

JAWAPAN

BAB 8 VEKTOR

Cabar Minda (Halaman 212)

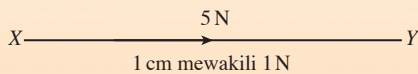
Kuantiti Skalar	Kuantiti Vektor	Bukan Kuantiti Skalar atau Vektor
Masa Isi padu Cas elektrik Ketumpatan Tenaga	Berat Daya Impuls Momentum	Konduktiviti logam Kekenyalan Frekuensi radio

Latih Diri 8.1 (Halaman 214)

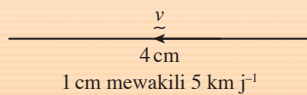
- Kuantiti skalar kerana kuantiti itu mempunyai magnitud sahaja.
 - Kuantiti vektor kerana kuantiti itu mempunyai magnitud dan arah.
 - Kuantiti skalar kerana kuantiti itu mempunyai magnitud sahaja.
 - Kuantiti skalar kerana kuantiti itu mempunyai magnitud sahaja.
 - Kuantiti vektor kerana kuantiti itu mempunyai magnitud dan arah.

Latih Diri 8.2 (Halaman 216-217)

1. (a)

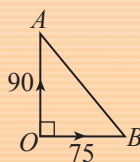


(c)

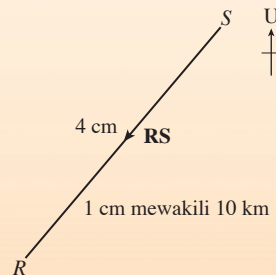


$$2. \text{ Magnitud } \tilde{f} = \sqrt{2^2 + 4^2} \\ = \sqrt{20} \text{ N}$$

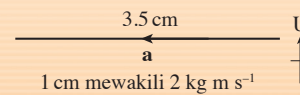
$$3. \text{ Jarak} = \sqrt{90^2 + 75^2} \\ = 117.15 \text{ km}$$



(b)



(d)



$$\text{Arah } : \tan \theta = 2$$

$$\theta = 63.43^\circ$$

$$\text{Arah } f : 90^\circ - 63.43^\circ = 26.57^\circ$$

$$4. \quad \begin{aligned} a &= d & \vec{MN} &= \vec{CD} \\ c &= f & \vec{EF} &= \vec{KL} \\ b &= e & \vec{GH} &= \vec{AB} \end{aligned}$$

$$5. \quad \begin{array}{ll} \text{(a) (i)} & \vec{ED} \\ \text{(ii)} & \vec{FE} \\ \text{(iii)} & \vec{AF} \end{array} \qquad \begin{array}{ll} \text{(b) (i)} & \vec{DC} \\ \text{(ii)} & \vec{CB} \\ \text{(iii)} & \vec{BA} \end{array}$$

Latih Diri 8.3 (Halaman 218)

$$1. \quad \vec{PQ} = \frac{1}{2}\underline{a} \qquad \underline{x} = -\frac{3}{2}\underline{a} \qquad \underline{y} = -\frac{7}{4}\underline{a} \qquad \vec{RS} = \frac{5}{4}\underline{a}$$

Inkuiri 1 (Halaman 218)

$$1. \quad \text{(a) } |\vec{AB}| = \sqrt{3^2 + 4^2} \\ = 5 \text{ unit}$$

$$|\vec{CD}| = \sqrt{6^2 + 8^2} \\ = 10 \text{ unit}$$

$$\text{(b) } |\vec{AB}| : |\vec{CD}| = 5 : 10 \\ = 1 : 2$$

(c) Kecerunan $AB = \frac{4}{3}$, Kecerunan $CD = \frac{4}{3}$
Garis lurus AB dan garis lurus CD adalah selari.

$$\text{(d) } \vec{AB} = \frac{1}{2}\vec{CD}$$

2. $\underline{a} = k\underline{b}$, dengan keadaan k adalah pemalar.

Cabar Minda (Halaman 219)

$$\vec{XY} = \alpha\vec{XZ}$$

$$\vec{XY} = \beta\vec{YZ}$$

$$\vec{XZ} = \lambda\vec{YZ}, \text{ dengan keadaan } \alpha, \beta \text{ dan } \lambda \text{ sebagai pemalar.}$$

Latih Diri 8.4 (Halaman 220)

$$1. \quad \frac{|\vec{AB}|}{|\vec{PQ}|} = \frac{|5\underline{a}|}{|20\underline{a}|}$$

$$\vec{AB} = \frac{1}{4}\vec{PQ}$$

$$2. \quad \frac{|\vec{LM}|}{|\vec{MN}|} = \frac{|6\underline{x}|}{|18\underline{x}|}$$

$$\vec{LM} = \frac{1}{3}\vec{MN}$$

Maka, \overrightarrow{LM} dan \overrightarrow{MN} adalah selari. Oleh sebab M ialah titik sepunya, maka L , M dan N adalah segaris.

$$3. \quad (a) \quad 4m + 3 = 0 \qquad n - 7 = 0$$

$$m = -\frac{3}{4} \qquad n = 7$$

$$(b) \quad m + n = 1 \dots \textcircled{1}$$

$$m - 2n = 10 \dots \textcircled{2}$$

$$\textcircled{1} - \textcircled{2}: 3n = -9$$

$$n = -3 \dots \textcircled{3}$$

Gantikan $\textcircled{3}$ ke dalam $\textcircled{1}$

$$m = 1 - (-3)$$

$$= 4$$

$$4. \quad \frac{|\overrightarrow{VW}|}{|\overrightarrow{XY}|} = \frac{21}{6}$$

$$\overrightarrow{VW} = \frac{7}{2} \overrightarrow{XY}$$

$$5. \quad a = \frac{1}{2}(k - 2)a$$

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

$$k = 4$$

6. PQT dan PRS ialah segi tiga serupa.

$$\frac{PS}{PT} = \frac{8}{5}$$

$$\frac{RS}{QT} = \frac{8}{5}$$

$$\text{Maka, } \overrightarrow{SR} = -\frac{8}{5} \overrightarrow{QT}$$

Latihan Intensif B.1 (Halaman 220)

$$1. \quad |\overrightarrow{DC}| = 2 \text{ cm}$$

$$\overrightarrow{DC} = \underline{u}$$

$$|\overrightarrow{AB}| = 6 \text{ cm}$$

$$\text{Maka, } \overrightarrow{AB} = 3\underline{u}$$

$$2. \quad (a) \quad \overrightarrow{AB} = 3\overrightarrow{DC}$$

$$|\overrightarrow{AB}| = 3 \times 4 \text{ cm}$$

$$= 12 \text{ cm}$$

(b) Segi tiga ECD dan segi tiga EAB ialah segi tiga serupa

$$(i) \quad \overrightarrow{EC} = 2a$$

$$(ii) \quad \overrightarrow{BE} = 6b$$

$$3. \frac{|\vec{AB}|}{|\vec{AC}|} = \frac{|4x|}{|6x|}$$

$$\vec{AB} = \frac{2}{3}\vec{AC}$$

Maka, \vec{AB} dan \vec{AC} adalah selari. Oleh sebab A ialah titik sepunya, maka A, B dan C adalah segaris.

