

# JAWAPAN

## BAB 7 GEOMETRI KOORDINAT

### Inkuiri 1 (Halaman 176)

3. Kedudukan titik  $P$  membahagi tembereng garis  $AB$  kepada dua bahagian dengan nisbah  $m : n$ .
4. (a) 2 bahagian  
(b) 8 bahagian  
(c) 10 bahagian  
(d)  $AP = \frac{2}{10}AB$   
 $= \frac{1}{5}AB$   
 $PB = \frac{8}{10}AB$   
 $= \frac{4}{5}AB$   
(e)  $AP : PB = 2 : 8$   
 $= 1 : 4$   
(f) Kedudukan  $P$  membahagi tembereng garis  $AB$  dengan nisbah  $m : n$ .
5. Ya. Panjang  $AP$  adalah sama dengan panjang  $PB$ .  
Kedudukan titik  $P$  adalah ditengah-tengah (titik tengah) tembereng garis  $AB$  apabila nisbah  $m : n$  adalah sama untuk setiap bahagian.
6. Ya. Kedudukan titik  $P$  berubah mengikut perubahan nilai nisbah  $m : n$ .

### Latih Diri 7.1 (Halaman 177)

1. (a) Titik  $P$  membahagi tembereng garis  $AB$  dengan nisbah 1 : 2.  
Titik  $Q$  membahagi tembereng garis  $AB$  dengan nisbah 1 : 1.  
Titik  $R$  membahagi tembereng garis  $AB$  dengan nisbah 11 : 1.

(b)



2. (a)  $m = 2, n = 5$   
(b)  $P$  membahagi tali  $AB$  dengan nisbah 2 : 5.  
(c)  $P(6, 0)$

### Latih Diri 7.2 (Halaman 180)

1. (a)  $x = \frac{2(3) + 3(-7)}{5}, y = \frac{2(7) + 3(2)}{5}$   
 $= \frac{-15}{5} = -3$   
 $= \frac{20}{5} = 4$   
 $P(-3, 4)$

$$\begin{aligned}
 \text{(b) } x &= \frac{2(-4) + 1(2)}{3}, y = \frac{2(-1) + 1(5)}{3} \\
 &= \frac{-6}{3} &= \frac{3}{3} \\
 &= -2 &= 1 \\
 &P(-2, 1)
 \end{aligned}$$

$$\begin{aligned}
 \text{(c) } x &= \frac{3(7) + 2(-3)}{5}, y = \frac{3(-3) + 2(2)}{5} \\
 &= \frac{15}{5} &= \frac{-5}{5} \\
 &= 3 &= -1 \\
 &P(3, -1)
 \end{aligned}$$

$$\begin{aligned}
 2. \quad p &= \frac{3(2h) + 2(2p)}{5} & t &= \frac{3(h) + 2(3t)}{5} \\
 &= \frac{6h + 4p}{5} & &= \frac{3h + 6t}{5} \\
 5p &= 6h + 4p & 5t &= 3h + 6t \\
 h &= \frac{p}{6} & -t &= 3h \\
 & & 3\left(\frac{p}{6}\right) &= -t \\
 & & p &= -2t
 \end{aligned}$$

$$\begin{aligned}
 3. \quad \text{(a) } x &= \frac{1(-2) + 3(6)}{4}, y = \frac{1(-5) + 3(7)}{4} \\
 &= \frac{16}{4} &= \frac{16}{4} \\
 &= 4 &= 4 \\
 &C(4, 4)
 \end{aligned}$$

$$\begin{aligned}
 \text{(b) } x &= \frac{1(-2) + 1(6)}{2}, y = \frac{1(-5) + 1(7)}{2} \\
 &= \frac{4}{2} &= \frac{2}{2} \\
 &= 2 &= 1 \\
 &D(2, 1)
 \end{aligned}$$

$$\begin{aligned}
 4. \quad \text{(a) } \frac{n - 5m}{m + n} &= -1 \\
 n - 5m &= -m - n \\
 2n &= 4m \\
 \frac{m}{n} &= \frac{2}{4} \\
 \frac{m}{n} &= \frac{1}{2} \\
 AP : PB &= 1 : 2 \\
 \frac{2k + 10}{3} &= 2 \\
 2k + 10 &= 6 \\
 2k &= -4 \\
 k &= -2
 \end{aligned}$$

$$(b) \frac{2n + 6m}{m + n} = 4$$

$$2n + 6m = 4m + 4n$$

$$2m = 2n$$

$$\frac{m}{n} = \frac{1}{1}$$

$$AP : PB = 1 : 1$$

$$\frac{1 + k}{2} = 3$$

$$1 + k = 6$$

$$k = 5$$

$$(c) \frac{3n + 8m}{m + n} = 4$$

$$3n + 8m = 4m + 4n$$

$$4m = n$$

$$\frac{m}{n} = \frac{1}{4}$$

$$AP : PB = 1 : 4$$

$$\frac{4k + 2}{5} = 6$$

$$4k + 2 = 30$$

$$4k = 28$$

$$k = 7$$

$$(d) \frac{-3n + 2m}{m + n} = -1$$

$$-3n + 2m = -m - n$$

$$3m = 2n$$

$$\frac{m}{n} = \frac{2}{3}$$

$$AP : PB = 2 : 3$$

$$\frac{3(-2) + 2(8)}{5} = k$$

$$5k = 10$$

$$k = 2$$

### Latih Diri 7.3 (Halaman 182)

$$1. \quad x = \frac{4 + 2(40)}{3}, \quad y = \frac{6 + 2(45)}{3}$$
$$= \frac{84}{3} \quad = \frac{96}{3}$$
$$= 28 \quad = 32$$

$\therefore (28, 32)$

Koordinat bola semasa ia menyentuh permukaan padang ialah (28, 32).

2. Rumah rehat yang pertama membahagi lebuh raya  $AB$  dengan nisbah 1 : 2.

$$x = \frac{2(-4) + 1(5)}{3}, \quad y = \frac{2(5) + 1(2)}{3}$$
$$= \frac{-3}{3} \quad = \frac{12}{3}$$
$$= -1 \quad = 4$$

$\therefore (-1, 4)$

Rumah rehat yang kedua membahagi lebuh raya  $AB$  dengan nisbah  $2 : 1$ .

$$x = \frac{1(-4) + 2(5)}{3}, y = \frac{1(5) + 2(2)}{3}$$

$$= \frac{6}{3} \qquad = \frac{9}{3}$$

$$= 2 \qquad = 3$$

$\therefore (2, 3)$

Koordinat kedua-dua rumah rehat ialah  $(-1, 4)$  dan  $(2, 3)$ .

3. (a)  $HL : LK = 2 : 1$

$$(b) x = \frac{1(-3) + 2(6)}{3}, y = \frac{1(-2) + 2(10)}{3} \qquad LK = \sqrt{(6-3)^2 + (10-6)^2}$$

$$= \frac{9}{3} \qquad = \frac{18}{3} \qquad = \sqrt{25}$$

$$= 3 \qquad = 6 \qquad = 5 \text{ unit}$$

$\therefore (3, 6)$

### Latihan Intensif 7.1 (Halaman 183)

1.  $x = \frac{1(2) + 4(7)}{5}, y = \frac{1(8) + 4(3)}{5}$

$$= \frac{30}{5} \qquad = \frac{20}{5}$$

$$= 6 \qquad = 4$$

$\therefore R(6, 4)$

2. (a)  $6 = \frac{5(4) + 2(x)}{7}, 3 = \frac{5(5) + 2(y)}{7}$

$$42 = 20 + 2x \qquad 21 = 25 + 2y$$

$$2x = 22 \qquad 2y = -4$$

$$x = 11 \qquad y = -2$$

$\therefore Q(11, -2)$

(b) Titik tengah  $PQ = \left(\frac{4+11}{2}, \frac{5+(-2)}{2}\right)$

$$= \left(\frac{15}{2}, \frac{3}{2}\right)$$

3.  $1 = \frac{3(-3) + 2(h)}{5}, 4 = \frac{3(6) + 2(k)}{5}$

$$5 = -9 + 2h \qquad 20 = 18 + 2k$$

$$2h = 14 \qquad 2k = 2$$

$$h = 7 \qquad k = 1$$

4.  $e = \frac{16r + 9e}{7}$

$$7e = 16r + 9e$$

$$2e = -16r$$

$$r = -\frac{1}{8}e \dots \textcircled{1}$$

$$f = \frac{4r + 12f}{7}$$

$$7f = 4r + 12f$$

$$5f = -4r$$

$$f = -\frac{4}{5}r \dots \textcircled{2}$$

Gantikan ❶ ke dalam ❷:

$$\begin{aligned}f &= -\frac{4}{5}\left(-\frac{1}{8}e\right) \\ &= \frac{1}{10}e \\ e &= 10f\end{aligned}$$

$$\begin{aligned}5. \text{ (a) } x &= \frac{1(1) + 2(7)}{3}, y = \frac{1(4) + 2(-8)}{3} \\ &= \frac{15}{3} &= \frac{-12}{3} \\ &= 5 &= -4 \\ \therefore U(5, -4)\end{aligned}$$

$$\begin{aligned}\text{(b) Titik tengah } QR &= \left(\frac{7+9}{2}, \frac{-8+5}{2}\right) \\ &= \left(8, -\frac{3}{2}\right)\end{aligned}$$

$$\begin{aligned}\text{(c) } \frac{9n + 5m}{m + n} &= 6 \\ 9n + 5m &= 6m + 6n \\ 3n &= m \\ \frac{m}{n} &= \frac{3}{1} \\ \therefore RT : TS &= 3 : 1\end{aligned}$$

$$\begin{aligned}\text{(d) } PS &= \sqrt{(5-1)^2 + (1-4)^2} \\ &= \sqrt{25} \\ &= 5 \text{ unit}\end{aligned}$$

$$\begin{aligned}6. \text{ (a) } \frac{n + 5m}{m + n} &= 2 \\ n + 5m &= 2m + 2n \\ 3m &= n \\ \frac{m}{n} &= \frac{1}{3} \\ \therefore m : n &= 1 : 3\end{aligned}$$

$$\begin{aligned}\text{(b) } \frac{3(-2) + 1(2)}{4} &= k \\ -6 + 2 &= 4k \\ 4k &= -4 \\ k &= -1\end{aligned}$$

$$\begin{aligned}7. \quad x &= \frac{1(3) + 4(13)}{5}, y = \frac{1(11) + 4(1)}{5} \\ &= \frac{55}{5} &= \frac{15}{5} \\ &= 11 &= 3 \\ \therefore P_1(11, 3)\end{aligned}$$

$$\begin{aligned}x &= \frac{2(4) + 1(10)}{3}, y = \frac{2(4) + 1(7)}{3} \\ &= \frac{18}{3} &= \frac{15}{3} \\ &= 6 &= 5 \\ \therefore P_2(6, 5)\end{aligned}$$

$$\begin{aligned}\text{Titik tengah } P_1P_2 &= \left(\frac{11+6}{2}, \frac{3+5}{2}\right) \\ &= \left(\frac{17}{2}, 4\right)\end{aligned}$$

Maka, titik kedudukan rumah Haziq ialah  $\left(\frac{17}{2}, 4\right)$ .

