C1 COORDINATE GEOMETRY — *Answers - Worksheet A*

1 **a** $= \frac{5-1}{5-3} = 2$ **b** $= \frac{9-7}{10-4} = \frac{1}{3}$ **c** $= \frac{5-1}{2-6} = -1$ **d** $= \frac{8-2}{2+2} = \frac{3}{2}$

e $= \frac{-1-3}{7-1} = -\frac{2}{3}$ **f** $= \frac{-7-5}{-5-4} = \frac{4}{3}$ **g** $= \frac{-8-0}{0+2} = -4$ **h** $= \frac{-2-6}{-7-8} = \frac{8}{15}$

2 **a** grad = 4, y-int = -1 **b** grad = $\frac{1}{3}$, y-int = 3 **c** grad = -1, y-int = 6 **d** grad = -2, y-int = $-\frac{3}{5}$

3 **a** $y = -x - 3$; grad = -1; y-int = -3 **b** $2y = x - 6$; $y = \frac{1}{2}x - 3$; grad = $\frac{1}{2}$; y-int = -3 **c** $3y = -3x + 2$; $y = -x + \frac{2}{3}$; grad = -1; y-int = $\frac{2}{3}$ **d** $5y = 4x + 1$; $y = \frac{4}{5}x + \frac{1}{5}$; grad = $\frac{4}{5}$; y-int = $\frac{1}{5}$

4 **a** $y - 1 = 2(x - 4)$ **b** $y + 5 = 5(x - 2)$

c $y - 1 = -3(x + 1)$ **d** $y - 6 = \frac{1}{2}(x - 1)$

e $y + \frac{1}{4} = -2(x - \frac{3}{4})$ **f** $y + 7 = -\frac{1}{5}(x + 3)$

5 **a** $y - 2 = 3(x - 1)$; $y = 3x - 1$ **b** $y - 3 = -(x - 5)$; $y = -x + 8$

c $y + 3 = 4(x + 2)$; $y = 4x + 5$ **d** $y - 1 = -2(x + 4)$; $y = -2x - 7$

e $y - 1 = \frac{1}{3}(x + 3)$; $y = \frac{1}{3}x + 2$ **f** $y + 2 = -\frac{5}{6}(x - 9)$; $y = -\frac{5}{6}x + \frac{11}{2}$

6 **a** $y + 4 = x - 2$; $x - y - 6 = 0$ **b** $y - 1 = \frac{1}{2}(x - 6)$; $2y - 2 = x - 6$; $x - 2y - 4 = 0$ **c** $y - 8 = -4(x + 1)$; $y - 8 = -4x - 4$; $4x + y - 4 = 0$

d $y - 5 = \frac{2}{5}(x + 3)$; $5y - 25 = 2x + 6$; $2x - 5y + 31 = 0$ **e** $y + \frac{1}{8} = -3(x - \frac{3}{2})$; $8y + 1 = -24x + 36$; $24x + 8y - 35 = 0$ **f** $y + 7 = -\frac{3}{4}(x - \frac{2}{3})$; $4y + 28 = -3x + 2$; $3x + 4y + 26 = 0$

7 **a** grad = $\frac{13-1}{4-0} = 3$; $y = 3x + 1$ **b** grad = $\frac{-1-9}{7-2} = -2$; $y - 9 = -2(x - 2)$; $y = -2x + 13$ **c** grad = $\frac{7-3}{2+4} = \frac{2}{3}$; $y - 3 = \frac{2}{3}(x + 4)$; $y = \frac{2}{3}x + \frac{17}{3}$

d grad = $\frac{8+2}{2+\frac{1}{2}} = 4$; $y - 8 = 4(x - 2)$; $y = 4x$ **e** grad = $\frac{-5+2}{18-3} = -\frac{1}{5}$; $y + 2 = -\frac{1}{5}(x - 3)$; $y = -\frac{1}{5}x - \frac{7}{5}$ **f** grad = $\frac{0.4-4}{-2+3.2} = -3$; $y - 4 = -3(x + 3.2)$; $y = -3x - 5.6$