$$4. \quad h + k = 0 \dots \textcircled{1}$$

$$h - k + 1 = 0 \dots \textcircled{2}$$

$$\textcircled{1} - \textcircled{2}: 2k - 1 = 0$$

$$k = \frac{1}{2} \dots \textcircled{3}$$

Gantikan $\textcircled{3}$ ke dalam $\textcircled{1}$

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

$$5. \quad \vec{PQ} \text{ dan } \vec{QR} \text{ adalah selari. Maka,}$$

$$(k + 2)x + 4y = \lambda(hx + y)$$

Bandingkan kedua-dua belah persamaan

$$k + 2 = \lambda h \dots \textcircled{1}$$

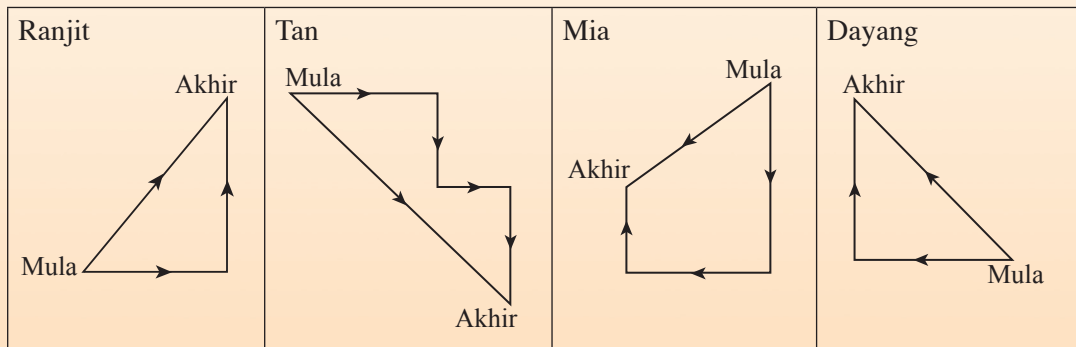
$$4 = \lambda \dots \textcircled{2}$$

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

$$k = 4h - 2$$

Inkuiri 2 (Halaman 221)

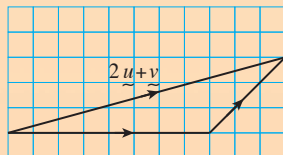
3.



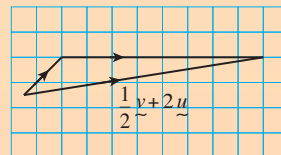
4. Laluan yang dilalui oleh mereka menghasilkan sesaran yang merupakan suatu vektor paduan.

Latih Diri 8.5 (Halaman 224)

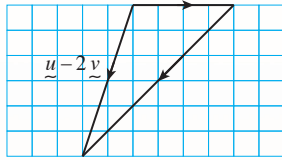
1. (a)



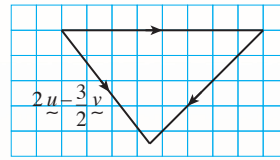
(b)



(c)



(d)

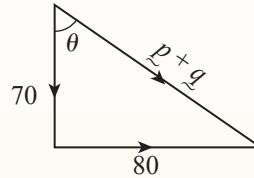


$$2. \text{ Magnitud} = \sqrt{70^2 + 80^2} \\ = 106.30 \text{ km j}^{-1}$$

$$\text{Arah: } \tan \theta = \frac{80}{70}$$

$$\theta = 48.81^\circ$$

$$\text{Arah } \vec{p} + \vec{q} = 180^\circ - 48.81^\circ \\ = 131.19^\circ$$



$$3. (a) \vec{AB} = \frac{2}{3}\vec{DC} \\ = \frac{2}{3}\vec{y}$$

$$(b) \vec{AC} = \vec{AD} + \vec{DC} \\ = -\vec{x} + \vec{y}$$

$$(c) \vec{BC} = \vec{BA} + \vec{AD} + \vec{DC} \\ = -\frac{2}{3}\vec{y} - \vec{x} + \vec{y} \\ = \frac{1}{3}\vec{y} - \vec{x}$$

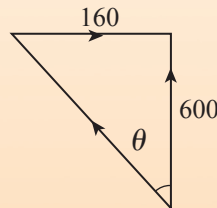
$$(d) \vec{BD} = \vec{BA} + \vec{AD} \\ = -\frac{2}{3}\vec{y} - \vec{x}$$

$$4. (a) \text{ Halaju asal kapal terbang} \\ = \sqrt{600^2 + 160^2} \\ = 620 \text{ km j}^{-1}$$

$$(b) \tan \theta = \frac{160}{600}$$

$$\theta = 14.93^\circ$$

$$\text{Arah asal kapal terbang} \\ = 360^\circ - 14.93^\circ \\ = 345.07^\circ$$



Latih Diri 8.6 (Halaman 225)

$$1. \vec{XY} = \vec{XO} + \vec{OY} \\ = (-4\vec{x} + 2\vec{y}) + (k\vec{x} - \vec{y}) \\ = (k - 4)\vec{x} + \vec{y}$$

X , Y dan Z adalah segaris.