**Inkuiri 2 (Halaman 184)****AKTIVITI 1**

4. Kecerunan garis lurus  $L_1$  sama dengan kecerunan garis lurus  $L_2$ ,  $m_1 = m_2$ .
5. Kedua-dua sudut yang terbentuk adalah sama,  $\theta_1 = \theta_2$ .

**AKTIVITI 2**

4. Hasil darab kecerunan garis lurus  $L_1$  dengan kecerunan garis lurus  $L_2$  ialah  $-1$ ,  $m_1 m_2 = -1$ .
6. Hasil darab  $\tan \theta_1$  dengan  $\tan \theta_2$  ialah  $-1$ ,  $\tan \theta_1 \tan \theta_2 = -1$ .

**Latih Diri 7.4 (Halaman 187)**

$$\begin{array}{ll}
 1. \text{ (a) } 2x + 3y = 9 & 4x + 6y = 0 \\
 \quad 3y = -2x + 9 & \quad 6y = -4x \\
 \quad y = -\frac{2}{3}x + 3 & \quad y = -\frac{2}{3}x \\
 \therefore m_1 = -\frac{2}{3} & \therefore m_2 = -\frac{2}{3}
 \end{array}$$

Oleh sebab pasangan garis lurus mempunyai kecerunan yang sama, maka pasangan itu adalah selari.

$$\begin{array}{ll}
 \text{(b) } y = \frac{3}{4}x - 5 & 4y - 3x = 12 \\
 \therefore m_1 = \frac{3}{4} & \quad 4y = 3x + 12 \\
 & \quad y = \frac{3}{4}x + 3 \\
 & \therefore m_2 = \frac{3}{4}
 \end{array}$$

Oleh sebab pasangan garis lurus mempunyai kecerunan yang sama, maka pasangan itu adalah selari.

$$\begin{array}{ll}
 \text{(c) } x - 2y = 6 & 2x + y = 5 \\
 \quad 2y = x - 6 & \quad y = -2x + 5 \\
 \quad y = \frac{1}{2}x - 3 & \therefore m_2 = -2 \\
 \therefore m_1 = \frac{1}{2}
 \end{array}$$

Oleh sebab pasangan garis lurus mempunyai hasil darab kecerunan  $-1$ , maka pasangan itu adalah serenjang.

$$\begin{array}{ll}
 \text{(d) } 2x + 3y = 9 & 2y = 3x + 10 \\
 \quad 3y = -2x + 9 & \quad y = \frac{3}{2}x + 5 \\
 \quad y = -\frac{2}{3}x + 3 & \therefore m_2 = \frac{3}{2} \\
 \therefore m_1 = -\frac{2}{3}
 \end{array}$$

Oleh sebab pasangan garis lurus mempunyai hasil darab kecerunan  $-1$ , maka pasangan itu adalah serenjang.

$$\begin{array}{ll}
 2. \text{ (a) } 2y = 10 - x & y = 3px - 1 \\
 \quad y = -\frac{1}{2}x + 5 & \therefore m_2 = 3p \\
 \therefore m_1 = -\frac{1}{2}
 \end{array}$$

$$m_1 = m_2$$

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

$$p = -\frac{1}{6}$$

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

$$\frac{y}{6} = \frac{x}{3} - 1$$

$$y = 2x - 6$$

$$\therefore m_1 = 2$$

$$m_1 = m_2$$

$$2 = \frac{4}{p}$$

$$p = 2$$

$$3. (a) 3x + 5y = 15$$

$$5y = -3x + 15$$

$$y = -\frac{3}{5}x + 3$$

$$\therefore m_1 = -\frac{3}{5}$$

$$m_1 m_2 = -1$$

$$\left(-\frac{3}{5}\right)\left(\frac{5}{k}\right) = -1$$

$$k = 3$$

$$(b) \frac{x}{3} + \frac{y}{9} = 1$$

$$\frac{y}{9} = -\frac{x}{3} + 1$$

$$y = -3x + 9$$

$$\therefore m_1 = -3$$

$$m_1 m_2 = -1$$

$$(-3)\left(\frac{2}{k}\right) = -1$$

$$k = 6$$

$$4. m_{AB} = \frac{4-1}{-1-1}$$
$$= -\frac{3}{2}$$

dan

$$m_{BC} = \frac{a-4}{5-(-1)}$$
$$= \frac{a-4}{6}$$

Oleh sebab  $AB$  berserenjang dengan  $BC$ , jadi

$$\left(-\frac{3}{2}\right)\left(\frac{a-4}{6}\right) = -1$$

$$a - 4 = 4$$

$$a = 8$$

$$py = 4x - 6$$

$$y = \frac{4}{p}x - \frac{6}{p}$$

$$\therefore m_2 = \frac{4}{p}$$

$$5x - ky = 2$$

$$ky = 5x - 2$$

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

$$\therefore m_2 = \frac{5}{k}$$

$$ky = 2x - 7$$

$$y = \frac{2}{k}x - \frac{7}{k}$$

$$\therefore m_2 = \frac{2}{k}$$

**Latih Diri 7.5 (Halaman 190)**

$$\begin{aligned}
 1. \quad 3x + 2y &= 48 & m_1 m_2 &= -1 \\
 2y &= -3x + 48 & \left(-\frac{3}{2}\right)(m_2) &= -1 \\
 y &= -\frac{3}{2}x + 24 & m_2 &= \frac{2}{3} \\
 \therefore m_1 &= -\frac{3}{2}
 \end{aligned}$$

Persamaan jejari  $AB$  ialah

$$y - 12 = \frac{2}{3}(x - 8)$$

$$3y - 36 = 2x - 16$$

$$3y - 2x = 20$$

$$\begin{aligned}
 2. \quad (a) \text{ Titik tengah } AB &= \left(\frac{3+7}{2}, \frac{8+2}{2}\right) \\
 &= (5, 5)
 \end{aligned}$$

$$\begin{aligned}
 (b) \text{ Panjang longkang} &= \sqrt{(7-5)^2 + (8-5)^2} \\
 &= \sqrt{13} \\
 &= 3.606 \text{ unit}
 \end{aligned}$$

**Latihan Intensif 7.2 (Halaman 190 – 191)**

$$\begin{aligned}
 1. \quad (a) \quad m_{AB} &= \frac{4-2}{3-6} & m_{CD} &= \frac{3-(-1)}{-3-3} \\
 &= -\frac{2}{3} & &= -\frac{2}{3}
 \end{aligned}$$

Oleh sebab  $m_{AB} = m_{CD}$ ,  $AB$  dan  $CD$  adalah selari.

$$\begin{aligned}
 (b) \quad m_{AB} &= \frac{4-(-3)}{-3-4} & m_{CD} &= \frac{1-4}{-2-1} \\
 &= -1 & &= 1
 \end{aligned}$$

Oleh sebab  $m_{AB} m_{CD} = -1$ , maka  $AB$  dan  $CD$  adalah berserenjang.

$$2. \quad m_{AB} m_{BC} = -1$$

$$\left(\frac{8-2}{6-1}\right)\left(\frac{k-8}{12-6}\right) = -1$$

$$\frac{6(k-8)}{5(6)} = -1$$

$$k - 8 = -5$$

$$k = 3$$

$$3. \quad (a) \quad m_{QR} = \frac{4-2}{-1-2} = -\frac{2}{3}$$

Persamaan garis lurus yang melalui titik  $P(7, 3)$  dan selari dengan  $QR$  ialah

$$y - 3 = -\frac{2}{3}(x - 7)$$

$$3y - 9 = -2x + 14$$

$$3y + 2x = 23 \dots \textcircled{1}$$



(b) Persamaan garis lurus yang melalui titik  $R(-1, 4)$  dan berserenjang dengan  $QR$  ialah

$$y - 4 = \frac{3}{2}(x + 1)$$

$$2y - 8 = 3x + 3$$

$$2y - 3x = 11 \dots \textcircled{2}$$

$$\textcircled{1} \times 3: 9y + 6x = 69 \dots \textcircled{3}$$

$$\textcircled{2} \times 2: 4y - 6x = 22 \dots \textcircled{4}$$

$$\textcircled{3} + \textcircled{4}: 13y = 91$$

$$y = \frac{91}{13}$$

$$y = 7$$

Gantikan  $y = 7$  ke dalam  $\textcircled{1}: 3(7) + 2(x) = 23$

$$2x = 23 - 21$$

$$2x = 2$$

$$x = 1$$

Maka, koordinat  $S$  ialah  $(1, 7)$ .

4. (a)  $m_{PQ} = m_{QR}$

$$\frac{-12 - (-6)}{3 - (-1)} = \frac{6 - (-12)}{e - 3}$$

$$-\frac{3}{2} = \frac{18}{e - 3}$$

$$e - 3 = -12$$

$$e = -9$$

(b)  $m_{PQ}m_{PR} = -1$

$$\left(-\frac{3}{2}\right)\left(\frac{12}{e+1}\right) = -1$$

$$e + 1 = 18$$

$$e = 17$$

5.  $m_{PQ} = \frac{-2 - 1}{1 - (-6)}$

$$= -\frac{3}{7}$$

$$-\frac{3}{7}\left(-\frac{h-5}{3}\right) = -1$$

$$h - 5 = -7$$

$$h = -2$$

$$m_{RS} = \frac{h-5}{-3-0}$$

$$= -\frac{h-5}{3}$$

6. (a)  $m_{AB} = \frac{5-0}{0-10}$

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

Persamaan garis lurus  $AB$  ialah

$$y - 0 = -\frac{1}{2}(x - 10)$$

$$2y = -x + 10$$

$$2y + x = 10$$

Persamaan garis lurus  $OC$  dengan kecerunan 2 dan melalui asalan  $(0, 0)$  ialah  $y = 2x$ .

$$(b) \quad 2y + x = 10 \dots \textcircled{1}$$

$$y - 2x = 0 \dots \textcircled{2}$$

$$\textcircled{1} \times 2: 4y + 2x = 20 \dots \textcircled{3}$$

$$\textcircled{2} + \textcircled{3}: \quad 5y = 20$$
$$y = 4$$

Gantikan  $y = 4$  ke dalam  $\textcircled{1}$ :  $2(4) + x = 10$

$$8 + x = 10$$

$$x = 2$$

$\therefore C(2, 4)$

$$\text{Jarak } OC = \sqrt{(2 - 0)^2 + (4 - 0)^2}$$

$$= \sqrt{20}$$

$$= 4.472 \text{ unit}$$

$$7. (a) 3y - x = 15$$

$$3y = x + 15$$

$$y = \frac{1}{3}x + 5$$

Kecerunan bagi  $DC$  ialah  $\frac{1}{3}$ .