8 **a** grad $= \frac{2-0}{5-3} = 1$

$y = x - 3$

$x - y - 3 = 0$

b grad $= \frac{-4-8}{5+1} = -2$

$y - 8 = -2(x + 1)$

$y - 8 = -2x - 2$

$2x + y - 6 = 0$

c grad $= \frac{5-3}{7+5} = \frac{1}{6}$

$y - 3 = \frac{1}{6}(x + 5)$

$6y - 18 = x + 5$

$x - 6y + 23 = 0$

d grad $= \frac{-17+1}{8+4} = -\frac{4}{3}$

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

$3y + 3 = -4x - 16$

$4x + 3y + 19 = 0$

e grad $= \frac{0+1.5}{7-2} = 0.3$

$y = 0.3(x - 7)$

$10y = 3x - 21$

$3x - 10y - 21 = 0$

f grad $= \frac{1-\frac{1}{10}}{3+\frac{3}{5}} = \frac{1}{4}$

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

$4y - 4 = x - 3$

$x - 4y + 1 = 0$

9 **a** grad $= \frac{2-8}{3+6} = -\frac{2}{3}$

$\therefore\ y - 8 = -\frac{2}{3}(x + 6)$

$[\ 2x + 3y - 12 = 0\ ]$

b sub.

$2(9) + 3(-2) - 12 = 18 - 6 - 12 = 0$

$\therefore$ C lies on l

10 $k - 3(2k) + 15 = 0$

$15 = 5k$

$k = 3$

11 $2(4p) - 4(p^2) + 5 = 0$

$4p^2 - 8p - 5 = 0$

$(2p + 1)(2p - 5) = 0$

$p = -\frac{1}{2}$ or $\frac{5}{2}$

12 **a** $x = 0$: $y = 5$; $y = 0$: $x = -\frac{5}{2}$; $(-\frac{5}{2}, 0)$ and $(0, 5)$

b $x = 0$: $y = 2$; $y = 0$: $x = -6$; $(-6, 0)$ and $(0, 2)$

c $x = 0$: $y = \frac{3}{4}$; $y = 0$: $x = \frac{3}{2}$; $(0, \frac{3}{4})$ and $(\frac{3}{2}, 0)$

d $x = 0$: $y = -\frac{10}{3}$; $y = 0$: $x = 2$; $(0, -\frac{10}{3})$ and $(2, 0)$

13 **a** $x = 0 \Rightarrow y = -\frac{5}{3}$

$y = 0 \Rightarrow x = 6$ $\quad\therefore (0, -\frac{5}{3})$ and $(6, 0)$

b area $= \frac{1}{2} \times 6 \times \frac{5}{3} = 5$

14 **a** $= \sqrt{3^2 + 4^2}$

$= \sqrt{25} = 5$

b $= \sqrt{3^2 + 1^2}$

$= \sqrt{10}$

c $= \sqrt{8^2 + 15^2}$

$= \sqrt{289} = 17$

d $= \sqrt{16^2 + 12^2}$

$= \sqrt{400} = 20$

e $= \sqrt{2^2 + 5^2}$

$= \sqrt{29}$

f $= \sqrt{8^2 + 4^2}$

$= \sqrt{80} = 4\sqrt{5}$

15 let centre be C $\therefore$ radius $= CP = \sqrt{20^2 + 15^2} = \sqrt{625} = 25$

$\therefore\ CQ^2 = 15^2 + c^2 = 25^2$

$c^2 = 625 - 225 = 400$

$c = \pm 20$

$CR^2 = (k - 2)^2 + 24^2 = 25^2$

$(k - 2)^2 = 625 - 576 = 49$

$k - 2 = \pm 7$

$k = -5$ or 9

16 $AB^2 = 8^2 + 10^2 = 164$

$AB = \sqrt{164} = 2\sqrt{41}$

radius $= \frac{1}{2}AB = \sqrt{41}$

area $= \pi \times (\sqrt{41})^2 = 41\pi$

17 **a** $PQ = \sqrt{6^2 + 2^2} = \sqrt{40} = 2\sqrt{10}$

$PR = \sqrt{1^2 + 17^2} = \sqrt{290}$

$QR = \sqrt{5^2 + 15^2} = \sqrt{250} = 5\sqrt{10}$

b $PQ^2 + QR^2 = 40 + 250 = 290 = PR^2$

$\therefore$ by converse of Pythagoras' $\angle PQR$ is a right-angle

c area $= \frac{1}{2} \times PQ \times QR = 50$

18 **a** $(\frac{0+8}{2}, \frac{2+4}{2}) = (4, 3)$ **b** $(\frac{1+7}{2}, \frac{9+5}{2}) = (4, 7)$ **c** $(\frac{-5+3}{2}, \frac{1-7}{2}) = (-1, -3)$