$$\vec{XY} = \lambda \vec{XZ}$$

$$\vec{XZ} = \vec{XO} + \vec{OZ} \\ = (-4\vec{x} + 2\vec{y}) + (6\vec{x} + 5\vec{y}) \\ = 2\vec{x} + 7\vec{y}$$

$$(k - 4)\tilde{x} + \tilde{y} = \lambda(2\tilde{x} + 7\tilde{y})$$

$$k - 4 = 2\lambda \dots \textcircled{1}$$

$$1 = 7\lambda \dots \textcircled{2}$$

$$\lambda = \frac{1}{7}$$

Gantikan nilai λ ke dalam $\textcircled{1}$

$$k - 4 = 2 \times \frac{1}{7}$$

$$k = \frac{30}{7}$$

$$2. \text{ (a) } \overrightarrow{BD} = \overrightarrow{BA} + \overrightarrow{AD}$$

$$= -24\tilde{x} + 20\tilde{y}$$

$$\overrightarrow{BE} = 3\overrightarrow{ED}$$

$$\overrightarrow{BE} = \frac{3}{4}\overrightarrow{BD}$$

$$\overrightarrow{AE} = \overrightarrow{AB} + \overrightarrow{BE}$$

$$\overrightarrow{AE} = \overrightarrow{AB} + \frac{3}{4}\overrightarrow{BD}$$

$$= 24\tilde{x} + \frac{3}{4}(-24\tilde{x} + 20\tilde{y})$$

$$= 24\tilde{x} - 18\tilde{x} + 15\tilde{y}$$

$$= 6\tilde{x} + 15\tilde{y}$$

$$\text{(b) } \overrightarrow{BC} = \overrightarrow{BD} + \overrightarrow{DC}$$

$$= (-24\tilde{x} + 20\tilde{y}) + \frac{4}{3}\overrightarrow{AB}$$

$$= (-24\tilde{x} + 20\tilde{y}) + \frac{4}{3}(24\tilde{x})$$

$$= (-24\tilde{x} + 20\tilde{y}) + 32\tilde{x}$$

$$= 8\tilde{x} + 20\tilde{y}$$

$$\overrightarrow{AE} = 6\tilde{x} + 15\tilde{y}$$

$$\frac{|\overrightarrow{AE}|}{|\overrightarrow{BC}|} = \frac{6}{8} = \frac{15}{20} = \frac{3}{4}$$

Didapati $\overrightarrow{AE} = \frac{3}{4}\overrightarrow{BC}$, maka lorong AE dan BC adalah selari.

Latihan Intensif 8.2 (Halaman 226)

$$1. \text{ (a) } \overrightarrow{AC} = \overrightarrow{AB} + \overrightarrow{BC}$$

$$= \tilde{y} + \tilde{x}$$

$$\text{(b) } \overrightarrow{QR} = \overrightarrow{QP} + \overrightarrow{PR}$$

$$= -\tilde{y} + \tilde{x}$$

$$\begin{aligned}
 \text{(c) } \vec{PR} &= \vec{PT} + \vec{TR} \\
 &= \vec{PT} + \frac{1}{2}\vec{TQ} \\
 &= 2\tilde{x} + \frac{1}{2}(-2\tilde{x} + \tilde{y}) \\
 &= \tilde{x} + \frac{1}{2}\tilde{y}
 \end{aligned}$$

2. (a) $3\tilde{x} + \tilde{y}$

(b) $\tilde{y} - 2\tilde{x}$

(c) $-\tilde{y} + 2\tilde{x}$

$$\begin{aligned}
 \text{3. } \vec{BQ} &= \vec{BA} + \vec{AQ} \\
 &= \vec{BA} + \frac{1}{4}\vec{AC} \\
 &= -\tilde{a} + \frac{1}{4}(4\tilde{b}) \\
 &= -\tilde{a} + \tilde{b}
 \end{aligned}$$

4. $r = h\tilde{a} + (h+k)\tilde{b} \dots \textcircled{1}$

$$\begin{aligned}
 r &= 3\tilde{p} - 4\tilde{q} \\
 &= 3(2\tilde{a} + 3\tilde{b}) - 4(4\tilde{a} - \tilde{b}) \\
 &= (6\tilde{a} - 16\tilde{a}) + (9\tilde{b} + 4\tilde{b})
 \end{aligned}$$

$r = -10\tilde{a} + 13\tilde{b} \dots \textcircled{2}$

Bandungkan $\textcircled{1}$ dan $\textcircled{2}$

$$h = -10,$$

$$h + k = 13$$

$$-10 + k = 13$$

$$k = 23$$

5. Jarak $PQ = \sqrt{70^2 + 40^2}$
 $= 80.62 \text{ m}$

$$\begin{aligned}
 \text{Halaju akhir perahu} &= \frac{80.62}{12} \\
 &= 6.718 \text{ m s}^{-1}
 \end{aligned}$$

$$\begin{aligned}
 \text{Laju Hamid mendayung perahu} &= \sqrt{6.718^2 - 1.8^2} \\
 &= 6.47 \text{ m s}^{-1}
 \end{aligned}$$

6. (a) (i) $\vec{BA} = \vec{BO} + \vec{OA}$
 $= -\tilde{b} + \tilde{a}$

(ii) $\vec{BX} = \frac{3}{5}\vec{BA}$
 $= \frac{3}{5}(-\tilde{b} + \tilde{a})$

(iii) $\vec{OX} = \vec{OB} + \vec{BX}$
 $= \tilde{b} - \frac{3}{5}\tilde{b} + \frac{3}{5}\tilde{a}$
 $= \frac{2}{5}\tilde{b} + \frac{3}{5}\tilde{a}$

$$(iv) \vec{BY} = \vec{BO} + \vec{OY}$$

$$= -\underline{b} + \frac{3}{4}\underline{a}$$

$$(b) (i) \vec{OP} = \lambda\left(\frac{2}{5}\underline{b} + \frac{3}{5}\underline{a}\right)$$

$$= \frac{2}{5}\lambda\underline{b} + \frac{3}{5}\lambda\underline{a}$$

$$(ii) \vec{OP} = \vec{OB} + \vec{BP}$$

$$= \vec{OB} + \mu\vec{BY}$$

$$= \underline{b} + \mu\left(-\underline{b} + \frac{3}{4}\underline{a}\right)$$

$$= (1 - \mu)\underline{b} + \frac{3}{4}\mu\underline{a}$$

$$(c) \frac{2}{5}\lambda\underline{b} + \frac{3}{5}\lambda\underline{a} = (1 - \mu)\underline{b} + \frac{3}{4}\mu\underline{a}$$

$$\frac{2}{5}\lambda = 1 - \mu \dots \textcircled{1}$$

$$\frac{3}{5}\lambda = \frac{3}{4}\mu$$

$$\lambda = \frac{5}{4}\mu \dots \textcircled{2}$$

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

$$\frac{2}{5}\left(\frac{5}{4}\mu\right) = 1 - \mu$$

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

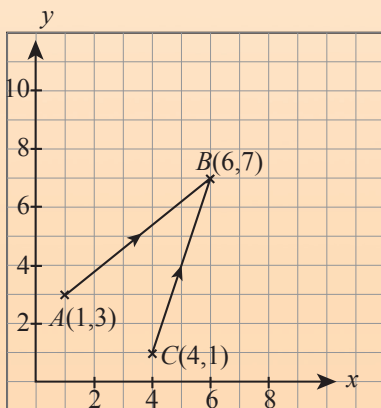
$$\mu = \frac{2}{3}$$

$$\lambda = \frac{5}{4}\left(\frac{2}{3}\right)$$

$$= \frac{5}{6}$$

Inkuiri 3 (Halaman 227)

3.