Persamaan  $AB$  yang selari dengan  $DC$  dan melalui titik  $A(1, 2)$  ialah

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

$$3y - 6 = x - 1$$

$$3y - x = 5$$

Oleh sebab  $DE$  ialah pembahagi dua sama serenjang  $DC$ ,

$$\frac{1}{3}m_2 = -1$$

$$m_2 = -3$$

Kecerunan bagi  $DE$  ialah  $-3$ .

Persamaan  $DE$  yang berserenjang dengan  $DC$  dan melalui titik  $D(3, 6)$  ialah

$$y - 6 = -3(x - 3)$$

$$y - 6 = -3x + 9$$

$$y + 3x = 15$$

(b) Koordinat bagi  $E$  ialah nilai-nilai  $x$  dan  $y$  bagi penyelesaian persamaan serentak  $AB$  dan  $DE$ .

$$3y - x = 5 \dots \textcircled{1}$$

$$y + 3x = 15 \dots \textcircled{2}$$

$$\textcircled{1} \times 3: 9y - 3x = 15 \dots \textcircled{3}$$

$$\textcircled{2} + \textcircled{3}: \quad 10y = 30$$

$$y = 3$$

Gantikan  $y = 3$  ke dalam  $\textcircled{1}$ :  $3(3) - x = 5$

$$9 - x = 5$$

$$x = 4$$

$\therefore$  Koordinat bagi  $E$  ialah  $(4, 3)$ .

Oleh sebab  $DE$  ialah pembahagi dua sama serenjang bagi  $AB$ , jadi  $E$  ialah titik tengah  $AB$ . Katakan koordinat bagi titik  $B$  ialah  $(x, y)$ .

$$\text{Jadi, } \left(\frac{1+x}{2}, \frac{2+y}{2}\right) = (4, 3)$$

$$\text{Iaitu, } \frac{1+x}{2} = 4 \quad \text{dan} \quad \frac{2+y}{2} = 3$$

$$1+x = 8 \quad 2+y = 6$$

$$x = 7 \quad y = 4$$

∴ Koordinat bagi  $B$  ialah  $(7, 4)$ .

$$8. \text{ (a) } m_{AB} = \frac{10-6}{11-3} \quad m_{BC} = \frac{4-10}{9-11}$$

$$= \frac{1}{2} \quad = 3$$

$$m_{CD} = \frac{4-2}{9-5} \quad m_{AD} = \frac{6-2}{3-5}$$

$$= \frac{1}{2} \quad = -2$$

Oleh sebab  $m_{AB} = m_{CD}$  maka,  $AB$  dan  $CD$  adalah selari.

Oleh sebab  $m_{AB}m_{AD} = -1$ , maka  $AB$  dan  $AD$  adalah berserenjang.

Oleh sebab  $m_{CD}m_{AD} = -1$ , maka  $CD$  dan  $AD$  adalah berserenjang.

(b) Persamaan garis lurus  $AB$

$$y - 6 = \frac{1}{2}(x - 3)$$

$$2y - 12 = x - 3$$

$$2y = x + 9$$

(c) Persamaan garis lurus

$$y - 4 = -2(x - 9)$$

$$y - 4 = -2x + 18$$

$$y + 2x - 22 = 0$$

$$\text{Titik tengah } AB = \left(\frac{3+11}{2}, \frac{6+10}{2}\right)$$

$$= (7, 8)$$

$$\text{Sebelah kiri} = 8 + 2(7) - 22$$

$$= 0$$

$$= \text{Sebelah kanan}$$

Jadi, garis melalui titik tengah  $AB$ .

$$9. \text{ (a) (i) } m_{AC} = \frac{9 - (-3)}{9 - 1}$$

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

$$\text{Titik tengah } AC = \left(\frac{9+1}{2}, \frac{9+(-3)}{2}\right)$$

$$= (5, 3)$$

Persamaan pembahagi dua sama seranjang  $AC$

$$y - 3 = -\frac{2}{3}(x - 5)$$

$$3y - 9 = -2x + 10$$

$$3y + 2x = 19$$

$$\begin{aligned}
 \text{(ii)} \quad & 3y + 2x = 19 \dots \text{①} \\
 & y - 8x = -63 \dots \text{②} \\
 \text{①} \times 4: & 12y + 8x = 76 \dots \text{③} \\
 \text{②} + \text{③}: & 13y = 13 \\
 & y = 1
 \end{aligned}$$

Gantikan  $y = 1$  ke dalam ①:  $3(1) + 2x = 19$

$$\begin{aligned}
 2x &= 16 \\
 x &= 8
 \end{aligned}$$

Maka, koordinat  $B$  ialah  $(8, 1)$ .

(b) (i) Katakan titik  $D$  ialah  $(x, y)$

$$\begin{aligned}
 \left(\frac{x+8}{2}, \frac{y+1}{2}\right) &= (5, 3) \\
 \frac{x+8}{2} &= 5 & \frac{y+1}{2} &= 3 \\
 x+8 &= 10 & y+1 &= 6 \\
 x &= 2 & y &= 5
 \end{aligned}$$

Maka, koordinat  $D$  ialah  $(2, 5)$ .

$$\begin{aligned}
 \text{(ii)} \quad AC &= \sqrt{(9+3)^2 + (9-1)^2} \\
 &= \sqrt{208} \\
 &= 4\sqrt{13} \\
 BD &= \sqrt{(1-5)^2 + (8-2)^2} \\
 &= \sqrt{52} \\
 &= 2\sqrt{13} \\
 \frac{AC}{BD} &= \frac{4\sqrt{13}}{2\sqrt{13}} \\
 &= 2
 \end{aligned}$$

$AC = 2BD$  (tertunjuk)

$$\begin{aligned}
 \text{10. (a)} \quad & 3y - x = 8 \dots \text{①} \\
 & y - x = 4 \dots \text{②} \\
 \text{①} - \text{②}: & 2y = 4 \\
 & y = 2
 \end{aligned}$$

Gantikan  $y = 2$  ke dalam ①:  $3(2) - x = 8$

$$\begin{aligned}
 6 - x &= 8 \\
 x &= -2
 \end{aligned}$$

Maka, koordinat bagi  $P$  ialah  $(-2, 2)$ . (tertunjuk)

(b) Persamaan garis lurus serenjang dengan  $m = -\frac{1}{2}$  dan melalui titik  $P(-2, 2)$  ialah

$$\begin{aligned}
 y - 2 &= -\frac{1}{2}(x + 2) \\
 2y - 4 &= -x - 2 \\
 2y + x &= 2 \text{ (tertunjuk)}
 \end{aligned}$$

(c) Persamaan garis lurus  $AB$  dengan  $m = 2$  dan melalui titik  $P(-2, 2)$  ialah

$$\begin{aligned}
 y - 2 &= 2(x + 2) \\
 y - 2 &= 2x + 4 \\
 y &= 2x + 6
 \end{aligned}$$

Pada paksi- $x$ ,  $y = 0$ ,

$$0 = 2x + 6$$

$$2x = -6$$

$$x = -3$$

dan pada paksi- $y$ ,  $x = 0$ ,

$$y = 2(0) + 6$$

$$y = 6$$

Maka, koordinat  $A$  ialah  $(-3, 0)$  dan koordinat  $B$  ialah  $(0, 6)$ . (tertunjuk)

(d) Katakan  $P(-2, 2)$  membahagi  $AB$  dengan nisbah  $m : n$  dan koordinat- $x$  bagi  $P$  ialah  $-2$ .

Jadi,  $\frac{n(-3) + m(0)}{m + n} = -2$

$$-3n = -2m - 2n$$

$$2m = n$$

$$\frac{m}{n} = \frac{1}{2}$$

Maka, nisbah  $\frac{AP}{PB}$  ialah  $\frac{1}{2}$ . (tertunjuk)

11.  $m_{AB} = \frac{8 - (-2)}{1 - (-4)}$

$$= 2$$

Persamaan tangen  $BC$

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

$$2y - 16 = -x + 1$$

$$2y + x = 17$$

### Inkuiri 3 (Halaman 192)

- (a)  $AD = 4$  unit,  $DE = 4$  unit,  $BE = 5$  unit dan  $CD = 8$  unit  
 (b) Luas  $\triangle ACD = 16$  unit<sup>2</sup>, luas trapezium  $BCDE = 26$  unit<sup>2</sup> dan luas  $\triangle ABE = 20$  unit<sup>2</sup>  
 (c) Luas  $\triangle ABC = 22$  unit<sup>2</sup>
- Luas  $\triangle ABC =$  luas  $\triangle ACD +$  luas trapezium  $BCDE -$  luas  $\triangle ABE$   
 $= 16 + 26 - 20$   
 $= 22$  unit<sup>2</sup>
- Ya, terdapat pelbagai cara lain untuk menentukan luas segi tiga, salah satunya ialah dengan menggunakan rumus.

### Latih Diri 7.6 (Halaman 195)

1. (a) Luas  $= \frac{1}{2} \begin{vmatrix} 5 & 2 & 8 & 5 \\ 10 & 1 & 3 & 10 \end{vmatrix}$

$$= \frac{1}{2} |(5 + 6 + 80) - (20 + 8 + 15)|$$

$$= \frac{1}{2} |48|$$

$$= 24 \text{ unit}^2$$

$$\begin{aligned}
 \text{(b) Luas} &= \frac{1}{2} \begin{vmatrix} 3 & 6 & -4 & 3 \\ 1 & 4 & 2 & 1 \end{vmatrix} \\
 &= \frac{1}{2} |(12 + 12 - 4) - (6 - 16 + 6)| \\
 &= \frac{1}{2} |24| \\
 &= 12 \text{ unit}^2
 \end{aligned}$$

$$\begin{aligned}
 \text{(c) Luas} &= \frac{1}{2} \begin{vmatrix} -4 & 5 & 2 & -4 \\ -3 & 1 & 6 & -3 \end{vmatrix} \\
 &= \frac{1}{2} |(-4 + 30 - 6) - (-15 + 2 - 24)| \\
 &= \frac{1}{2} |57| \\
 &= 28\frac{1}{2} \text{ unit}^2
 \end{aligned}$$

$$\begin{aligned}
 2. \quad & \frac{1}{2} \begin{vmatrix} 3 & 1 & k & 3 \\ 4 & -2 & 0 & 4 \end{vmatrix} = 10 \\
 & \frac{1}{2} |(-6 + 0 + 4k) - (4 - 2k + 0)| = 10 \\
 & \frac{1}{2} (6k - 10) = \pm 10 \\
 \frac{1}{2} (6k - 10) = 10 & \quad \text{atau} \quad \frac{1}{2} (6k - 10) = -10 \\
 6k - 10 = 20 & \quad \quad \quad 6k - 10 = -20 \\
 6k = 30 & \quad \quad \quad 6k = -10 \\
 k = 5 & \quad \quad \quad k = -\frac{5}{3}
 \end{aligned}$$

Maka, koordinat  $R$  yang mungkin ialah  $(5, 0)$  atau  $(-\frac{5}{3}, 0)$ .

