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** $l \Rightarrow$ $9x + 3y - 27 = 0$

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

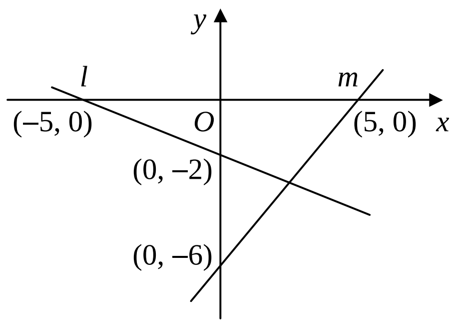
l meeets x-axis: $y = 0 \Rightarrow x = 3$

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 = $-\frac{1}{2\sqrt{3}}$

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

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

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