

- 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 **b** grad = $\frac{1}{3}$ **c** grad = -1 **d** grad = -2
 e y-int = -1 **f** y-int = 3 **g** y-int = 6 **h** y-int = $-\frac{3}{5}$
- 3** **a** $y = -x - 3$ **b** $2y = x - 6$ **c** $3y = -3x + 2$ **d** $5y = 4x + 1$
 grad = -1 $y = \frac{1}{2}x - 3$ $y = -x + \frac{2}{3}$ $y = \frac{4}{5}x + \frac{1}{5}$
 y-int = -3 grad = $\frac{1}{2}$ grad = -1 grad = $\frac{4}{5}$
 y-int = -3 y-int = $\frac{2}{3}$ 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** $y - 2 = 3(x - 1)$ **b** $y - 3 = -(x - 5)$
 $y = 3x - 1$ $y = -x + 8$
c $y + 3 = 4(x + 2)$ **d** $y - 1 = -2(x + 4)$
 $y = 4x + 5$ $y = -2x - 7$
e $y - 1 = \frac{1}{3}(x + 3)$ **f** $y + 2 = -\frac{5}{6}(x - 9)$
 $y = \frac{1}{3}x + 2$ $y = -\frac{5}{6}x + \frac{11}{2}$
- 6** **a** $y + 4 = x - 2$ **b** $y - 1 = \frac{1}{2}(x - 6)$ **c** $y - 8 = -4(x + 1)$
 $x - y - 6 = 0$ $2y - 2 = x - 6$ $y - 8 = -4x - 4$
 $x - 2y - 4 = 0$ $4x + y - 4 = 0$
d $y - 5 = \frac{2}{5}(x + 3)$ **e** $y + \frac{1}{8} = -3(x - \frac{3}{2})$ **f** $y + 7 = -\frac{3}{4}(x - \frac{2}{3})$
 $5y - 25 = 2x + 6$ $8y + 1 = -24x + 36$ $4y + 28 = -3x + 2$
 $2x - 5y + 31 = 0$ $24x + 8y - 35 = 0$ $3x + 4y + 26 = 0$
- 7** **a** grad = $\frac{13-1}{4-0} = 3$ **b** grad = $\frac{-1-9}{7-2} = -2$ **c** grad = $\frac{7-3}{2+4} = \frac{2}{3}$
 $y = 3x + 1$ $y - 9 = -2(x - 2)$ $y - 3 = \frac{2}{3}(x + 4)$
 $y = -2x + 13$ $y = \frac{2}{3}x + \frac{17}{3}$
d grad = $\frac{8+2}{2+\frac{1}{2}} = 4$ **e** grad = $\frac{-5+2}{18-3} = -\frac{1}{5}$ **f** grad = $\frac{0.4-4}{-2+3.2} = -3$
 $y - 8 = 4(x - 2)$ $y + 2 = -\frac{1}{5}(x - 3)$ $y - 4 = -3(x + 3.2)$
 $y = 4x$ $y = -\frac{1}{5}x - \frac{7}{5}$ $y = -3x - 5.6$

$$8 \quad \mathbf{a} \quad \text{grad} = \frac{2-0}{5-3} = 1 \qquad \mathbf{b} \quad \text{grad} = \frac{-4-8}{5+1} = -2 \qquad \mathbf{c} \quad \text{grad} = \frac{5-3}{7+5} = \frac{1}{6}$$

$$y = x - 3$$

$$x - y - 3 = 0$$

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

$$y - 8 = -2x - 2$$

$$2x + y - 6 = 0$$

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

$$6y - 18 = x + 5$$

$$x - 6y + 23 = 0$$

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

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

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

$$4x + 3y + 19 = 0$$

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

$$y = 0.3(x - 7)$$

$$10y = 3x - 21$$

$$3x - 10y - 21 = 0$$

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

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

$$4y - 4 = x - 3$$

$$x - 4y + 1 = 0$$

$$9 \quad \mathbf{a} \quad \text{grad} = \frac{2-8}{3+6} = -\frac{2}{3}$$

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

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

b sub.

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

$\therefore C$ lies on l

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

$$15 = 5k$$

$$k = 3$$

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

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

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

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

$$12 \quad \mathbf{a} \quad x = 0: y = 5 \qquad \mathbf{b} \quad x = 0: y = 2 \qquad \mathbf{c} \quad x = 0: y = \frac{3}{4} \qquad \mathbf{d} \quad x = 0: y = -\frac{10}{3}$$

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

$$y = 0: x = -6$$

$$y = 0: x = \frac{3}{2}$$

$$y = 0: x = 2$$

$$(-\frac{5}{2}, 0) \text{ and } (0, 5)$$

$$(-6, 0) \text{ and } (0, 2)$$

$$(0, \frac{3}{4}) \text{ and } (\frac{3}{2}, 0)$$

$$(0, -\frac{10}{3}) \text{ and } (2, 0)$$

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

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

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

$$14 \quad \mathbf{a} \quad = \sqrt{3^2 + 4^2} \\ = \sqrt{25} = 5$$

$$\mathbf{b} \quad = \sqrt{3^2 + 1^2} \\ = \sqrt{10}$$

$$\mathbf{c} \quad = \sqrt{8^2 + 15^2} \\ = \sqrt{289} = 17$$

$$\mathbf{d} \quad = \sqrt{16^2 + 12^2} \\ = \sqrt{400} = 20$$

$$\mathbf{e} \quad = \sqrt{2^2 + 5^2} \\ = \sqrt{29}$$

$$\mathbf{f} \quad = \sqrt{8^2 + 4^2} \\ = \sqrt{80} = 4\sqrt{5}$$

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

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

$$c^2 = 625 - 225 = 400$$

$$c = \pm 20$$

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

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

$$k - 2 = \pm 7$$

$$k = -5 \text{ or } 9$$

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 $2x + 1 = 3x - 1$ b $x + 7 = 4 - 2x$ c $5x - 4 = 3x - 1$
 $x = 2$ $3x = -3$ $2x = 3$
 $\therefore (2, 5)$ $x = -1$ $x = \frac{3}{2}$
 $\therefore (-1, 6)$ $\therefore (\frac{3}{2}, \frac{7}{2})$
d adding e $6x + 3y - 6 = 0$ f $6x + 4y = 0$
 $4x = 0$ $x + 3y + 9 = 0$ $x + 4y - 2 = 0$
 $x = 0$ subtracting subtracting
 $\therefore (0, 2)$ $5x - 15 = 0$ $5x + 2 = 0$
 $x = 3$ $\therefore (3, -4)$ $x = -\frac{2}{5}$
 $\therefore (-\frac{2}{5}, \frac{3}{5})$

21 $l: x = 0 \Rightarrow y = 1 \therefore P(0, 1)$
 $m: x = 0 \Rightarrow y = 15 \therefore Q(0, 15)$
 $l \quad x - 2y + 2 = 0$
 $m \Rightarrow 6x + 2y - 30 = 0$
adding, $7x - 28 = 0$
 $x = 4$
sub. $y = 3 \therefore R(4, 3)$
area = $\frac{1}{2} \times 14 \times 4 = 28$