$$\begin{aligned}
 3. \text{ Luas} &= \frac{1}{2} \begin{vmatrix} 8 & 2 & -2 & 8 \\ 4 & 1 & -1 & 4 \end{vmatrix} \\
 &= \frac{1}{2} |(8 - 2 - 8) - (8 - 2 - 8)| \\
 &= 0 \text{ (tertunjuk)}
 \end{aligned}$$

$$\begin{aligned}
 4. \quad & \frac{1}{2} \begin{vmatrix} -2 & 2 & 10 & -2 \\ -1 & p & 5 & -1 \end{vmatrix} = 0 \\
 & \frac{1}{2} |(-2p + 10 - 10) - (-2 + 10p - 10)| = 0 \\
 & \frac{1}{2} |12 - 12p| = 0 \\
 & 12 - 12p = 0 \\
 & 12p = 12 \\
 & p = 1
 \end{aligned}$$

$$\begin{aligned}
 5. \text{ (a)} \quad & \frac{1}{2} \begin{vmatrix} -4 & 5 & -1 & -4 \\ -1 & 3 & k & -1 \end{vmatrix} = 15 \\
 & \frac{1}{2} |(-12 + 5k + 1) - (-5 - 3 - 4k)| = 15 \\
 & \frac{1}{2} (9k - 3) = \pm 15
 \end{aligned}$$

$$\begin{aligned} \frac{1}{2}(9k - 3) = 15 & \quad \text{atau} \quad \frac{1}{2}(9k - 3) = -15 \\ 9k - 3 = 30 & \quad 9k - 3 = -30 \\ 9k = 33 & \quad 9k = -27 \\ k = \frac{11}{3} & \quad k = -3 \end{aligned}$$

$$(b) \quad \frac{1}{2} \begin{vmatrix} 5 & 3 & 1 & 5 \\ k & 7 & 3 & k \end{vmatrix} = 10$$

$$\begin{aligned} \frac{1}{2} |(35 + 9 + k) - (3k + 7 + 15)| &= 10 \\ \frac{1}{2} (22 - 2k) &= \pm 10 \end{aligned}$$

$$\begin{aligned} \frac{1}{2} (22 - 2k) = 10 & \quad \text{atau} \quad \frac{1}{2} (22 - 2k) = -10 \\ 22 - 2k = 20 & \quad 22 - 2k = -20 \\ 2k = 2 & \quad 2k = 42 \\ k = 1 & \quad k = 21 \end{aligned}$$

$$(c) \quad \frac{1}{2} \begin{vmatrix} 1 & k & 1 & 1 \\ -2 & 6 & 2 & -2 \end{vmatrix} = 12$$

$$\begin{aligned} \frac{1}{2} |(6 + 2k - 2) - (-2k + 6 + 2)| &= 12 \\ \frac{1}{2} (4k - 4) &= \pm 12 \end{aligned}$$

$$\begin{aligned} \frac{1}{2} (4k - 4) = 12 & \quad \text{atau} \quad \frac{1}{2} (4k - 4) = -12 \\ 4k - 4 = 24 & \quad 4k - 4 = -24 \\ 4k = 28 & \quad 4k = -20 \\ k = 7 & \quad k = -5 \end{aligned}$$

$$(d) \quad \frac{1}{2} \begin{vmatrix} 3 & 4 & 1 & 3 \\ 0 & k & 4 & 0 \end{vmatrix} = 5$$

$$\begin{aligned} \frac{1}{2} |(3k + 16 + 0) - (0 + k + 12)| &= 5 \\ \frac{1}{2} (2k + 4) &= \pm 5 \end{aligned}$$

$$\begin{aligned} \frac{1}{2} (2k + 4) = 5 & \quad \text{atau} \quad \frac{1}{2} (2k + 4) = -5 \\ 2k + 4 = 10 & \quad 2k + 4 = -10 \\ 2k = 6 & \quad 2k = -14 \\ k = 3 & \quad k = -7 \end{aligned}$$

### Latih Diri 7.7 (Halaman 196)

$$\begin{aligned} 1. (a) \text{ Luas} &= \frac{1}{2} \begin{vmatrix} 1 & -5 & -2 & 2 & 1 \\ 7 & 6 & -4 & -3 & 7 \end{vmatrix} \\ &= \frac{1}{2} |(6 + 20 + 6 + 14) - (-35 - 12 - 8 - 3)| \\ &= \frac{1}{2} |104| \\ &= 52 \text{ unit}^2 \end{aligned}$$

$$\begin{aligned}
 \text{(b) Luas} &= \frac{1}{2} \begin{vmatrix} 2 & -6 & -1 & 8 & 2 \\ 9 & 4 & -3 & 1 & 9 \end{vmatrix} \\
 &= \frac{1}{2} |(8 + 18 - 1 + 72) - (-54 - 4 - 24 + 2)| \\
 &= \frac{1}{2} |177| \\
 &= 88\frac{1}{2} \text{ unit}^2
 \end{aligned}$$

$$\begin{aligned}
 \text{(c) Luas} &= \frac{1}{2} \begin{vmatrix} 0 & -6 & -3 & -1 & 0 \\ 2 & -2 & -5 & -3 & 2 \end{vmatrix} \\
 &= \frac{1}{2} |(0 + 30 + 9 - 2) - (-12 + 6 + 5 + 0)| \\
 &= \frac{1}{2} |38| \\
 &= 19 \text{ unit}^2
 \end{aligned}$$

$$\begin{aligned}
 \text{(d) Luas} &= \frac{1}{2} \begin{vmatrix} 3 & -2 & 2 & 5 & 3 \\ 4 & 0 & -4 & 1 & 4 \end{vmatrix} \\
 &= \frac{1}{2} |(0 + 8 + 2 + 20) - (-8 + 0 - 20 + 3)| \\
 &= \frac{1}{2} |55| \\
 &= 27\frac{1}{2} \text{ unit}^2
 \end{aligned}$$

$$\begin{aligned}
 2. \quad & \frac{1}{2} \begin{vmatrix} k & -2 & 4 & 2 & k \\ 6 & 1 & 5 & 8 & 6 \end{vmatrix} = 30 \\
 & \frac{1}{2} |(k - 10 + 32 + 12) - (-12 + 4 + 10 + 8k)| = 30 \\
 & \frac{1}{2} |32 - 7k| = 30 \\
 & 32 - 7k = 60 \\
 & 7k = -28 \\
 & k = -4
 \end{aligned}$$

**Latih Diri 7.8 (Halaman 197)**

$$\begin{aligned}
 1. \text{ Luas} &= \frac{1}{2} \begin{vmatrix} -2 & 3 & 2 & 0 & -3 & -2 \\ -5 & 2 & 8 & 9 & 1 & -5 \end{vmatrix} \\
 &= \frac{1}{2} |(-4 + 24 + 18 + 0 + 15) - (-15 + 4 + 0 - 27 - 2)| \\
 &= \frac{1}{2} |93| \\
 &= 46\frac{1}{2} \text{ unit}^2
 \end{aligned}$$



$$\begin{aligned}
2. \text{ Luas} &= \frac{1}{2} \begin{vmatrix} 0 & 2 & 1 & -2 & -4 & -3 & 0 \\ -1 & 1 & 5 & 6 & 2 & -1 & -1 \end{vmatrix} \\
&= \frac{1}{2} |(0 + 10 + 6 - 4 + 4 + 3) - (-2 + 1 - 10 - 24 - 6 - 0)| \\
&= \frac{1}{2} |60| \\
&= 30 \text{ unit}^2
\end{aligned}$$

**Latih Diri 7.9** (Halaman 198)

$$\begin{aligned}
1. \text{ (a) } M &= \left( \frac{-1+5}{2}, \frac{6+2}{2} \right) \\
&= (2, 4) \\
\frac{-3+x}{2} &= 2 \quad \text{dan} \quad \frac{0+y}{2} = 4 \\
-3+x &= 4 & y &= 8 \\
x &= 7 \\
\therefore C &= (7, 8)
\end{aligned}$$

$$\begin{aligned}
\text{(b) Luas } \triangle ABM &= \frac{1}{2} \begin{vmatrix} -3 & 5 & 2 & -3 \\ 0 & 2 & 4 & 0 \end{vmatrix} \\
&= \frac{1}{2} |(-6 + 20 + 0) - (0 + 4 - 12)| \\
&= \frac{1}{2} |22| \\
&= 11 \text{ unit}^2
\end{aligned}$$

$$\begin{aligned}
\text{Luas } ABCD &= \frac{1}{2} \begin{vmatrix} -3 & 5 & 7 & -1 & -3 \\ 0 & 2 & 8 & 6 & 0 \end{vmatrix} \\
&= \frac{1}{2} |(-6 + 40 + 42 - 0) - (0 + 14 - 8 - 18)| \\
&= \frac{1}{2} |88| \\
&= 44 \text{ unit}^2
\end{aligned}$$

Maka, nisbah luas  $\triangle ABM$  kepada luas segi empat selari  $ABCD$  ialah  $11 : 44 = 1 : 4$ .

$$\begin{aligned}
2. \text{ (a) } \frac{1}{2} \begin{vmatrix} 0 & \frac{8-k}{2} & 0 & 0 \\ 0 & k & 8 & 0 \end{vmatrix} &= 12 \\
\frac{1}{2}(32 - 4k) &= \pm 12 \\
\frac{1}{2}(32 - 4k) = -12 & \quad \text{atau} \quad \frac{1}{2}(32 - 4k) = 12 \\
32 - 4k = -24 & \quad 32 - 4k = 24 \\
4k = 56 & \quad 4k = 8 \\
k = 14 & \quad k = 2
\end{aligned}$$

$$\begin{aligned}
\therefore k &= 2 \\
\text{(b) } P &= (3, 2)
\end{aligned}$$

$$\begin{aligned}
 3. \text{ (a) Luas } \triangle ABC &= \frac{1}{2} \begin{vmatrix} 4 & 7 & 4 & 4 \\ -2 & 5 & 7 & -2 \end{vmatrix} \\
 &= \frac{1}{2} |(20 + 49 - 8) - (-14 + 20 + 28)| \\
 &= \frac{1}{2} |27| \\
 &= 13\frac{1}{2} \text{ unit}^2
 \end{aligned}$$

$$\begin{aligned}
 \text{(b)} \quad \frac{1}{2} \begin{vmatrix} 4 & 4 & k & 4 \\ -2 & 7 & 0 & -2 \end{vmatrix} &= \frac{27}{2} \\
 \frac{1}{2} |(28 + 0 - 2k) - (-8 + 7k + 0)| &= \frac{27}{2} \\
 36 - 9k &= 27 \\
 9k &= 9 \\
 k &= 1
 \end{aligned}$$

$$\begin{aligned}
 \text{(c) Titik tengah } AB &= \left( \frac{4+7}{2}, \frac{-2+5}{2} \right) \\
 &= \left( \frac{11}{2}, \frac{3}{2} \right)
 \end{aligned}$$

$$\begin{aligned}
 \frac{x+4}{2} = \frac{11}{2} \quad \text{dan} \quad \frac{y+7}{2} = \frac{3}{2} \\
 2x+8 = 22 \quad \quad \quad 2y+14 = 6 \\
 x = 7 \quad \quad \quad y = -4 \\
 \therefore E(7, -4)
 \end{aligned}$$

$$\begin{aligned}
 \text{(d) Luas } ACBE &= \frac{1}{2} \begin{vmatrix} 4 & 7 & 7 & 4 & 4 \\ -2 & -4 & 5 & 7 & -2 \end{vmatrix} \\
 &= \frac{1}{2} |(-16 + 35 + 49 - 8) - (-14 - 28 + 20 + 28)| \\
 &= \frac{1}{2} |54| \\
 &= 27 \text{ unit}^2
 \end{aligned}$$

