6) = 12$$

$$r^2 - 2r - 6r + 12 = 12$$

$$r^2 - 8r = 0$$

$$r(r-8) = 0$$

$$\Rightarrow r = 0 \quad \text{or} \quad r = 8$$

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iv) If RQ = RP

$$\sqrt{(r-2)^2 + (2-0)^2} = \sqrt{(r-6)^2 + (2-8)^2}$$ Pythagoras

$$\Rightarrow (r-2)^2 + 4 = (r-6)^2 + 36$$

$$r^2 - 4r + 4 + 4 = r^2 - 12r + 36 + 36$$

$$r^2 - 4r + 8 - r^2 + 12r - 72 = 0$$

$$8r - 64 = 0$$

$$r - 8 = 0$$

$$r = 8$$

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8) $P(x, y)$ $Q(3x, 5y)$

i) Gradient of PQ $= \dfrac{5y - y}{3x - x} = \dfrac{4y}{2x} = \dfrac{2y}{x}$

ii) Midpoint of PQ $= \left(\dfrac{x + 3x}{2}, \dfrac{y + 5y}{2} \right)$

$= (2x, 3y)$

iii) Length of PQ $= \sqrt{(3x - x)^2 + (5y - y)^2}$

$= \sqrt{4x^2 + 16y^2}$