d $(\frac{-5+7}{2}, \frac{-7-5}{2}) = (1, -6)$ **e** $(\frac{1+2}{2}, \frac{0+9}{2}) = (\frac{3}{2}, \frac{9}{2})$ **f** $(\frac{-1+4}{2}, \frac{-2-5}{2}) = (\frac{3}{2}, -\frac{7}{2})$

g $(\frac{2.4+0.6}{2}, \frac{3.1+4.5}{2}) = (1.5, 3.8)$ **h** $(\frac{0+\frac{1}{2}}{2}, \frac{3+\frac{3}{2}}{2}) = (\frac{1}{4}, \frac{9}{4})$ **i** $(\frac{-\frac{5}{4}-1}{2}, \frac{2-\frac{3}{5}}{2}) = (-\frac{9}{8}, \frac{7}{10})$

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

$y - 1 = -\frac{1}{3}(x + 2)$

$3y - 3 = -x - 2$

$x + 3y - 1 = 0$

b mid-point of $PQ = (\frac{-2+4}{2}, \frac{1-1}{2}) = (1, 0)$

grad of $l_2 = \frac{0-4}{1-2} = 4$

$y = 4(x - 1)$

$y = 4x - 4$

20 **a** $2x + 1 = 3x - 1$

$x = 2$

$\therefore$ (2, 5)

b $x + 7 = 4 - 2x$

$3x = -3$

$x = -1$

$\therefore$ (−1, 6)

c $5x - 4 = 3x - 1$

$2x = 3$

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

$\therefore$ $(\frac{3}{2}, \frac{7}{2})$

d adding

$4x = 0$

$x = 0$

$\therefore$ (0, 2)

e $6x + 3y - 6 = 0$

$x + 3y + 9 = 0$

subtracting

$5x - 15 = 0$

$x = 3$

$\therefore$ (3, −4)

f $6x + 4y = 0$

$x + 4y - 2 = 0$

subtracting

$5x + 2 = 0$

$x = -\frac{2}{5}$

$\therefore$ $(-\frac{2}{5}, \frac{3}{5})$

21 l: $x = 0 \Rightarrow y = 1$ $\therefore P(0, 1)$

m: $x = 0 \Rightarrow y = 15$ $\therefore Q(0, 15)$

l $x - 2y + 2 = 0$

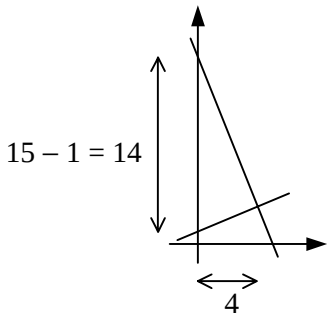
$m \Rightarrow$ $6x + 2y - 30 = 0$

adding, $7x - 28 = 0$

$x = 4$

sub. $y = 3$ $\therefore R(4, 3)$

area $= \frac{1}{2} \times 14 \times 4 = 28$



C1 COORDINATE GEOMETRY — *Answers - Worksheet B*

1 **a** grad of $y = 3 - 2x$ is -2
parallel grad $= -2$

b $2x - 5y + 1 = 0 \Rightarrow y = \frac{2}{5}x + \frac{1}{5}$
grad of $y = \frac{2}{5}x + \frac{1}{5}$ is $\frac{2}{5}$
parallel grad $= \frac{2}{5}$

c grad of $y = 3x + 4$ is 3
perp grad $= \frac{-1}{3} = -\frac{1}{3}$

d $x + 2y - 3 = 0 \Rightarrow y = \frac{3}{2} - \frac{1}{2}x$
grad of $y = \frac{3}{2} - \frac{1}{2}x$ is $-\frac{1}{2}$
perp grad $= \frac{-1}{-\frac{1}{2}} = 2$

2 **a** grad of $y = 4x - 1$ is 4
parallel grad $= 4$
$\therefore\ y - 7 = 4(x - 1)$
$y = 4x + 3$

b grad of $y = 6 - x$ is -1
perp grad $= 1$
$\therefore\ y - 3 = x + 4$
$y = x + 7$

c grad of $x - 3y = 0$ is $\frac{1}{3}$
perp grad $= -3$
$\therefore\ y + 2 = -3(x + 2)$
$y = -3x - 8$