### Latihan Intensif 7.3 (Halaman 199)

$$\begin{aligned}
 1. \text{ (a) Titik tengah } AC &= \left( \frac{-5+3}{2}, \frac{3+5}{2} \right) \\
 &= (-1, 4)
 \end{aligned}$$

$$\therefore E(-1, 4)$$

$$\begin{aligned}
 \frac{x+0}{2} = -1 \quad \quad \quad \frac{y+(-2)}{2} = 4 \\
 x = -2 \quad \quad \quad y = 10
 \end{aligned}$$

$$\therefore D(-2, 10)$$

$$\begin{aligned}
 \text{(b) Luas } ABCD &= \frac{1}{2} \begin{vmatrix} -5 & 0 & 3 & -2 & -5 \\ 3 & -2 & 5 & 10 & 3 \end{vmatrix} \\
 &= \frac{1}{2} |(10 + 0 + 30 - 6) - (0 - 6 - 10 - 50)| \\
 &= \frac{1}{2} |100| \\
 &= 50 \text{ unit}^2
 \end{aligned}$$

$$2. \text{ (a) Titik tengah } PR = \left( \frac{3 + (-5)}{2}, \frac{3 + (-1)}{2} \right) \\ = (-1, 1)$$

$$\frac{h+0}{2} = -1 \quad \text{dan} \quad \frac{3+k}{2} = 1 \\ h = -2 \qquad \qquad \qquad k = -1$$

$$\text{(b) Luas } PQRS = \frac{1}{2} \begin{vmatrix} 3 & -2 & -5 & 0 & 3 \\ 3 & 3 & -1 & -1 & 3 \end{vmatrix} \\ = \frac{1}{2} |(9 + 2 + 5 + 0) - (-6 - 15 + 0 - 3)| \\ = \frac{1}{2} |40| \\ = 20 \text{ unit}^2$$

$$3. \text{ (a) Luas } \Delta ABC = \frac{1}{2} \begin{vmatrix} -1 & 2 & 6 & -1 \\ -5 & 1 & 9 & -5 \end{vmatrix} \\ = \frac{1}{2} |(-1 + 18 - 30) - (-10 + 6 - 9)| \\ = \frac{1}{2} |0| \\ = 0 \text{ unit}^2$$

(b) Titik  $A$ ,  $B$  dan  $C$  adalah segaris.

$$4. \text{ Luas poligon} = \frac{1}{2} \begin{vmatrix} 5 & 2 & -3 & -4 & -1 & 3 & 5 \\ 2 & 6 & 2 & 0 & -3 & -2 & 2 \end{vmatrix} \\ = \frac{1}{2} |(30 + 4 + 12 + 2 + 6) - (4 - 18 - 8 - 9 - 10)| \\ = \frac{1}{2} |95| \\ = 47\frac{1}{2} \text{ unit}^2$$

$$5. \qquad \qquad \qquad \frac{1}{2} \begin{vmatrix} 5 & 3 & -6 & 5 \\ -1 & 3 & p & -1 \end{vmatrix} = 16$$

$$\frac{1}{2} |(15 + 3p + 6) - (-3 - 18 + 5p)| = 16$$

$$\frac{1}{2} (42 - 2p) = \pm 16$$

$$\frac{1}{2} (42 - 2p) = 16 \qquad \text{atau} \qquad \frac{1}{2} (42 - 2p) = -16$$

$$42 - 2p = 32 \qquad \qquad \qquad 42 - 2p = -32$$

$$2p = 10 \qquad \qquad \qquad 2p = 74$$

$$p = 5 \qquad \qquad \qquad p = 37$$

$$6. \quad \frac{1}{2} \begin{vmatrix} 2 & r-1 & r+3 & 2 \\ 2r-1 & r+1 & 0 & 2r-1 \end{vmatrix} = 0$$

$$\frac{1}{2} |2(r+1) + 0 + (r+3)(2r-1) - (2r-1)(r-1) - (r+1)(r+3) - 0| = 0$$

$$2r + 2 + 2r^2 + 5r - 3 - 2r^2 + 3r - 1 - r^2 - 4r - 3 = 0$$

$$-5 + 6r - r^2 = 0$$

$$r^2 - 6r + 5 = 0$$

$$(r-1)(r-5) = 0$$

$$r = 1 \text{ atau } r = 5$$

$$7. (a) \quad \frac{1}{2} \begin{vmatrix} 8 & -1 & 3 & 8 \\ a & 2 & 10 & a \end{vmatrix} = 0$$

$$\frac{1}{2} |(16 - 10 + 3a) - (-a + 6 + 80)| = 0$$

$$4a = 80$$

$$a = 20$$

$$(b) \quad \frac{1}{2} \begin{vmatrix} 8 & -1 & 3 & 8 \\ a & 2 & 10 & a \end{vmatrix} = 12$$

$$\frac{1}{2} |(16 - 10 + 3a) - (-a + 6 + 80)| = 12$$

$$\frac{1}{2}(4a - 80) = \pm 12$$

$$\frac{1}{2}(4a - 80) = 12 \quad \text{atau} \quad \frac{1}{2}(4a - 80) = -12$$

$$4a - 80 = 24$$

$$4a = 104$$

$$a = 26$$

$$4a - 80 = -24$$

$$4a = 56$$

$$a = 14$$

$$8. (a) \quad EF = FG$$

$$\sqrt{(k-4)^2 + (0-4)^2} = \sqrt{(4-8)^2 + (4-7)^2}$$

$$k^2 - 8k + 16 + 16 = 25$$

$$k^2 - 8k + 7 = 0$$

$$(k-1)(k-7) = 0$$

$$k = 1 \text{ atau } k = 7$$

Maka, nilai  $k$  ialah 7.

$$(b) (i) \quad EH = GH$$

$$\sqrt{(x-0)^2 + (11-7)^2} = \sqrt{(x-7)^2 + (11-8)^2}$$

$$x^2 + 16 = x^2 - 14x + 49 + 9$$

$$14x = 42$$

$$x = 3$$

$$\therefore H(3, 11)$$

$$(ii) \text{ Luas } \triangle EFG = \frac{1}{2} \begin{vmatrix} 0 & 4 & 7 & 0 \\ 7 & 4 & 8 & 7 \end{vmatrix}$$

$$= \frac{1}{2} |(0 + 32 + 49) - (28 + 28 + 0)|$$

$$= \frac{1}{2} |25|$$

$$= 12\frac{1}{2} \text{ unit}^2$$

$$\begin{aligned}
 \text{Luas } EFGH &= \frac{1}{2} \begin{vmatrix} 0 & 4 & 7 & 3 & 0 \\ 7 & 4 & 8 & 11 & 7 \end{vmatrix} \\
 &= \frac{1}{2} |(0 + 32 + 77 + 21) - (28 + 28 + 24 + 0)| \\
 &= \frac{1}{2} |50| \\
 &= 25 \text{ unit}^2
 \end{aligned}$$

$$\begin{aligned}
 \text{Nisbah luas } \triangle EFG : \text{luas } EFGH &= \frac{25}{2} : 25 \\
 &= 1 : 2
 \end{aligned}$$

$$\begin{aligned}
 9. \text{ (a)} \quad \frac{1}{2} \begin{vmatrix} 0 & m+1 & 2m+1 & m & 0 \\ 0 & m-7 & 2m & m+6 & 0 \end{vmatrix} &= 34\frac{1}{2} \\
 \frac{1}{2} |(2m^2 + 2m + 2m^2 + 13m + 6) - (2m^2 - 13m - 7 + 2m^2)| &= 34\frac{1}{2} \\
 \frac{1}{2} (28m + 13) &= \pm 34\frac{1}{2}
 \end{aligned}$$

$$\begin{aligned}
 \frac{1}{2} (28m + 13) = 34\frac{1}{2} \quad \text{atau} \quad \frac{1}{2} (28m + 13) = -34\frac{1}{2} \\
 28m + 13 = 69 \qquad \qquad \qquad 28m + 13 = -69 \\
 m = 2 \qquad \qquad \qquad m = -\frac{41}{14}
 \end{aligned}$$

Maka,  $m = 2 (> 0)$

$$\begin{aligned}
 \text{(b) Luas } \triangle OPR &= \frac{1}{2} \begin{vmatrix} 0 & 3 & 2 & 0 \\ 0 & -5 & 8 & 0 \end{vmatrix} \\
 &= \frac{1}{2} |(0 + 24 + 0) - (0 - 10 + 0)| \\
 &= \frac{1}{2} |34| \\
 &= 17 \text{ unit}^2
 \end{aligned}$$

$$\begin{aligned}
 10. \text{ (a) } AB &= \sqrt{(0 - 9)^2 + (7 - 0)^2} \\
 &= \sqrt{130} \\
 &= 11.402 \text{ unit} \\
 &= 11.402 \times 100 \text{ m} \\
 &= 1140.2 \text{ m} \\
 &= 1.1402 \text{ km}
 \end{aligned}$$

$$\begin{aligned}
 \text{(b) Luas} &= \frac{1}{2} \begin{vmatrix} 0 & 7 & 12 & 0 \\ 9 & 0 & 12 & 9 \end{vmatrix} \\
 &= \frac{1}{2} |(0 + 84 + 108) - (63 + 0 + 0)| \\
 &= \frac{1}{2} |129| \\
 &= 64.5 \text{ unit}^2
 \end{aligned}$$

$$1 \text{ unit} = 100 \text{ m (0.1 km)}$$

$$1 \text{ unit}^2 = 0.01 \text{ km}^2$$

$$64.5 \text{ unit}^2 = 0.645 \text{ km}^2$$

Maka, luas yang dicakupi tiga stesen itu ialah 0.645 km<sup>2</sup>.

**Inkuiri 4 (Halaman 200)**

4. Bentuk lokus  $P$  yang terbentuk ialah sebuah bulatan.  
 5.  $(x - x_1)^2 + (y - y_1)^2 = r^2$

**Inkuiri 5 (Halaman 201)**

4. Ya. Bulatan itu merupakan bentuk lokus bagi titik bergerak  $P$ .

Persamaan ialah  $\frac{(x - x_1)^2 + (y - y_1)^2}{(x - x_2)^2 + (y - y_2)^2} = \frac{m^2}{n^2}$

6. Jika  $PA : PB = 1 : 1$ , titik  $P(x, y)$  sentiasa berjarak sama dari dua titik tetap  $A(x_1, y_1)$  dan  $B(x_2, y_2)$ . Jadi, bentuk lokus  $P$  ialah pembahagi dua sama serenjang bagi garis  $AB$ .

