COORDINATE GEOMETRY — *Answers*

1 **a** grad $l = -2$

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

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

$2y + 2 = x - 6$

$x - 2y - 8 = 0$

b $x - 2(1 - 2x) - 8 = 0$

$5x - 10 = 0$

$x = 2 \;\therefore\; (2, -3)$

2 **a** grad $= \frac{5+3}{7-1} = \frac{4}{3}$

$\therefore\; y + 3 = \frac{4}{3}(x - 1) \quad [4x - 3y - 13 = 0]$

b subtracting, $4y - 4 = 0$

$y = 1 \;\therefore\; C\,(4, 1)$

mid-point $= (\frac{1+7}{2}, \frac{-3+5}{2}) = (4, 1)$

$\therefore$ C is the mid-point of AB

c grad $m = -4$

$\therefore$ grad perp to $m = \frac{1}{4}$

$y - 1 = \frac{1}{4}(x - 4)$

$\therefore\; y = \frac{1}{4}x$ which passes through $(0, 0)$

3 **a** $M = (q, \frac{9}{2}) = (\frac{-2+4}{2}, \frac{7+p}{2})$

$\therefore\; p = 2,\; q = 1$

b grad $AB = \frac{2-7}{4+2} = -\frac{5}{6}$

$\therefore$ grad perp to $AB = \frac{6}{5}$

$y - 7 = \frac{6}{5}(x + 2)$

$5y - 35 = 6x + 12$

$6x - 5y + 47 = 0$

4 **a** $PQ^2 = 4^2 + 8^2 = 80$

$PQ = \sqrt{80} = 4\sqrt{5} \quad [k = 4]$

b $M = (\frac{-5-1}{2}, \frac{-2+6}{2}) = (-3, 2)$

c grad $MS = \frac{-1-2}{3+3} = -\frac{1}{2}$

grad $PQ = \frac{6+2}{-1+5} = 2$

grad $MS \times$ grad $PQ = -\frac{1}{2} \times 2 = -1$

$\therefore$ MS is perpendicular to PQ

d $MS = \sqrt{6^2 + 3^2} = \sqrt{45} = 3\sqrt{5}$

area $= PQ \times MS = 60$

5 **a** grad of $2x - y + 4 = 0$ is 2

$\therefore$ grad of $l = 2$

$y + 3 = 2(x + 1) \quad [y = 2x - 1]$

b grad of $6x + 5y - 2 = 0$ is $-\frac{6}{5}$

$\therefore$ grad of $m = \frac{5}{6}$

$y - 4 = \frac{5}{6}(x - 4)$

$6y - 24 = 5x - 20$

$5x - 6y + 4 = 0$

c $5x - 6(2x - 1) + 4 = 0$

$10 - 7x = 0$

$x = \frac{10}{7} \;\therefore\; (1\frac{3}{7}, 1\frac{6}{7})$

6 **a** $y - 4 = \frac{1}{2}(x - 2)$

$2y - 8 = x - 2$

$x - 2y + 6 = 0$

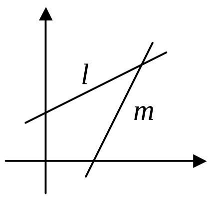
b $x - 2(2x - 6) + 6 = 0$

$18 - 3x = 0$

$x = 6 \;\therefore\; (6, 6)$

c l meets y-axis at $(0, 3)$

m meets x-axis at $(3, 0)$



$(0, 0)$ and $(6, 6)$ on $y = x$

$(0, 3)$ and $(3, 0)$ symmetrical about $y = x$

$\therefore$ quadrilateral is a kite

7 **a** at A, $y = 0$ $\therefore$ $x = 20$

at B, $x = 0$ $\therefore$ $y = 10$

$\therefore$ A (20, 0), B (0, 10)

b $l \Rightarrow y = 10 - \frac{1}{2}x$

$\therefore$ grad of $l = -\frac{1}{2}$

$\therefore$ grad of $m = 2$

$m: \quad y = 2x$

at C, $10 - \frac{1}{2}x = 2x$

$x = 4$ $\therefore$ C (4, 8)

$\therefore$ area of Δ OAC : area of Δ OBC

$= \frac{1}{2} \times 20 \times 8 : \frac{1}{2} \times 10 \times 4$

$= 4 : 1$

8 **a** grad q = grad $p = -\frac{3}{4}$

$\therefore$ $y = -\frac{3}{4}x + 7$

b grad $r = \frac{4}{3}$

$\therefore$ $y = \frac{4}{3}(x - 1)$

$3y = 4x - 4$

$4x - 3y - 4 = 0$

c $\frac{4}{3}x - \frac{4}{3} = -\frac{3}{4}x + 7$

$16x - 16 = -9x + 84$

$25x = 100$

$x = 4$ $\therefore$ (4, 4)

$\therefore$ lies on $y = x$

9 **a** grad $PQ = \frac{2-c}{9-3} = \frac{2-c}{6}$

grad $QR = \frac{11-2}{3c-9} = \frac{3}{c-3}$

$\angle PQR = 90°$ $\therefore$ PQ perp to QR

$\therefore$ $\frac{2-c}{6} \times \frac{3}{c-3} = -1$

$3(2 - c) = -6(c - 3)$

$3c = 12$

$c = 4$

b $PQ^2 = 6^2 + 2^2 = 40$

$PQ = \sqrt{40} = 2\sqrt{10}$ [$k = 2$]

c $QR = \sqrt{3^2 + 9^2} = \sqrt{90} = 3\sqrt{10}$

area $= \frac{1}{2} \times PQ \times QR = 30$

10 **a** $PQ^2 = 12^2 + 9^2 = 225$

$PQ = \sqrt{225} = 15$

b grad $= \frac{12-3}{13-1} = \frac{3}{4}$

$\therefore$ $y - 3 = \frac{3}{4}(x - 1)$

$4y - 12 = 3x - 3$

$3x - 4y + 9 = 0$

c grad $l_2 = -\frac{4}{3}$

$y - 10 = -\frac{4}{3}(x - 2)$ [$4x + 3y - 38 = 0$]

d $l_1 \Rightarrow 9x - 12y + 27 = 0$

$l_2 \Rightarrow 16x + 12y - 152 = 0$

adding $25x - 125 = 0$

$x = 5$ $\therefore$ (5, 6)

e distance R to (5, 6) $= \sqrt{3^2 + 4^2} = 5$

area $= \frac{1}{2} \times 15 \times 5 = 37\frac{1}{2}$