3 **a** grad of $2x - 3y + 5 = 0$ is $\frac{2}{3}$
parallel grad $= \frac{2}{3}$
$\therefore\ y + 1 = \frac{2}{3}(x - 3)$
$3y + 3 = 2x - 6$
$2x - 3y - 9 = 0$

b grad of $3x + 4y = 1$ is $-\frac{3}{4}$
perp grad $= \frac{4}{3}$
$\therefore\ y - 5 = \frac{4}{3}(x - 2)$
$3y - 15 = 4x - 8$
$4x - 3y + 7 = 0$

c grad of $3x + 5y = 6$ is $-\frac{3}{5}$
parallel grad $= -\frac{3}{5}$
$\therefore\ y + 7 = -\frac{3}{5}(x + 4)$
$5y + 35 = -3x - 12$
$3x + 5y + 47 = 0$

4 **a** mid-point $= (\frac{0+8}{2}, \frac{4+0}{2})$
$= (4, 2)$
grad $= \frac{0-4}{8-0} = -\frac{1}{2}$
perp grad $= 2$
$\therefore\ y - 2 = 2(x - 4)$
$y - 2 = 2x - 8$
$2x - y - 6 = 0$

b mid-point $= (\frac{2+4}{2}, \frac{7+1}{2})$
$= (3, 4)$
grad $= \frac{1-7}{4-2} = -3$
perp grad $= \frac{1}{3}$
$\therefore\ y - 4 = \frac{1}{3}(x - 3)$
$3y - 12 = x - 3$
$x - 3y + 9 = 0$

c mid-point $= (\frac{-3+9}{2}, \frac{-2+1}{2})$
$= (3, -\frac{1}{2})$
grad $= \frac{1+2}{9+3} = \frac{1}{4}$
perp grad $= -4$
$\therefore\ y + \frac{1}{2} = -4(x - 3)$
$2y + 1 = -8x + 24$
$8x + 2y - 23 = 0$

5 **a** grad $AB = \frac{-1+3}{4+6} = \frac{1}{5}$
grad $BC = \frac{4+1}{3-4} = -5$

b grad $AB \times$ grad $BC = \frac{1}{5} \times -5 = -1$
$\therefore\ AB$ is perpendicular to BC
$\therefore\ \angle ABC = 90°$

6 $2x - 3y + 5 = 0 \Rightarrow y = \frac{2}{3}x + \frac{5}{3}$ $\therefore$ grad $= \frac{2}{3}$
$3x + ky - 1 = 0 \Rightarrow y = -\frac{3}{k}x + \frac{1}{k}$ $\therefore$ grad $= -\frac{3}{k}$
perp $\therefore\ \frac{2}{3} \times -\frac{3}{k} = -1$
$k = 2$