Persamaannya ialah

$$PA = PB$$

$$(x - x_1)^2 + (y - y_1)^2 = (x - x_2)^2 + (y - y_2)^2$$

**Latih Diri 7.10 (Halaman 203)**

1. (a)  $\sqrt{(x - 0)^2 + (y - 0)^2} = 3$   
 $x^2 + y^2 = 9$

(b)  $\sqrt{(x - 2)^2 + (y - 3)^2} = 3$   
 $x^2 - 4x + 4 + y^2 - 6y + 9 = 9$   
 $x^2 + y^2 - 4x - 6y + 4 = 0$

(c)  $\sqrt{(x + 4)^2 + (y - 5)^2} = 3$   
 $x^2 + 8x + 16 + y^2 - 10y + 25 = 9$   
 $x^2 + y^2 + 8x - 10y + 32 = 0$

(d)  $\sqrt{(x + 1)^2 + (y + 6)^2} = 3$   
 $x^2 + 2x + 1 + y^2 + 12y + 36 = 9$   
 $x^2 + y^2 + 2x + 12y + 28 = 0$

2.  $\sqrt{(x + 2)^2 + (y - 1)^2} = 5$   
 $x^2 + 4x + 4 + y^2 - 2y + 1 = 25$   
 $x^2 + y^2 + 4x - 2y - 20 = 0$

3. (a)  $\frac{PA}{PB} = \frac{1}{2}$   
 $2PA = PB$

$$2\sqrt{(x + 2)^2 + (y - 0)^2} = 1\sqrt{(x - 4)^2 + (y - 0)^2}$$

$$4(x^2 + 4x + 4 + y^2) = 1(x^2 - 8x + 16 + y^2)$$

$$4x^2 + 16x + 4y^2 + 16 = x^2 - 8x + y^2 + 16$$

$$3x^2 + 3y^2 + 24x = 0$$

$$x^2 + y^2 + 8x = 0$$

$$(b) \quad \frac{PC}{PD} = \frac{1}{3}$$

$$3PC = PD$$

$$3\sqrt{(x+3)^2 + (y-0)^2} = 1\sqrt{(x-2)^2 + (y-5)^2}$$

$$9(x^2 + 6x + 9 + y^2) = 1(x^2 - 4x + 4 + y^2 - 10y + 25)$$

$$9x^2 + 54x + 81 + 9y^2 = x^2 - 4x + y^2 - 10y + 29$$

$$8x^2 + 58x + 8y^2 + 10y + 52 = 0$$

$$4x^2 + 4y^2 + 29x + 5y + 26 = 0$$

$$(c) \quad \frac{PE}{PF} = \frac{3}{2}$$

$$2PE = 3PF$$

$$2\sqrt{(x-0)^2 + (y-2)^2} = 3\sqrt{(x+2)^2 + (y-4)^2}$$

$$4(x^2 + y^2 - 4y + 4) = 9(x^2 + 4x + 4 + y^2 - 8y + 16)$$

$$4x^2 + 4y^2 - 16y + 16 = 9x^2 + 36x + 36 + 9y^2 - 72y + 144$$

$$5x^2 + 36x + 5y^2 - 56y + 164 = 0$$

$$5x^2 + 5y^2 + 36x - 56y + 164 = 0$$

$$(d) \quad \frac{PR}{PS} = \frac{2}{1}$$

$$PR = 2PS$$

$$\sqrt{(x-1)^2 + (y-2)^2} = 2\sqrt{(x-4)^2 + (y+1)^2}$$

$$(x^2 - 2x + 1 + y^2 - 4y + 4) = 4(x^2 - 8x + 16 + y^2 + 2y + 1)$$

$$x^2 - 2x + y^2 - 4y + 5 = 4x^2 - 32x + 4y^2 + 8y + 68$$

$$3x^2 - 30x + 3y^2 + 12y + 63 = 0$$

$$x^2 + y^2 - 10x + 4y + 21 = 0$$

$$4. \quad \frac{QJ}{QK} = \frac{2}{3}$$

$$3QJ = 2QK$$

$$3\sqrt{(x+1)^2 + (y-3)^2} = 2\sqrt{(x-4)^2 + (y-6)^2}$$

$$9(x^2 + 2x + 1 + y^2 - 6y + 9) = 4(x^2 - 8x + 16 + y^2 - 12y + 36)$$

$$9x^2 + 18x + 9y^2 - 54y + 90 = 4x^2 - 32x + 4y^2 - 48y + 208$$

$$5x^2 + 5y^2 + 50x - 6y - 118 = 0$$

$$5. \quad RA = 2RB$$

$$\sqrt{(x-6)^2 + (y-0)^2} = 2\sqrt{(x+3)^2 + (y-0)^2}$$

$$x^2 - 12x + 36 + y^2 = 4(x^2 + 6x + 9 + y^2)$$

$$x^2 - 12x + 36 + y^2 = 4x^2 + 24x + 36 + 4y^2$$

$$3x^2 + 3y^2 + 36x = 0$$

$$x^2 + y^2 + 12x = 0$$

6.

$$\frac{PO}{PA} = \frac{1}{4}$$

$$4PO = PA$$

$$4\sqrt{x^2 + y^2} = \sqrt{(x-2)^2 + (y-0)^2}$$

$$16(x^2 + y^2) = x^2 - 4x + 4 + y^2$$

$$15x^2 + 15y^2 + 4x - 4 = 0$$

7. (a)

$$PA = PB$$

$$\sqrt{(x+2)^2 + y^2} = \sqrt{x^2 + (y-4)^2}$$

$$x^2 + 4x + 4 + y^2 = x^2 + y^2 - 8y + 16$$

$$4x + 8y - 12 = 0$$

$$x + 2y - 3 = 0$$

(b)

$$PC = PD$$

$$\sqrt{(x+3)^2 + (y-5)^2} = \sqrt{(x-2)^2 + (y+4)^2}$$

$$x^2 + 6x + 9 + y^2 - 10y + 25 = x^2 - 4x + 4 + y^2 + 8y + 16$$

$$10x - 18y + 14 = 0$$

$$5x - 9y + 7 = 0$$

(c)

$$PJ = PK$$

$$\sqrt{(x-2)^2 + (y-3)^2} = \sqrt{(x-6)^2 + (y-8)^2}$$

$$x^2 - 4x + 4 + y^2 - 6y + 9 = x^2 - 12x + 36 + y^2 - 16y + 64$$

$$8x + 10y - 87 = 0$$

### Latih Diri 7.11 (Halaman 204)

1.

$$PA = 4$$

$$\sqrt{(x-3)^2 + (y-4)^2} = 4$$

$$x^2 - 6x + 9 + y^2 - 8y + 16 = 16$$

$$x^2 + y^2 - 6x - 8y + 9 = 0$$

2. (a)

$$PQ = PR$$

$$\sqrt{(x-8)^2 + (y-7)^2} = \sqrt{(x-11)^2 + (y-4)^2}$$

$$x^2 - 16x + 64 + y^2 - 14y + 49 = x^2 - 22x + 121 + y^2 - 8y + 16$$

$$6x - 6y - 24 = 0$$

$$x - y - 4 = 0$$

(b)

$$ST = 5$$

$$\sqrt{(x-7)^2 + (y-8)^2} = 5$$

$$x^2 - 14x + 49 + y^2 - 16y + 64 = 25$$

$$x^2 + y^2 - 14x - 16y + 88 = 0 \text{ (tertunjuk)}$$

(c)

$$y = x - 4 \dots \textcircled{1}$$

$$x^2 + y^2 - 14x - 16y + 88 = 0 \dots \textcircled{2}$$



Gantikan ❶ ke dalam ❷

$$\begin{aligned}x^2 + (x - 4)^2 - 14x - 16(x - 4) + 88 &= 0 \\x^2 + x^2 - 8x + 16 - 14x - 16x + 64 + 88 &= 0 \\2x^2 - 38x + 168 &= 0 \\x^2 - 19x + 84 &= 0 \\(x - 7)(x - 12) &= 0 \\x = 7 \text{ atau } x = 12\end{aligned}$$

Gantikan  $x = 7$  ke dalam ❶:  $y = 7 - 4$   
 $= 3$

Gantikan  $x = 12$  ke dalam ❶:  $y = 12 - 4$   
 $= 8$

Maka, titik persilangan ialah (7, 3) atau (12, 8).

3. (a)  $\frac{PA}{PB} = \frac{2}{1}$   
 $PA = 2PB$

$$\begin{aligned}\sqrt{(x + 2)^2 + y^2} &= 2\sqrt{(x - 1)^2 + y^2} \\x^2 + 4x + 4 + y^2 &= 4(x^2 - 2x + 1 + y^2) \\x^2 + 4x + 4 + y^2 &= 4x^2 - 8x + 4y^2 + 4 \\3x^2 + 3y^2 - 12x &= 0 \\x^2 + y^2 - 4x &= 0 \text{ (tertunjuk)}\end{aligned}$$

(b) Gantikan titik  $C(2, 2)$  ke dalam persamaan bulatan:

$$\begin{aligned}2^2 + 2^2 - 4(2) &= 0 \\&= \text{sebelah kanan}\end{aligned}$$

Jadi, titik  $C(2, 2)$  terletak pada bulatan itu.

### Latihan Intensif 7.4 (Halaman 205)

1. (a)  $2RA = RB$

$$\begin{aligned}2\sqrt{(x + 1)^2 + (y - 10)^2} &= \sqrt{(x - 2)^2 + (y - 6)^2} \\4(x^2 + 2x + 1 + y^2 - 20y + 100) &= x^2 - 4x + 4 + y^2 - 12y + 36 \\4x^2 + 8x + 4y^2 - 80y + 404 &= x^2 - 4x + y^2 - 12y + 40 \\3x^2 + 3y^2 + 12x - 68y + 364 &= 0\end{aligned}$$

(b) Pada paksi-y,  $x = 0$

$$\begin{aligned}3y^2 - 68y + 364 &= 0 \\(3y - 26)(y - 14) &= 0 \\y &= \frac{26}{3} \text{ atau } y = 14\end{aligned}$$

Koordinat titik bagi lokus  $R$  yang menyentuh paksi-y ialah  $(0, \frac{26}{3})$  dan  $(0, 14)$ .