4. Beluran

5. $\begin{pmatrix} 5 \\ 4 \end{pmatrix}$

6. Jarak Arding = $\sqrt{(6-1)^2 + (7-3)^2}$
= 6.403 unit

Jarak Timan = $\sqrt{(6-4)^2 + (7-1)^2}$
= 6.325 unit

Latih Diri 8.7 (Halaman 229)

1. (a) $\vec{OA} = 2\hat{i} + 2\hat{j}$ $\vec{OF} = -8\hat{i}$ $\vec{BC} = -10\hat{i} + \hat{j}$
 $\vec{FA} = 10\hat{i} + 2\hat{j}$ $\vec{DE} = 14\hat{i}$ $\vec{DO} = -\hat{j}$

(b) $\vec{OA} = \begin{pmatrix} 2 \\ 2 \end{pmatrix}$ $\vec{OF} = \begin{pmatrix} -8 \\ 0 \end{pmatrix}$ $\vec{BC} = \begin{pmatrix} -10 \\ 1 \end{pmatrix}$
 $\vec{FA} = \begin{pmatrix} 10 \\ 2 \end{pmatrix}$ $\vec{DE} = \begin{pmatrix} 14 \\ 0 \end{pmatrix}$ $\vec{DO} = \begin{pmatrix} 0 \\ -1 \end{pmatrix}$

2. (a) Vektor kedudukan $\vec{OB} = \begin{pmatrix} 5 \\ 8 \end{pmatrix}$

(b) $\vec{AB} = \vec{AO} + \vec{OB}$
= $-\vec{OA} + \vec{OB}$
= $\begin{pmatrix} 2 \\ -3 \end{pmatrix} + \begin{pmatrix} 5 \\ 8 \end{pmatrix}$
= $\begin{pmatrix} 7 \\ 5 \end{pmatrix}$

$|\vec{AB}| = \sqrt{7^2 + 5^2}$
= 8.602 unit

3. (a) (i) $\vec{AB} = 4\hat{i} + \hat{j}$ (ii) $\vec{BA} = -4\hat{i} - \hat{j}$ (iii) $\vec{BC} = -\hat{i} - 5\hat{j}$
(iv) $\vec{DC} = 2\hat{i}$ (v) $\vec{AC} = 3\hat{i} - 4\hat{j}$ (vi) $\vec{DE} = 4\hat{i} + \hat{j}$

(b) \vec{AB} selari dengan \vec{DE} oleh sebab $\vec{AB} = \vec{DE}$ dan mempunyai kecerunan yang sama.

(c) \vec{BA} adalah vektor negatif kepada \vec{DE} kerana $|\vec{BA}| = |\vec{DE}|$ dan arah \vec{BA} adalah bertentangan dengan arah \vec{DE} .

4. (a) $p = 3\hat{i} - 4\hat{j}$
 $q = -5\hat{i} - 7\hat{j}$
 $r = \hat{i} + 5\hat{j}$

(b) $P(3, -4)$
 $Q(-5, -7)$
 $R(1, 5)$

(c) $|p| = \sqrt{3^2 + (-4)^2}$
= 5 unit

$$\begin{aligned} |\underline{q}| &= \sqrt{(-5)^2 + (-7)^2} \\ &= 8.602 \text{ unit} \end{aligned}$$

$$\begin{aligned} |\underline{r}| &= \sqrt{1^2 + 5^2} \\ &= 5.099 \text{ unit} \end{aligned}$$

Inkuiri 4 (Halaman 230)

3. Vektor unit yang diperoleh akan berubah kerana perubahan nilai x_1 dan y_1 menyebabkan magnitud bagi vektor akan berubah.
4. Kaedah mencari vektor unit dalam arah vektor $\underline{r} = x\underline{i} - y\underline{j}$ ialah $\hat{\underline{r}} = \frac{x\underline{i} + y\underline{j}}{\sqrt{x^2 + y^2}}$

Latih Diri 8.8 (Halaman 231)

1. (a) $\sqrt{3^2 + 2^2} = 3.606 \text{ unit}$ (b) $\sqrt{(-4)^2 + (-7)^2} = 8.062 \text{ unit}$ (c) $\frac{4}{7} \text{ unit}$
 (d) $\sqrt{(-12)^2 + (-5)^2} = 13 \text{ unit}$ (e) 6 unit

2. (a) Magnitud vektor = $\sqrt{3^2 + 2^2} = \sqrt{13}$

$$\text{Vektor unit} = \frac{3\underline{i} + 2\underline{j}}{\sqrt{13}}$$

- (b) Magnitud vektor = $\sqrt{(-1)^2 + (-9)^2} = \sqrt{82}$

$$\text{Vektor unit} = \frac{-\underline{i} - 9\underline{j}}{\sqrt{82}}$$

- (c) Magnitud vektor = $\sqrt{(4)^2 + 0^2} = 4$

$$\text{Vektor unit} = \frac{4\underline{i}}{4} = \underline{i}$$

- (d) Magnitud vektor = $\sqrt{(-8)^2 + (-15)^2} = 17$

$$\text{Vektor unit} = \frac{-8\underline{i} - 15\underline{j}}{17}$$

3. (a) $\sqrt{(-1)^2} = 1$ (vektor unit)
 (b) $\sqrt{\left(-\frac{1}{\sqrt{2}}\right)^2 + \left(\frac{1}{\sqrt{2}}\right)^2} = 1$ (vektor unit)
 (c) $\sqrt{(-0.6)^2 + (-0.8)^2} = 1$ (vektor unit)
 (d) $\sqrt{\left(\frac{7}{25}\right)^2 + \left(\frac{24}{25}\right)^2} = 1$ (vektor unit)
 (e) $\sqrt{\left(\frac{2}{3}\right)^2 + \left(\frac{\sqrt{7}}{3}\right)^2} = 1.106$ (bukan vektor unit)