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

$\therefore\ y - 5 = \frac{1}{3}(x + 5)$

$3y - 15 = x + 5$

$x - 3y + 20 = 0$

b $M = (\frac{-5+1}{2}, \frac{5+7}{2}) = (-2, 6)$

grad $OM = \frac{6-0}{-2-0} = -3$

grad $l \times$ grad $OM = \frac{1}{3} \times (-3) = -1$

$\therefore$ OM is perpendicular to l

8 **a** $p \Rightarrow y = \frac{3}{4}x + 2 \ \therefore$ grad $= \frac{3}{4}$

parallel grad $= \frac{3}{4}$

$\therefore\ y - 5 = \frac{3}{4}(x - 8)$

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

b perp grad $= -\frac{4}{3}$

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

$3y - 18 = -4x - 16$

$4x + 3y - 2 = 0$

c $q \Rightarrow \quad 3x - 4y - 4 = 0$

$\Rightarrow \quad 9x - 12y - 12 = 0$

$r \Rightarrow \quad 16x + 12y - 8 = 0$

adding, $25x - 20 = 0$

$x = \frac{4}{5}$

$\therefore\ (\frac{4}{5}, -\frac{2}{5})$

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

$\therefore\ y - 7 = -3(x + 3)$

$3x + y + 2 = 0$

b perp grad $= \frac{1}{3}$

$\therefore\ l_2 : \quad y - 6 = \frac{1}{3}(x - 4)$

$3y - 18 = x - 4$

$x - 3y + 14 = 0$

$l_1 \Rightarrow \ 9x + 3y + 6 = 0$

adding, $10x + 20 = 0$

$x = -2$

$\therefore$ pt of intersection $(-2, 4)$

$\therefore$ dist from origin $= \sqrt{4+16} = \sqrt{20} = 2\sqrt{5}$

C1 COORDINATE GEOMETRY — Answers - Worksheet C

1 **a** $y + 5 = -3(x - 3)$ $[y = 4 - 3x]$

b grad $= \frac{1+2}{4+1} = \frac{3}{5}$

$\therefore\ y + 2 = \frac{3}{5}(x + 1)$

$5y + 10 = 3x + 3$

$3x - 5y - 7 = 0$

c $3x - 5(4 - 3x) - 7 = 0$

$18x - 27 = 0$

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

$\therefore\ P\left(\frac{3}{2}, -\frac{1}{2}\right)$

2 **a** $\frac{k+3}{7-2} = \frac{3}{2}$

$2(k + 3) = 15$

$k = \frac{9}{2}$

b mid-point $= \left(\frac{2+7}{2}, \frac{-3+\frac{9}{2}}{2}\right) = \left(\frac{9}{2}, \frac{3}{4}\right)$

perp grad $= -\frac{2}{3}$

$\therefore\ y - \frac{3}{4} = -\frac{2}{3}\left(x - \frac{9}{2}\right)$

$12y - 9 = -8x + 36$

$8x + 12y - 45 = 0$

3 **a** grad $= \frac{8-4}{-5-5} = -\frac{2}{5}$

$\therefore\ y - 4 = -\frac{2}{5}(x - 5)$

$5y - 20 = -2x + 10$

$2x + 5y - 30 = 0$

b $M = \left(\frac{5+1}{2}, \frac{4+11}{2}\right) = \left(3, 7\frac{1}{2}\right)$

c grad $OM = 7\frac{1}{2} \div 3 = \frac{5}{2}$

grad $OM \times$ grad $AB = \frac{5}{2} \times -\frac{2}{5} = -1$

$\therefore$ OM is perpendicular to AB

4 **a** $l \quad \Rightarrow \qquad 9x + 3y - 27 = 0$

subtracting, $7x - 15 = 0$

$x = \frac{15}{7}$

$\therefore\ A\left(\frac{15}{7}, \frac{18}{7}\right)$

b l meeets y-axis: $x = 0 \Rightarrow y = 9$

m meeets y-axis: $x = 0 \Rightarrow y = 4$

area of $R_1 = \frac{1}{2} \times 5 \times \frac{15}{7} = \frac{75}{14}$

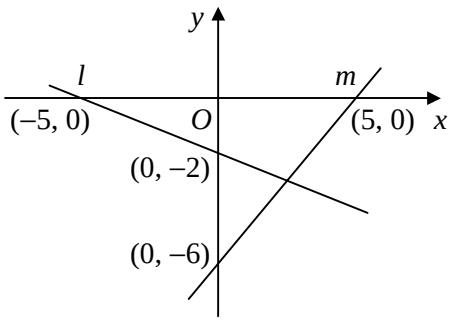
l meeets x-axis: $y = 0 \Rightarrow x = 3$

m meeets x-axis: $y = 0 \Rightarrow x = 6$

area of $R_2 = \frac{1}{2} \times 3 \times \frac{18}{7} = \frac{54}{14}$

area R_1 : area of $R_2 = \frac{75}{14} : \frac{54}{14} = 25 : 18$

5 **a**



b mid-point $= \left(\frac{0+5}{2}, \frac{-6+0}{2}\right) = \left(\frac{5}{2}, -3\right)$