2.  $m_{AS} m_{BS} = -1$

$$\begin{aligned}\left(\frac{y - 1}{x - 1}\right)\left(\frac{y - 9}{x - 7}\right) &= -1 \\(y - 1)(y - 9) &= -(x - 1)(x - 7) \\y^2 - 10y + 9 &= -x^2 + 8x - 7 \\x^2 + y^2 - 8x - 10y + 16 &= 0\end{aligned}$$

$$\begin{aligned}
 3. \text{ (a) Jejari bulatan} &= \sqrt{(8-5)^2 + (2-6)^2} \\
 &= \sqrt{25} \\
 &= 5
 \end{aligned}$$

$$\begin{aligned}
 \sqrt{(x-6)^2 + (y-5)^2} &= 5 \\
 x^2 - 12x + 36 + y^2 - 10y + 25 &= 25 \\
 x^2 + y^2 - 12x - 10y + 36 &= 0
 \end{aligned}$$

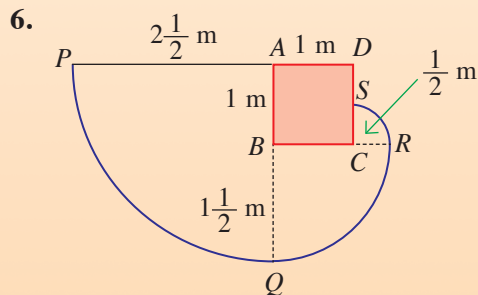
$$\begin{aligned}
 \text{(b) Apabila } S(k, 2), \\
 k^2 + (2)^2 - 12k - 10(2) + 36 &= 0 \\
 k^2 - 12k + 20 &= 0 \\
 (k-2)(k-10) &= 0 \\
 k &= 2 \text{ atau } k = 10
 \end{aligned}$$

$$\begin{aligned}
 4. \quad PS &= PR \\
 x + 1 &= \sqrt{(x-1)^2 + y^2} \\
 (x+1)^2 &= (x-1)^2 + y^2 \\
 x^2 + 2x + 1 &= x^2 - 2x + 1 + y^2 \\
 y^2 &= 4x
 \end{aligned}$$

$$\begin{aligned}
 5. \text{ (a) } \alpha^2 + \beta^2 &= 9^2 \\
 \alpha^2 + \beta^2 &= 81 \\
 \text{(b) } x &= \frac{2(0) + 1(\alpha)}{3} & y &= \frac{2(\beta) + 1(0)}{3} \\
 x &= \frac{\alpha}{3} & y &= \frac{2}{3}\beta \\
 \alpha &= 3x & \beta &= \frac{3}{2}y
 \end{aligned}$$

Gantikan  $\alpha = 3x$  dan  $\beta = \frac{3}{2}y$  ke dalam  $\alpha^2 + \beta^2 = 81$

$$\begin{aligned}
 (3x)^2 + \left(\frac{3}{2}y\right)^2 &= 81 \\
 9x^2 + \frac{9}{4}y^2 &= 81 \\
 36x^2 + 9y^2 &= 324 \\
 4x^2 + y^2 &= 36
 \end{aligned}$$



Lokus terdiri daripada lengkok-lengkok bagi tiga sukuan bulatan:

- (i)  $APQ$  iaitu sukuan bulatan berpusat  $A$  dan berjejari  $2\frac{1}{2}$  m.
- (ii)  $BQR$  iaitu sukuan bulatan berpusat  $B$  dan berjejari  $1\frac{1}{2}$  m.
- (iii)  $CRS$  iaitu sukuan bulatan berpusat  $C$  dan berjejari  $\frac{1}{2}$  m.

**Latihan Pengukuhan (Halaman 207-209)**

$$\begin{aligned} 1. \text{ (a) } \frac{h+7}{2} &= 2 & \frac{1+k}{2} &= 3 \\ h+7 &= 4 & 1+k &= 6 \\ h &= -3 & k &= 5 \end{aligned}$$

$$\begin{aligned} \text{(b) } m_{AB} &= \frac{5-1}{7-(-3)} \\ &= \frac{4}{10} \\ &= \frac{2}{5} \end{aligned}$$

$$\begin{aligned} \text{(c) } m &= -\frac{5}{2}, (2, 3) \\ y-3 &= -\frac{5}{2}(x-2) \\ 2y-6 &= -5x+10 \\ 2y+5x &= 16 \end{aligned}$$

$$\begin{aligned} 2. \text{ (a) } x &= \frac{3(-2) + 2(8)}{5} & y &= \frac{3(6) + 2(-4)}{5} \\ &= \frac{10}{5} & &= \frac{10}{5} \\ &= 2 & &= 2 \end{aligned}$$

$$\begin{aligned} \therefore P &= (2, 2) \\ \text{(b) } m_{AB} &= \frac{6-(-4)}{-2-8} \\ &= -1 \\ m &= 1, (2, 2) \\ y-2 &= 1(x-2) \\ y-2 &= x-2 \\ y &= x \end{aligned}$$

$$\begin{aligned} 3. \quad m_{PQ} &= m_{QR} \\ \frac{2-(-1)}{n-1} &= \frac{n+3-2}{n^2-n} \\ \frac{3}{n-1} &= \frac{n+1}{n^2-n} \\ 3(n^2-n) &= (n+1)(n-1) \\ 3n^2-3n &= n^2-1 \\ 2n^2-3n+1 &= 0 \\ (2n-1)(n-1) &= 0 \\ n &= \frac{1}{2} \text{ atau } n = 1 \end{aligned}$$

4. Katakan koordinat  $T$  ialah  $(0, h)$ .

$$\frac{1}{2} \begin{vmatrix} -3 & 3 & 0 & -3 \\ 4 & -1 & h & 4 \end{vmatrix} = 13.5$$

$$\frac{1}{2} |(3 + 3h + 0) - (12 - 0 - 3h)| = 13.5$$

$$\frac{1}{2} (3 + 3h - 12 + 3h) = \pm 13.5$$

$$\frac{1}{2} (6h - 9) = \pm 13.5$$

$$\frac{1}{2} (6h - 9) = 13.5$$

$$6h - 9 = 27$$

$$6h = 36$$

$$h = 6$$

$$\frac{1}{2} (6h - 9) = -13.5$$

$$6h - 9 = -27$$

$$6h = -18$$

$$h = -3$$

Maka, koordinat  $T$  yang mungkin ialah  $(0, 6)$  atau  $(0, -3)$ .

5.  $PA = 3PB$

$$\sqrt{(x-2)^2 + (y-0)^2} = 3\sqrt{(x+4)^2 + (y-0)^2}$$

$$x^2 - 4x + 4 + y^2 = 9(x^2 + 8x + 16 + y^2)$$

$$x^2 - 4x + 4 + y^2 = 9x^2 + 72x + 144 + 9y^2$$

$$8x^2 + 8y^2 + 76x + 140 = 0$$

$$2x^2 + 2y^2 + 19x + 35 = 0$$

$$6. \quad x = \frac{1(-3) + 2(6)}{3} \qquad y = \frac{1(-1) + 2(5)}{3}$$

$$= \frac{9}{3} \qquad = \frac{9}{3}$$

$$= 3 \qquad = 3$$

Kedua-dua burung itu bertemu pada koordinat  $(3, 3)$ .

7. (a) Luas  $\triangle ABC = 10$

$$\frac{1}{2} \times 4 \times t = 10$$

$$t = 5$$

$$x = \frac{2+6}{2}$$

$$= 4$$

$$\therefore C(4, -3)$$

$$y = 2 - 5$$

$$= -3$$

$$(b) \frac{x+4}{2} = 6$$

$$x + 4 = 12$$

$$x = 8$$

$$\therefore D(8, 7)$$

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

$$y - 3 = 4$$

$$y = 7$$

$$(c) (i) \quad m_{AC} = \frac{-3-2}{4-2}$$

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

$$\frac{k-7}{11-8} = -\frac{5}{2}$$

$$2(k-7) = -5(3)$$

$$2k - 14 = -15$$

$$2k = -1$$

$$k = -\frac{1}{2}$$

$$(ii) m_{EC} = \frac{-\frac{1}{2} - (-3)}{11 - 4}$$

$$= \frac{5}{14}$$

$$m_{DE} = -\frac{5}{2}$$

$$m_{EC} \times m_{DE} = \frac{5}{14} \times -\frac{5}{2}$$

$$= -\frac{25}{28}$$

$$\neq -1$$

$\therefore CED$  bukan segi tiga bersudut tegak.

8. (a)  $y = 2x - 5 \dots \textcircled{1}$

$$y = \frac{1}{3}x \dots \textcircled{2}$$

Gantikan  $\textcircled{2}$  ke dalam  $\textcircled{1}$

$$\frac{1}{3}x = 2x - 5$$

$$x = 6x - 15$$

$$5x = 15$$

$$x = 3$$

Gantikan  $x = 3$  ke dalam  $\textcircled{2}$

$$y = \frac{1}{3}(3)$$

$$= 1$$

$\therefore P(3, 1)$

(b)  $m = -3, R(11, 7)$

Persamaan  $QR: y - 7 = -3(x - 11)$

$$y - 7 = -3x + 33$$

$$y + 3x = 40$$

$m = \frac{1}{3}, R(11, 7)$

Persamaan  $SR: y - 7 = \frac{1}{3}(x - 11)$

$$3y - 21 = x - 11$$

$$3y - x = 10$$

$$(c) \begin{aligned} y + 3x &= 40 \dots \textcircled{1} \\ y &= \frac{1}{3}x \dots \textcircled{2} \end{aligned}$$

Gantikan  $\textcircled{2}$  ke dalam  $\textcircled{1}$

$$\begin{aligned} \frac{1}{3}x + 3x &= 40 \\ x + 9x &= 120 \\ 10x &= 120 \\ x &= 12 \end{aligned}$$

Gantikan  $x = 12$  ke dalam  $\textcircled{2}$

$$\begin{aligned} y &= \frac{1}{3}(12) \\ &= 4 \end{aligned}$$

$\therefore Q(12, 4)$

$$y - 2x = -5 \dots \textcircled{1}$$

$$3y - x = 10 \dots \textcircled{2}$$

$$\textcircled{2} \times 2: 6y - 2x = 20 \dots \textcircled{3}$$

$$\begin{aligned} \textcircled{3} - \textcircled{1}: 5y &= 25 \\ y &= 5 \end{aligned}$$