$$4. \text{ (a) } \sqrt{k^2} = 1$$

$$k = \pm 1$$

$$\text{(c) } \sqrt{k^2 + 1} = 1$$

$$k^2 = 0$$

$$k = 0$$

$$\text{(e) } \sqrt{(0.5)^2 + k^2} = 1$$

$$(0.5)^2 + k^2 = 1$$

$$k^2 = 0.75$$

$$k = \pm 0.866$$

$$\text{(b) } \sqrt{k^2} = 1$$

$$k = \pm 1$$

$$\text{(d) } \sqrt{k^2 + k^2} = 1$$

$$\sqrt{2k^2} = 1$$

$$k = \pm \frac{1}{\sqrt{2}}$$

$$\text{(f) } \sqrt{k^2 + \left(\frac{13}{84}\right)^2} = 1$$

$$k^2 + \left(\frac{13}{84}\right)^2 = 1$$

$$k^2 = 1 - \left(\frac{13}{84}\right)^2$$

$$k = \pm 0.988$$

$$5. \sqrt{\left(\frac{p}{\sqrt{73}}\right)^2 + \left(\frac{8}{\sqrt{73}}\right)^2} = 1 \quad \text{atau} \quad p^2 + 8^2 = 73$$

$$\left(\frac{p}{\sqrt{73}}\right)^2 + \left(\frac{8}{\sqrt{73}}\right)^2 = 1$$

$$p^2 = 9$$

$$p = \pm 3$$

$$p^2 + 64 = 73$$

$$p^2 = 9$$

$$p = \pm 3$$

$$6. \sqrt{(1-k)^2 + h^2} = 1$$

$$1 - 2k + k^2 + h^2 = 1$$

$$h^2 = 2k - k^2$$

$$h = \pm \sqrt{2k - k^2}$$

Latih Diri 8.9 (Halaman 233)

$$1. \text{ (a) } 2\underset{\sim}{a} - \underset{\sim}{b} + \underset{\sim}{c} = 2\begin{pmatrix} -3 \\ 5 \end{pmatrix} - \begin{pmatrix} 4 \\ -12 \end{pmatrix} + \begin{pmatrix} 1 \\ 8 \end{pmatrix}$$

$$= \begin{pmatrix} -9 \\ 30 \end{pmatrix}$$

$$\text{(b) } -3\underset{\sim}{a} + 2\underset{\sim}{b} - \underset{\sim}{c} = -3\begin{pmatrix} -3 \\ 5 \end{pmatrix} + 2\begin{pmatrix} 4 \\ -12 \end{pmatrix} - \begin{pmatrix} 1 \\ 8 \end{pmatrix}$$

$$= \begin{pmatrix} 16 \\ -47 \end{pmatrix}$$

$$\text{(c) } \frac{1}{2}\underset{\sim}{b} + \underset{\sim}{c} - 3\underset{\sim}{a} = \frac{1}{2}\begin{pmatrix} 4 \\ -12 \end{pmatrix} + \begin{pmatrix} 1 \\ 8 \end{pmatrix} - 3\begin{pmatrix} -3 \\ 5 \end{pmatrix}$$

$$= \begin{pmatrix} 12 \\ -13 \end{pmatrix}$$

$$\text{(d) } \frac{1}{4}\underset{\sim}{b} - \underset{\sim}{a} + 3\underset{\sim}{c} = \frac{1}{4}\begin{pmatrix} 4 \\ -12 \end{pmatrix} - \begin{pmatrix} -3 \\ 5 \end{pmatrix} + 3\begin{pmatrix} 1 \\ 8 \end{pmatrix}$$

$$= \begin{pmatrix} 7 \\ 16 \end{pmatrix}$$

$$\begin{aligned}
 2. \text{ (a) } \underline{u} - 2\underline{v} + \underline{w} &= \begin{pmatrix} 3 \\ 6 \end{pmatrix} - 2\begin{pmatrix} -2 \\ -8 \end{pmatrix} + \begin{pmatrix} 3 \\ -4 \end{pmatrix} \\
 &= \begin{pmatrix} 10 \\ 18 \end{pmatrix} \\
 &= 10\underline{i} + 18\underline{j}
 \end{aligned}$$

$$\begin{aligned}
 \text{(b) } 3\underline{u} + 2\underline{v} - \underline{w} &= 3\begin{pmatrix} 3 \\ 6 \end{pmatrix} + 2\begin{pmatrix} -2 \\ -8 \end{pmatrix} - \begin{pmatrix} 3 \\ -4 \end{pmatrix} \\
 &= \begin{pmatrix} 2 \\ 6 \end{pmatrix} \\
 &= 2\underline{i} + 6\underline{j}
 \end{aligned}$$

$$\begin{aligned}
 \text{(c) } \frac{1}{2}\underline{v} - \underline{w} - 3\underline{u} &= \frac{1}{2}\begin{pmatrix} -2 \\ -8 \end{pmatrix} + \begin{pmatrix} 3 \\ -4 \end{pmatrix} - 3\begin{pmatrix} 3 \\ 6 \end{pmatrix} \\
 &= \begin{pmatrix} -7 \\ -26 \end{pmatrix} \\
 &= -7\underline{i} - 26\underline{j}
 \end{aligned}$$

$$\begin{aligned}
 \text{(d) } \frac{1}{4}\underline{v} - \underline{w} + 3\underline{u} &= \frac{1}{4}\begin{pmatrix} -2 \\ -8 \end{pmatrix} - \begin{pmatrix} 3 \\ -4 \end{pmatrix} + 3\begin{pmatrix} 3 \\ 6 \end{pmatrix} \\
 &= \begin{pmatrix} 5.5 \\ 20 \end{pmatrix} \\
 &= 5.5\underline{i} + 20\underline{j}
 \end{aligned}$$

Latih Diri 8.10 (Halaman 235)

$$1. \overrightarrow{OA} = \begin{pmatrix} -3 \\ -2 \end{pmatrix}, \underline{v} = \begin{pmatrix} 2 \\ -3 \end{pmatrix}$$

Vektor kedudukan selepas 2.5 saat

$$\begin{aligned}
 &= \begin{pmatrix} -3 \\ -2 \end{pmatrix} + 2.5\begin{pmatrix} 2 \\ -3 \end{pmatrix} \\
 &= \begin{pmatrix} 2 \\ -9.5 \end{pmatrix}
 \end{aligned}$$

$$2. \overrightarrow{OA} = \begin{pmatrix} 30t \\ 15t \end{pmatrix}, \overrightarrow{OB} = \begin{pmatrix} 50 + 10t \\ 5 + 10t \end{pmatrix}$$

$$\text{Halaju bot } A = \begin{pmatrix} 30 \\ 15 \end{pmatrix}, \text{ Halaju bot } B = \begin{pmatrix} 10 \\ 10 \end{pmatrix}$$

Kedua-dua bot hanya boleh bertembung jika vektor kedudukan sama pada waktu, t yang sama,

$$\overrightarrow{OA} = \overrightarrow{OB}$$

$$30t = 50 + 10t$$

$$t = \frac{5}{2} \text{ jam}$$

$$15t = 5 + 10t$$

$$t = 1 \text{ jam}$$

Oleh sebab nilai t adalah tidak sama, maka bot A dan bot B tidak akan bertembung.

