Chapter 13

Exercise 13A

1 **a** $m_{KL} = \frac{1}{3}$

b $m_{MN} = \frac{1}{3}$

c Lines KL and MN are parallel, because they have the same gradients.

2 **a** $m_{AB} = -\frac{7}{3}$

b P(0, $\frac{2}{3}$)

c $y = -\frac{2}{3}x + 3$

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

4 $m_{TU} = 2, m_{VW} = 2$

5 $m_{PQ} = \frac{4}{3}, m_{RS} = \frac{4}{3}$, hence $PQ||RS$.

$m_{QR} = \frac{3}{4}, m_{PS} = \frac{3}{4}$, hence $QR||RS$.

6 $a = -\frac{3}{2}$

7 $a = 4$

Exercise 13B

1 **a** $m_{AB} = 1, m_{BC} = \frac{4}{3}$. A, B, C are not collinear.

b $m_{DE} = -2, m_{EF} = -2$. D, E, F are collinear.

c $m_{GH} = \frac{1}{2}, m_{HJ} = \frac{1}{2}$. G, H, J are collinear.

d $m_{KL} = -3, m_{LM} = -2$. K, L, M are not collinear.

2 $k = 7$

3 The fly walked over point (3, 0), but not over point (3, –1).

4 $m_{AB} = \frac{5}{3}, m_{BS} = \frac{5}{3}$. Team 1 will make it to the station.

$m_{CD} = \frac{2}{3}, m_{CS} = \frac{10}{3}$. Team 2 will not make it to the station.

Exercise 13C

1 **a** $m = -\frac{3}{2}$

b $m = \frac{3}{4}$

c $m = -2$

d $m = -\frac{1}{7}$

e $m = -1$

f $m = \frac{1}{3}$

g $m = 5$

h m is undefined

2 $m_{\perp} = -\frac{2}{9}$

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

4 $m_{ST} = \frac{3}{4}, m_{\perp} = -\frac{4}{3}, M(-2,-2)$

5 $m_{CE} = -\frac{3}{4}, m_{DE} = \frac{4}{3}, m_{CE} \times m_{DE} = -1$

6 $m_{PQ} = m_{RS} = \frac{12}{5}$

$m_{QR} = m_{PS} = -\frac{5}{12}$

$m_{PQ} \times m_{PS} = -1$

$m_{QR} \times m_{RS} = -1$

$\overline{PQ} = \overline{QR} = \overline{RS} = \overline{SP} = 13$

7 $m_1 = \frac{2}{5}, m_2 = -\frac{5}{2}, m_1 \times m_2 = -1$

8 $a = -5$

9 $m_{AC} = -\frac{1}{5}, m_{BD} = 5, m_{AC} \times m_{BD} = -1$

10 **a** A(4, 0)

b B(2, 4)

c $\overline{AB} = 2\sqrt{5}$

11 $y = 4$

Exercise 13D

1 **a** $m = 1$

b $m = \frac{\sqrt{3}}{3}$

c $m = -1$

d $m = -\sqrt{3}$

e m is undefined.

f $m = -\frac{\sqrt{3}}{3}$

g $m = 0$

h $m = \sqrt{3}$

2 **a** $\theta = 78.7°$

b $\theta = 18.4°$

c $\theta = 116.6°$

d $\theta = 158.2°$

e $\theta = 60.3°$

f $\theta = 114.4°$

3 $\theta = 18.4°$

4 $\theta = 153.4°$

5 $\theta_{\widehat{AOB}} = 45°$

6 $\theta = 45°$

7 $\theta = 90°$

8 $\theta_1 = 56.3 \quad \theta_2 = 120.96 \quad \theta_3 = 177.26$

Exercise 13F

1 **a** $y = -3x + 15$

b $y = x - 1$

c P(4, 3)

d $m_{PQ} = -1$, $m_{BC} = -1$, hence $PQ||BC$.

2 $\frac{3}{2}y + x = 7$

3 **a** $JL : 2y + x = -9$

b $KP : y - 2x = 3$

c P(–3, –3)

4 **a** $AP : 7y + x = 10$, $BQ : y + 7x = 6$

b $N(\frac{2}{3}, \frac{4}{3})$

c $CR : y + x = 2$; $\frac{4}{3} + \frac{2}{3} = 2$, hence CR passes through N.

5 C(9, 15)

6 $AM : 2y - x = -5$; $BN : y + 2x = 0$; $CP : 3y + x = -5$ Centroid:(1, –2)

7 The coordinates of the centroid are the mean of the coordinates of the vertices.

8 Orthocentre: (–9, –8)

9 $m_{AB} = -1$, $m_{BC} = 1$, $m_{AB} \times m_{BC} = -1$, hence $\overline{AB} \perp \overline{BC}$ and the triangle is right-angled at B.

Orthocentre is at (–4, 0), which corresponds to vertex B.