# COORDINATE GEOMETRY — *Answers*

**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 $= \sqrt{4+16} = \sqrt{20} = 2\sqrt{5}$

# COORDINATE GEOMETRY — *Answers*

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

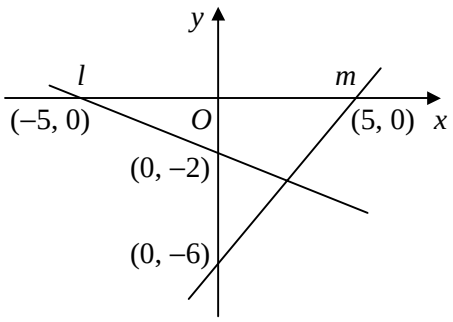
$l$ meeets $x$-axis: $y = 0 \Rightarrow x = 3$

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

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

$= \frac{289}{36}$

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