Latihan Intensif 8.3 (Halaman 235)

$$1. (a) \text{ Daya paduan} = \begin{pmatrix} -4 \\ 3 \end{pmatrix} + \begin{pmatrix} 7 \\ 5 \end{pmatrix} \\ = \begin{pmatrix} 3 \\ 8 \end{pmatrix}$$

$$(b) \text{ Magnitud} = \sqrt{3^2 + 8^2} \\ = 8.544 \text{ N}$$

$$2. \begin{pmatrix} k-3 \\ 14 \end{pmatrix} = \lambda \begin{pmatrix} 1 \\ k-8 \end{pmatrix} \\ k-3 = \lambda \quad \dots \textcircled{1} \\ 14 = \lambda(k-8) \dots \textcircled{2}$$

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

$$14 = (k-3)(k-8) \\ 14 = k^2 - 8k - 3k + 24 \\ 0 = k^2 - 11k + 10 \\ k = 1 \text{ atau } 10$$

$$3. \underline{u} = \begin{pmatrix} 5 \\ -2 \end{pmatrix} - \begin{pmatrix} 3 \\ 1 \end{pmatrix} \qquad \underline{v} = \begin{pmatrix} m \\ -6 \end{pmatrix} - \begin{pmatrix} 5 \\ -2 \end{pmatrix} \\ = \begin{pmatrix} 2 \\ -3 \end{pmatrix} \qquad = \begin{pmatrix} m-5 \\ -4 \end{pmatrix}$$

Oleh sebab \underline{u} dan \underline{v} adalah selari, maka

$$\begin{pmatrix} m-5 \\ -4 \end{pmatrix} = k \begin{pmatrix} 2 \\ -3 \end{pmatrix} \\ m-5 = 2k \dots \textcircled{1} \\ -4 = -3k \\ k = \frac{4}{3} \dots \textcircled{2}$$

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

$$m = 2\left(\frac{4}{3}\right) + 5 \\ = \frac{23}{3}$$

$$|\underline{u}| = \sqrt{2^2 + (-3)^2} \\ = \sqrt{13} \text{ unit}$$

$$\underline{v} = \begin{pmatrix} \frac{8}{3} \\ -4 \end{pmatrix}, |\underline{v}| = \sqrt{\left(\frac{8}{3}\right)^2 + (-4)^2} \\ = \sqrt{\frac{208}{9}}$$

$$|\underline{u}| : |\underline{v}| = \sqrt{13} : \sqrt{\frac{208}{9}} \\ = 13 : \frac{208}{9} \\ = 117 : 208 \\ = 9 : 16$$

$$4. (a) \vec{BC} = \vec{BA} + \vec{AC}$$

$$= \begin{pmatrix} -2 \\ 1 \end{pmatrix} + \begin{pmatrix} 10 \\ 5 \end{pmatrix}$$

$$= \begin{pmatrix} 8 \\ 6 \end{pmatrix}$$

$$\vec{BC} = 8\tilde{i} + 6\tilde{j}$$

$$(b) |\vec{BC}| = \sqrt{8^2 + 6^2}$$

$$= 10$$

$$\text{Vektor unit} = \frac{8\tilde{i} + 6\tilde{j}}{10}$$

$$= \frac{4\tilde{i} + 3\tilde{j}}{5}$$

$$(c) \vec{AR} = \vec{AB} + \vec{BR}$$

$$= \vec{AB} + \frac{1}{2}\vec{BC}$$

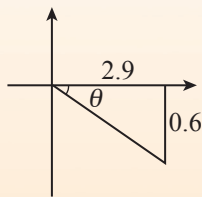
$$= \begin{pmatrix} 2 \\ -1 \end{pmatrix} + \frac{1}{2}\begin{pmatrix} 8 \\ 6 \end{pmatrix}$$

$$= \begin{pmatrix} 6 \\ 2 \end{pmatrix} \text{ atau } 6\tilde{i} + 2\tilde{j}$$

$$5. \tilde{v} = \begin{pmatrix} 2.4 \\ 1.5 \end{pmatrix}, \tilde{a} = \begin{pmatrix} 0.5 \\ -2.1 \end{pmatrix}$$

$$\tilde{v} + \tilde{a} = \begin{pmatrix} 2.4 \\ 1.5 \end{pmatrix} + \begin{pmatrix} 0.5 \\ -2.1 \end{pmatrix}$$

$$= \begin{pmatrix} 2.9 \\ -0.6 \end{pmatrix}$$



$$\text{Magnitud} = \sqrt{(2.9)^2 + (-0.6)^2}$$

$$= 2.96 \text{ km j}^{-1}$$

$$\tan \theta = \frac{0.6}{2.9}$$

$$\theta = 11.69^\circ$$

$$\text{Arah halaju paduan} = 90^\circ + 11.69^\circ$$

$$= 101.69^\circ$$

$$6. (a) \tilde{r} + \tilde{s} = (2\tilde{i} - 5\tilde{j}) + (m\tilde{i} - 3\tilde{j})$$

$$= (2 + m)\tilde{i} - 8\tilde{j}$$

$$|\tilde{r} + \tilde{s}| = \sqrt{(2 + m)^2 + (-8)^2}$$

$$100 = (2 + m)^2 + (-8)^2$$

$$(2 + m)^2 = 36$$

$$2 + m = 6 \quad , \quad 2 + m = -6$$

$$m = 4 \quad , \quad m = -8$$

(b) Oleh sebab \vec{r} selari dengan \vec{s}

$$m\vec{i} - 3\vec{j} = k(2\vec{i} - 5\vec{j})$$

$$m = 2k \dots \text{①}$$

$$-3 = -5k$$

$$k = \frac{3}{5} \dots \text{②}$$

Gantikan ② ke dalam ①

$$m = 2 \times \frac{3}{5}$$

$$= \frac{6}{5}$$

(c) $2\vec{r} - \vec{s} = 2\begin{pmatrix} 2 \\ -5 \end{pmatrix} - \begin{pmatrix} m \\ -3 \end{pmatrix}$