Gantikan  $y = 5$  ke dalam  $\textcircled{1}$

$$\begin{aligned} 5 - 2x &= -5 \\ 2x &= 10 \\ x &= 5 \end{aligned}$$

$\therefore S(5, 5)$

$$\begin{aligned} (d) \text{ Luas } PQRS &= \frac{1}{2} \begin{vmatrix} 3 & 12 & 11 & 5 & 3 \\ 1 & 4 & 7 & 5 & 1 \end{vmatrix} \\ &= \frac{1}{2} |(12 + 84 + 55 + 5) - (12 + 44 + 35 + 15)| \\ &= \frac{1}{2} |50| \\ &= 25 \text{ unit}^2 \end{aligned}$$

$$\begin{aligned} \text{Luas } \Delta PQR &= \frac{1}{2} \begin{vmatrix} 3 & 12 & 11 & 3 \\ 1 & 4 & 7 & 1 \end{vmatrix} \\ &= \frac{1}{2} |(12 + 84 + 11) - (12 + 44 + 21)| \\ &= \frac{1}{2} |30| \\ &= 15 \text{ unit}^2 \end{aligned}$$

$$\begin{aligned} \text{Luas } \Delta PRS &= \frac{1}{2} \begin{vmatrix} 3 & 11 & 5 & 3 \\ 1 & 7 & 5 & 1 \end{vmatrix} \\ &= \frac{1}{2} |(21 + 55 + 5) - (11 + 35 + 15)| \\ &= \frac{1}{2} |20| \\ &= 10 \text{ unit}^2 \end{aligned}$$

$$\begin{aligned}
 PQ &= \sqrt{(12-3)^2 + (4-1)^2} \\
 &= \sqrt{90} \\
 &= 3\sqrt{10}
 \end{aligned}$$

$$\begin{aligned}
 SR &= \sqrt{(11-5)^2 + (7-5)^2} \\
 &= \sqrt{40} \\
 &= 2\sqrt{10}
 \end{aligned}$$

$$\begin{aligned}
 \frac{\text{Luas } \triangle PQR}{\text{Luas } \triangle PRS} &= \frac{15}{10} \\
 &= \frac{3}{2}
 \end{aligned}$$

$$\begin{aligned}
 \frac{PQ}{SR} &= \frac{3\sqrt{10}}{2\sqrt{10}} \\
 &= \frac{3}{2}
 \end{aligned}$$

$$\frac{\text{Luas } \triangle PQR}{\text{Luas } \triangle PRS} = \frac{PQ}{SR} \text{ (tertunjuk)}$$

$$\begin{aligned}
 9. \text{ (a) Luas } \triangle JKL &= \frac{1}{2} \begin{vmatrix} 2 & 11 & 5 & 2 \\ 1 & 5 & 9 & 1 \end{vmatrix} \\
 &= \frac{1}{2} |(10 + 99 + 5) - (11 + 25 + 18)| \\
 &= \frac{1}{2} |60| \\
 &= 30 \text{ unit}^2
 \end{aligned}$$

$$\begin{aligned}
 \text{(b) Luas } \triangle JKP &= \frac{1}{2} \begin{vmatrix} 2 & 11 & h & 2 \\ 1 & 5 & k & 1 \end{vmatrix} \\
 &= \frac{1}{2} |(10 + 11k + h) - (11 + 5h + 2k)| \\
 &= \frac{1}{2} |9k - 4h - 1| \\
 &= \frac{9k - 4h - 1}{2}
 \end{aligned}$$

$$\begin{aligned}
 \text{Luas } \triangle KLP &= \frac{1}{2} \begin{vmatrix} 11 & 5 & h & 11 \\ 5 & 9 & k & 5 \end{vmatrix} \\
 &= \frac{1}{2} |(99 + 5k + 5h) - (25 + 9h + 11k)| \\
 &= \frac{1}{2} |74 - 6k - 4h| \\
 &= 37 - 3k - 2h
 \end{aligned}$$

$$\begin{aligned}
 \text{(c) } \frac{9k - 4h - 1}{2} &= 10 \\
 9k - 4h - 1 &= 20 \\
 9k - 4h &= 21 \dots \text{①} \\
 37 - 3k - 2h &= 10 \\
 3k + 2h &= 27 \dots \text{②} \\
 \text{②} \times 2: 6k + 4h &= 54 \dots \text{③} \\
 \text{①} + \text{③}: 15k &= 75 \\
 k &= 5
 \end{aligned}$$

Gantikan  $k = 5$  ke dalam ❶

$$9(5) - 4h = 21$$

$$45 - 4h = 21$$

$$4h = 24$$

$$h = 6$$

$$\therefore P(6, 5)$$

(d)  $J(2, 1), P(6, 5)$

$$m_{JP} = \frac{5 - 1}{6 - 2}$$

$$= 1$$

Persamaan  $JP$

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

$$y - 1 = x - 2$$

$$y = x - 1$$

(e) (i)  $m_{KL} = \frac{9 - 5}{5 - 11}$

$$= \frac{4}{-6}$$

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

Persamaan  $KL$ :

$$y - 5 = -\frac{2}{3}(x - 11)$$

$$3y - 15 = -2x + 22$$

$$3y + 2x = 37 \dots \text{❶}$$

$$y - x = -1 \dots \text{❷}$$

$$\text{❷} \times 2: 2y - 2x = -2 \dots \text{❸}$$

$$\text{❶} + \text{❸}: 5y = 35$$

$$y = 7$$

Gantikan  $y = 7$  ke dalam ❶

$$3(7) + 2x = 37$$

$$2x = 16$$

$$x = 8$$

$$\therefore Q(8, 7)$$

(ii)  $\frac{n(11) + m(5)}{m + n} = 8$

$$11n + 5m = 8m + 8n$$

$$3m = 3n$$

$$\frac{m}{n} = \frac{3}{3}$$

$$= \frac{1}{1}$$

$$\therefore KQ : QL = 1 : 1$$

10. (a)  $OR = \sqrt{45}$

$$\sqrt{x^2 + y^2} = \sqrt{45}$$

$$x^2 + y^2 = 45 \dots \text{❶}$$

$$y = -2x \dots \text{❷}$$



Gantikan ② ke dalam ①

$$x^2 + (-2x)^2 = 45$$

$$5x^2 = 45$$

$$x^2 = 9$$

$$x = \pm 3$$

Gantikan  $x = -3$  ke dalam ②

$$y = -2(-3)$$

$$= 6$$

$$\therefore R(-3, 6)$$

$$m_{OR} = \frac{6 - 0}{-3 - 0}$$
$$= -2$$

Persamaan RS

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

$$2y - 12 = x + 3$$

$$2y = x + 15$$

Pada paksi-y,  $x = 0$

$$2y = 0 + 15$$

$$y = \frac{15}{2}$$

$$\therefore S\left(0, \frac{15}{2}\right)$$

Persamaan ST

$$y - \frac{15}{2} = -2(x - 0)$$

$$2y + 4x = 15 \dots \text{①}$$

$$y = 2x \dots \text{②}$$

Gantikan ② ke dalam ①

$$2(2x) + 4x = 15$$

$$8x = 15$$

$$x = \frac{15}{8}$$

$$\text{Apabila } x = \frac{15}{8}, y = 2\left(\frac{15}{8}\right)$$

$$= \frac{15}{4}$$

$$\therefore T\left(\frac{15}{8}, \frac{15}{4}\right)$$

$$\begin{aligned} \text{(b) Luas } ORST &= \frac{1}{2} \begin{vmatrix} 0 & \frac{15}{8} & 0 & -3 & 0 \\ 0 & \frac{15}{4} & \frac{15}{2} & 6 & 0 \end{vmatrix} \\ &= \frac{1}{2} \left| \frac{225}{16} + \frac{45}{2} \right| \\ &= 18 \frac{9}{32} \text{ unit}^2 \end{aligned}$$

11. (a)  $y = \frac{8}{x}$

Pada titik  $P(h, 8)$

$$8 = \frac{8}{h}$$

$$h = 1$$

Pada titik  $Q(k, 2)$

$$2 = \frac{8}{k}$$

$$k = 4$$

(b)  $P(1, 8), Q(4, 2)$

$$m = \frac{2 - 8}{4 - 1}$$

$$= -2$$

Persamaan  $PQ$

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

$$y + 2x = 10$$

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

$$y = -2x - 8$$

12. (a)  $5y - x = 33$

$$y = \frac{1}{5}x + \frac{33}{5}$$

$$m = \frac{1}{5}$$

$$m_{BP} = -5$$

Persamaan  $BP$  ialah

$$y - 1 = -5(x + 2)$$

$$y + 5x + 9 = 0$$

(b)  $5y - x = 33$

$$x = 5y - 33 \dots \textcircled{1}$$

$$y + 5x + 9 = 0 \dots \textcircled{2}$$

Gantikan  $\textcircled{1}$  ke dalam  $\textcircled{2}$

$$y + 5(5y - 33) + 9 = 0$$

$$26y - 156 = 0$$

$$y = 6$$

Gantikan nilai  $y = 6$  ke dalam  $\textcircled{1}$

$$x = 5(6) - 33$$

$$= -3$$

Maka, koordinat  $P$  ialah  $(-3, 6)$ .

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

$$-16 + x = -9$$

$$x = 7$$

$$\frac{2(5) + y}{3} = 6$$

$$10 + y = 18$$

$$y = 8$$

Maka, koordinat  $D$  ialah  $(7, 8)$ .

$$m_{DC} = m_{AB} = \frac{5-1}{-8-(-2)}$$

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

Persamaan  $DC$

$$y - 8 = -\frac{2}{3}(x - 7)$$

$$3y - 24 = -2x + 14$$

$$3y = -2x + 38$$

$$3y = -2x + 38 \dots \textcircled{1}$$

$$x = 5y - 7 \dots \textcircled{2}$$

Gantikan  $\textcircled{2}$  ke dalam  $\textcircled{1}$

$$3y = -2(5y - 7) + 38$$

$$13y = 52$$

$$y = 4$$

Gantikan  $y = 4$  ke dalam  $\textcircled{2}$

$$x = 5(4) - 7$$

$$= 13$$

Maka, koordinat  $C$  ialah  $(13, 4)$ .

$$(c) \text{ Luas } ABCD = \frac{1}{2} \begin{vmatrix} -8 & -2 & 13 & 7 & -8 \\ 5 & 1 & 4 & 8 & 5 \end{vmatrix}$$

$$= \frac{1}{2} |(-8 - 8 + 104 + 35) - (-10 + 13 + 28 - 64)|$$

$$= \frac{1}{2} |156|$$

$$= 78 \text{ unit}^2$$

$$13. (a) E = \left( \frac{-1+7}{2}, \frac{-2+4}{2} \right)$$

$$= (3, 1)$$

$$\frac{0+x}{2} = 3 \quad \frac{5+y}{2} = 1$$

$$x = 6 \quad y = -3$$

$$\therefore B = (6, -3)$$

$$(b) AB = \sqrt{(-1-6)^2 + (-2+3)^2}$$

$$= 5\sqrt{2}$$

$$BC = \sqrt{(7-6)^2 + (4+3)^2}$$

$$= 5\sqrt{2}$$

$$CD = \sqrt{(0-7)^2 + (5-4)^2}$$

$$= 5\sqrt{2}$$

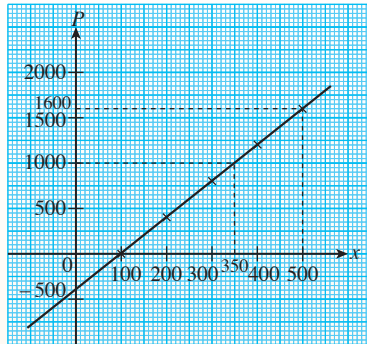
$$AD = \sqrt{(0+1)^2 + (5+2)^2}$$

$$= 5\sqrt{2}$$

Oleh sebab semua sisi adalah sama panjang, maka sisi empat  $ABCD$  ialah sebuah segi empat sama.

14. (a)  $P = 6x - 2x - 400$   
 $= 4x - 400$   
 $\therefore P = 4x - 400$

(b)



- (i) RM1 600
- (ii) 350 naskah

15.