sub. in l: $2\left(\frac{5}{2}\right) + 5(-3) + 10$

$= 5 - 15 + 10 = 0$

$\therefore$ l passes through mid-point of AB

6 **a** grad $= \frac{4+4}{5+10} = \frac{8}{15}$

$\therefore\ y - 4 = \frac{8}{15}(x - 5)$

$15y - 60 = 8x - 40$

$8x - 15y + 20 = 0$

b $x = 0 \Rightarrow y = \frac{4}{3}$

$y = 0 \Rightarrow x = -\frac{5}{2}$

area $= \frac{1}{2} \times \frac{5}{2} \times \frac{4}{3} = \frac{5}{3}$

c $PQ^2 = \left(\frac{5}{2}\right)^2 + \left(\frac{4}{3}\right)^2$

$= \frac{25}{4} + \frac{16}{9}$

$= \frac{289}{36}$

$PQ = \sqrt{\frac{289}{36}} = \frac{17}{6} = 2\frac{5}{6}$

7 **a** grad $= \frac{-5-1}{-4+8} = -\frac{3}{2}$

$\therefore\ y - 1 = -\frac{3}{2}(x + 8)$

$2y - 2 = -3x - 24$

$3x + 2y + 22 = 0$

b mid-point $= (\frac{-8-4}{2}, \frac{1-5}{2}) = (-6, -2)$

distance $= \sqrt{6^2 + 2^2} = \sqrt{40}$

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

8 **a** $y - 4 = \frac{1}{3}(x + 3)$

$3y - 12 = x + 3$

$x - 3y + 15 = 0$

b $(q, 7) \Rightarrow q - (3 \times 7) + 15 = 0$

$\therefore\ q = 6$

$(6, 7) \Rightarrow (5 \times 6) + 7p - 2 = 0$

$\therefore\ p = -4$

9 **a** grad $= \frac{6-2}{6+4} = \frac{2}{5}$

$\therefore\ y - 2 = \frac{2}{5}(x + 4)$

$5y - 10 = 2x + 8$

$2x - 5y + 18 = 0$

b $y - 6 = -(x - 6)$ $[y = 12 - x]$

c grad DC = grad $AB = \frac{2}{5}$

$\therefore$ eqn DC is $y - 7 = \frac{2}{5}(x + 2)$

$y = \frac{2}{5}x + 7\frac{4}{5}$

at C: $12 - x = \frac{2}{5}x + 7\frac{4}{5}$

$60 - 5x = 2x + 39$

$x = 3$

$\therefore\ C\ (3, 9)$

d grad $AC = \frac{9-2}{3+4} = 1$

grad $AC \times$ grad $BC = 1 \times -1 = -1$

$\therefore\ AC$ is perpendicular to BC

$\therefore\ \angle ACB = 90°$

10 **a** grad $= \frac{6-2\sqrt{3}}{\sqrt{3}-1} = \frac{6-2\sqrt{3}}{\sqrt{3}-1} \times \frac{\sqrt{3}+1}{\sqrt{3}+1}$

$= \frac{6\sqrt{3}+6-6-2\sqrt{3}}{3-1} = \frac{4\sqrt{3}}{2}$

$= 2\sqrt{3}$

b l : $y - 2\sqrt{3} = 2\sqrt{3}(x - 1)$

$y = 2\sqrt{3}\,x$

when $x = 0$, $y = 0$

$\therefore$ passes through origin

c perp grad $= -\frac{1}{2\sqrt{3}}$

$\therefore\ y - 2\sqrt{3} = -\frac{1}{2\sqrt{3}}(x - 1)$

$2\sqrt{3}\,y - 12 = -x + 1$

$x + 2\sqrt{3}\,y - 13 = 0$

C1 COORDINATE GEOMETRY — *Answers - Worksheet D*

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

$2y - 8 = x - 2$

$x - 2y + 6 = 0$

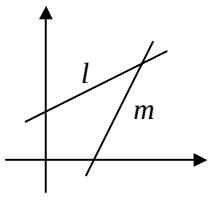
b $x - 2(2x - 6) + 6 = 0$

$18 - 3x = 0$

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

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

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

$\therefore$ grad of $m = 2$

m : $\quad y = 2x$

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

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

$\therefore$ area of ΔOAC : area of ΔOBC

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

$= 4 : 1$

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

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

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

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

$3y = 4x - 4$

$4x - 3y - 4 = 0$

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 $PQ = \dfrac{2-c}{9-3} = \dfrac{2-c}{6}$

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

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

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

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

$3c = 12$

$c = 4$

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

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

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

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

$4y - 12 = 3x - 3$

$3x - 4y + 9 = 0$

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

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

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

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

adding $\quad 25x - 125 = 0$

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

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

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