$$= \begin{pmatrix} 4 \\ -10 \end{pmatrix} - \begin{pmatrix} m \\ -3 \end{pmatrix}$$

$$= \begin{pmatrix} 4 - m \\ -7 \end{pmatrix}$$

Oleh sebab $(2\vec{r} - \vec{s})$ selari dengan paksi-y,

$$4 - m = 0$$

$$m = 4$$

7. $\sqrt{k^2 + \left(\frac{1}{\sqrt{2}}\right)^2} = 1$

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

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

$$k = \pm \frac{1}{\sqrt{2}} \text{ atau } \pm \frac{\sqrt{2}}{2}$$

8. Katakan $\vec{a} = 2\vec{i} - \vec{j}$

$$\hat{\vec{a}} = \frac{2\vec{i} - \vec{j}}{\sqrt{5}}$$

Maka, $\vec{y} = \frac{5(-2\vec{i} + \vec{j})}{\sqrt{5}}$

$$= -2\sqrt{5}\vec{i} + \sqrt{5}\vec{j}$$

9. Jika vektor \vec{p} dan vektor \vec{q} berserenjang, maka kecerunan vektor $\vec{p} \times$ kecerunan vektor $\vec{q} = -1$

$$\frac{2}{(m-1)} \times \frac{n}{8} = -1$$

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

$$n = -4m + 4$$

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

$$10. \text{ (a) } \vec{ON} = t(-4\hat{i} + 4\hat{j}) + 50\hat{i} + 20\hat{j} \\ = (50 - 4t)\hat{i} + (20 + 4t)\hat{j}$$

(b) Kapal M akan memintas bot N jika kedua-duanya berada di kedudukan yang sama pada masa yang sama.

$$\vec{OM} = \vec{ON}$$

$$6t\hat{i} + 8t\hat{j} = (50 - 4t)\hat{i} + (20 + 4t)\hat{j}$$

Didapati jika $6t = 50 - 4t$ maka $t = 5$

dan jika $8t = 20 + 4t$ maka $t = 5$

Maka kapal M akan memintas kapal N selepas 5 jam pelayaran.

Latihan Pengukuhan (Halaman 237 – 238)

1. (a) $\hat{a} + \hat{b}$

(b) $\hat{a} - \hat{c}$

2. $3k\hat{a} - 4\hat{b} = \lambda(4\hat{a} + 8\hat{b})$

$$3k = 4\lambda \dots \text{①}$$

$$-4 = 8\lambda$$

$$\lambda = -\frac{1}{2} \dots \text{②}$$

Gantikan ② ke dalam ①

$$3k = 4 \times \left(-\frac{1}{2}\right)$$

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

3. $\sqrt{m^2 + (-n)^2} = 1$

$$m^2 + n^2 = 1$$

$$m^2 = 1 - n^2$$

$$m = \sqrt{1 - n^2}$$

4. $|\hat{u} + \hat{v}| = \sqrt{k^2 + h^2} \dots \text{①}$

$$\hat{u} + \hat{v} = (k\hat{i} + h\hat{j}) + (\hat{i} - 4\hat{j})$$

$$|\hat{u} + \hat{v}| = \sqrt{(k+1)^2 + (h-4)^2} \dots \text{②}$$

$$\text{①} = \text{②}$$

$$k^2 + h^2 = k^2 + 2k + 1 + h^2 - 8h + 16$$

$$8h = 2k + 17$$

$$h = \frac{2k + 17}{8}$$

5. (a) $\vec{AC} = \vec{AB} + \vec{BC}$

$$= \begin{pmatrix} 5 \\ 12 \end{pmatrix} + \begin{pmatrix} 10 \\ -3 \end{pmatrix}$$

$$= \begin{pmatrix} 15 \\ 9 \end{pmatrix}$$

$$|\vec{AC}| = \sqrt{15^2 + 9^2}$$

$$= \sqrt{306}$$

$$\text{Vektor unit} = \frac{15\vec{i} + 9\vec{j}}{\sqrt{306}}$$

$$(b) \vec{OC} = \vec{OA} + \vec{AC}$$

$$= \begin{pmatrix} 3 \\ 4 \end{pmatrix} + \begin{pmatrix} 15 \\ 9 \end{pmatrix}$$

$$= \begin{pmatrix} 18 \\ 13 \end{pmatrix}$$

$$C = (18, 13)$$

$$6. \vec{RS} = \frac{2}{5}(\vec{RQ})$$

$$= \frac{2}{5}(\vec{RP} + \vec{PQ})$$

$$= \frac{2}{5}(3\vec{i} - 2\vec{j})$$

$$7. \vec{BC} = \vec{BE} + \vec{ED} + \vec{DC}$$

$$\vec{BC} = -\vec{v} + \frac{1}{2}\vec{BC} + \vec{u}$$

$$\frac{1}{2}\vec{BC} = \vec{u} - \vec{v}$$

$$\vec{BC} = 2(\vec{u} - \vec{v})$$

$$8. (a) (i) \vec{AB} = \vec{AF} + \vec{FB}$$

$$= -\vec{a} + \vec{b}$$

$$(iii) \vec{FC} = 2\vec{FO}$$

$$= 2(\vec{b} - \vec{a})$$

$$(v) \vec{FD} = \vec{FO} + \vec{OD}$$

$$= \vec{FO} + \vec{BC}$$

$$= \vec{b} - \vec{a} + \vec{b} - 2\vec{a}$$

$$= 2\vec{b} - 3\vec{a}$$

$$(b) \vec{AB} = \frac{1}{2}\vec{FC}$$

$$(c) \vec{AC} = \vec{AB} + \vec{BC}$$

$$= -\vec{a} + \vec{b} + \vec{b} - 2\vec{a}$$

$$= 2\vec{b} - 3\vec{a}$$

$$\vec{FD} = 2\vec{b} - 3\vec{a}$$

Oleh sebab $\vec{AC} = \vec{FD}$, maka \vec{AC} adalah selari dengan \vec{FD} .

$$(ii) \vec{FO} = \vec{FB} + \vec{BO}$$

$$= \vec{b} - \vec{a}$$

$$(iv) \vec{BC} = \vec{BF} + \vec{FC}$$

$$= -\vec{b} + 2(\vec{b} - \vec{a})$$

$$= \vec{b} - 2\vec{a}$$

$$(vi) \vec{AD} = 2\vec{BC}$$

$$= 2(\vec{b} - 2\vec{a})$$

$$\begin{aligned}
 9. \text{ (a) } \vec{AB} &= \vec{AO} + \vec{OB} \\
 &= -\vec{OA} + \vec{OB} \\
 &= \begin{pmatrix} 10 \\ -10 \end{pmatrix} + \begin{pmatrix} 10 \\ -11 \end{pmatrix} \\
 &= \begin{pmatrix} 20 \\ -21 \end{pmatrix}
 \end{aligned}$$

$$\begin{aligned}
 \text{(b) Jarak di antara bandar A dengan bandar B} &= |\vec{AB}| \\
 &= \sqrt{(20)^2 + (-21)^2} \\
 &= 29 \text{ km}
 \end{aligned}$$

$$\begin{aligned}
 \text{(c) } \vec{OC} &= \vec{OA} + \vec{AC} \\
 \vec{OC} &= \vec{OA} + 2\vec{AB} \\
 &= \begin{pmatrix} -10 \\ 10 \end{pmatrix} + 2\begin{pmatrix} 20 \\ -21 \end{pmatrix} \\
 &= \begin{pmatrix} 30 \\ -32 \end{pmatrix}
 \end{aligned}$$

$$\begin{aligned}
 10. \text{ (a) (i) } \vec{AC} &= \vec{AO} + \vec{OC} \\
 &= -3\vec{u} - 2\vec{v} + 9\vec{u} + 2\vec{v} \\
 &= 6\vec{u}
 \end{aligned}$$

$$\begin{aligned}
 \text{(ii) } \vec{OM} &= \vec{OA} + \vec{AM} \\
 &= \vec{OA} + \frac{1}{2}\vec{AC} \\
 &= 3\vec{u} + 2\vec{v} + \frac{1}{2}(6\vec{u}) \\
 &= 6\vec{u} + 2\vec{v}
 \end{aligned}$$

$$\begin{aligned}
 \text{(b) (i) } \vec{OB} &= \frac{3}{2}\vec{OM} \\
 &= \frac{3}{2}(6\vec{u} + 2\vec{v}) \\
 &= 9\vec{u} + 3\vec{v}
 \end{aligned}$$

$$\begin{aligned}
 \text{(ii) } \vec{OB} &= \vec{OC} + \vec{CB} \\
 &= 9\vec{u} + 2\vec{v} + 3k\vec{v} \\
 &= 9\vec{u} + (2 + 3k)\vec{v}
 \end{aligned}$$

$$\vec{OB} = 9\vec{u} + 3\vec{v} \quad \dots \text{ ①}$$

$$\vec{OB} = 9\vec{u} + (2 + 3k)\vec{v} \quad \dots \text{ ②}$$

Persamaan ① = ②, maka

$$2 + 3k = 3$$

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

$$\begin{aligned}
 11. \text{ (a) (i) } \vec{OB} &= \vec{OA} + \vec{AB} \\
 &= 4\vec{a} + 4\vec{c}
 \end{aligned}$$

$$\begin{aligned}
 \text{(ii) } \vec{OD} &= \frac{3}{4}\vec{OB} \\
 &= \frac{3}{4}(4\vec{a} + 4\vec{c}) \\
 &= 3\vec{a} + 3\vec{c}
 \end{aligned}$$

$$\begin{aligned}
 \text{(iii) } \vec{OY} &= \vec{OA} + \vec{AB} + \vec{BY} \\
 &= 4\vec{a} + 4\vec{c} + \frac{1}{2}(4\vec{c}) \\
 &= 4\vec{a} + 6\vec{c}
 \end{aligned}$$

$$\begin{aligned}
 \text{(iv) } \vec{ED} &= \vec{EO} + \vec{OD} \\
 &= \frac{1}{2}(-4\vec{a}) + (3\vec{a} + 3\vec{c}) \\
 &= -2\vec{a} + 3\vec{a} + 3\vec{c} \\
 &= \vec{a} + 3\vec{c}
 \end{aligned}$$

$$\begin{aligned}
 \text{(b) } \vec{D\dot{Y}} &= \vec{D\dot{O}} + \vec{O\dot{Y}} & \vec{E\dot{D}} &= \underline{a} + 3\underline{c} \\
 &= -\vec{O\dot{D}} + \vec{O\dot{Y}} \\
 &= -(3\underline{a} + 3\underline{c}) + (4\underline{a} + 6\underline{c}) \\
 &= \underline{a} + 3\underline{c}
 \end{aligned}$$

Oleh sebab $\vec{E\dot{D}} = \vec{D\dot{Y}}$ dan D ialah titik sepunya, maka E , D dan Y berada dalam satu garis lurus.

$$\begin{aligned}
 \text{12. (a) Halaju paduan bot Arul} &= (3\underline{i} + \underline{j}) + \left(\underline{i} + \frac{1}{3}\underline{j}\right) \\
 &= 4\underline{i} + \frac{4}{3}\underline{j}
 \end{aligned}$$

$$\begin{aligned}
 \text{Magnitud bagi vektor paduan bot Arul} &= \sqrt{4^2 + \left(\frac{4}{3}\right)^2} \\
 &= 4.216 \text{ m s}^{-1}
 \end{aligned}$$

$$\begin{aligned}
 \text{Halaju paduan bot Ben} &= (6\underline{i} + 2\underline{j}) + \left(\underline{i} + \frac{1}{3}\underline{j}\right) \\
 &= 7\underline{i} + \frac{7}{3}\underline{j}
 \end{aligned}$$

$$\begin{aligned}
 \text{Magnitud bagi vektor paduan bot Ben} &= \sqrt{7^2 + \left(\frac{7}{3}\right)^2} \\
 &= 7.379 \text{ m s}^{-1}
 \end{aligned}$$

$$\begin{aligned}
 \text{Beza laju} &= 7.379 - 4.216 \\
 &= 3.163 \text{ m s}^{-1}
 \end{aligned}$$

$$\begin{aligned}
 \text{(b) Halaju paduan bot Raju} &= \left(2\underline{i} - \frac{4}{3}\underline{j}\right) + \left(\underline{i} + \frac{1}{3}\underline{j}\right) \\
 &= 3\underline{i} - \underline{j}
 \end{aligned}$$

$$\begin{aligned}
 \text{Magnitud bagi vektor paduan bot Raju} &= \sqrt{3^2 + (-1)^2} \\
 &= \sqrt{10}
 \end{aligned}$$

$$\text{Vektor unit pada arah vektor tersebut ialah } \frac{3\underline{i} - \underline{j}}{\sqrt{10}}$$