- 1 a $|\mathbf{bmit}a| = \sqrt{1+9} = \sqrt{10}$
 - $\therefore \backslash \overrightarrow{\text{bmit}} a = \frac{1}{\sqrt{10}} (\backslash \overrightarrow{\text{bmit}} i + 3 \backslash \overrightarrow{\text{bmit}} j)$
 - **b** $|\ | bmit b| = \sqrt{4+4} = \sqrt{8} = 2\sqrt{2}$
 - $\therefore \setminus \hat{\mathrm{bmit}}a = \frac{1}{2\sqrt{2}}(2 \setminus \mathrm{bmit}i + 2 \setminus \mathrm{bmit}j) = \frac{1}{\sqrt{2}}(\setminus \mathrm{bmit}i + \setminus \mathrm{bmit}j)$
 - $\mathbf{c} \quad \mathbf{bmit} c = \overrightarrow{AB} = \overrightarrow{AO} + \overrightarrow{OB} = \mathbf{bmit} i \mathbf{bmit} j$
 - $\therefore \hat{bmit}c = \frac{1}{\sqrt{2}}(\hat{bmit}i \hat{bmit}j)$
- 2 a i $\hat{bmit}a = \frac{1}{5}(3\hat{bmit}i + 4\hat{bmit}j)$
 - ii $|\langle bmitb | = \sqrt{2}$
 - **b** $\frac{\sqrt{2}}{5}(3\backslash bmiti + 4\backslash bmitj)$
- 3 a i $\hat{bmit}a = \frac{1}{5}(3\hat{bmit}i + 4\hat{bmit}j)$
 - ii $\hat{bmit}b = \frac{1}{12}(5\hat{bmit}i + 12\hat{bmit}j)$
 - **b** Let $\overrightarrow{OA'} = \backslash \overrightarrow{\text{bmit}} a$ and $\overrightarrow{OB'} = \backslash \overrightarrow{\text{bmit}} b$

Then $\triangle A'OB'$ is isosceles. Therefore the angle bisector of $\angle AOB$ passes through the midpoint of A'B'.

Let M be the midpoint of A'B'

Ther

$$egin{aligned} \overrightarrow{OM} &= rac{1}{2}(\hat{\mathbf{bmit}a} + \hat{\mathbf{bmit}b}) \ &= rac{1}{2}(rac{1}{5}(3\hat{\mathbf{bmit}i} + 4\hat{\mathbf{bmit}j}) + rac{1}{13}(5\hat{\mathbf{bmit}i} + 12\hat{\mathbf{bmit}j})) \ &= rac{8}{65}(4\hat{\mathbf{bmit}i} + 7\hat{\mathbf{bmit}j}) \end{aligned}$$

.:. the unit vector in the direction of

$$\overrightarrow{OM}$$
 is: = $\frac{1}{\sqrt{65}}(4 \backslash \mathbf{bmit}i + 7 \backslash \mathbf{bmit}j)$

 $\begin{subarray}{l} \begin{subarray}{l} \beg$

$$\frac{\langle \mathrm{bmit} a \cdot \langle \mathrm{bmit} b \rangle}{\langle \mathrm{bmit} b \cdot \langle \mathrm{bmit} b \rangle} = \frac{1-12}{17} (\langle \mathrm{bmit} i - 4 \rangle)$$

$$= -\frac{11}{17}(\backslash \mathbf{bmit}i - 4 \backslash \mathbf{bmit}j)$$

$$\textbf{b} \quad \backslash \text{bmit} a = \backslash \text{bmit} i - 3 \backslash \text{bmit} j, \backslash \text{bmit} b = \backslash \text{bmit} i - 4 \backslash \text{bmit} j$$

$$\frac{\langle bmita \cdot \langle bmitb \rangle}{\langle bmitb \cdot \langle bmitb \rangle} \langle bmitb = \frac{1+12}{17} (\langle bmiti - 4 \rangle bmitj)$$

$$=\frac{13}{17}(\backslash \overline{\mathrm{bmit}i}-4\backslash \overline{\mathrm{bmit}j})$$

c The vector resolute is $\backslash bmitb$

- 5 a $\frac{\langle \mathrm{bmit} a \cdot \langle \mathrm{bmit} b \rangle}{|\langle \mathrm{bmit} b \rangle|} = \frac{2}{1} = 2$
 - $\mathbf{b} \quad \frac{\langle \mathbf{bmit} a \cdot \langle \mathbf{bmit} c \rangle}{|\langle \mathbf{bmit} c \rangle|} = \frac{3-2}{\sqrt{5}} = \frac{1}{\sqrt{5}}$

$$\mathbf{c} \quad \frac{\langle \mathbf{bmit} a \cdot \langle \mathbf{bmit} b \rangle}{|\langle \mathbf{bmit} a \rangle} = \frac{2\sqrt{3}}{\sqrt{7}}$$

$$\mathbf{d} \quad \frac{\backslash \mathbf{bmit} b \cdot \backslash \mathbf{bmit} c}{|\backslash \mathbf{bmit} c|} = \frac{-1 - 4\sqrt{5}}{\sqrt{17}}$$

6 a
$$oldsymbol{a} = oldsymbol{u} + oldsymbol{w}$$
 where $oldsymbol{u} = 2oldsymbol{i}$ and $oldsymbol{w} = oldsymbol{j}$

$$oldsymbol{a} = oldsymbol{u} + oldsymbol{w}$$
 where $oldsymbol{u} = 2oldsymbol{i} + 2oldsymbol{j}$ and $oldsymbol{w} = oldsymbol{i} - oldsymbol{j}$

$$\mathbf{c} \quad \mathbf{a} = \mathbf{u} + \mathbf{w}$$
 where $\mathbf{u} = \mathbf{0}$ and $\mathbf{w} = -\mathbf{i} + \mathbf{j}$

7 a
$$\frac{\langle \mathrm{bmit} a \cdot \backslash \mathrm{bmit} b}{\langle \mathrm{bmit} b \cdot \backslash \mathrm{bmit} b} \setminus \mathrm{bmit} b = 2(\langle \mathrm{bmit} i + \langle \mathrm{bmit} j \rangle)$$

$$\mathbf{b} \quad \mathsf{Let} \stackrel{\longrightarrow}{OC} = 2(\backslash \mathsf{bmit} i + \backslash \mathsf{bmit} j)$$

 $\overset{
ightarrow}{OC}$ is the vector resolute of ackslash in the direction of ackslash in the direction of ackslash

 $\therefore \overrightarrow{CA}$ is a vector perpendicular to \overrightarrow{OB}

$$\overrightarrow{CA} = \overrightarrow{CO} + \overrightarrow{OA}$$

$$= -2(\langle \mathbf{bmit}i + \langle \mathbf{bmit}j \rangle) + (\langle \mathbf{bmit}i + 3 \rangle \mathbf{bmit}j)$$

$$= -\langle \mathbf{bmit}i + \langle \mathbf{bmit}j \rangle$$

Therefore the unit vector is $\frac{1}{\sqrt{2}}(-\begin{subarray}{c} -\begin{subarray}{c} -\begin{s$

8 a
$$\frac{\langle \text{bmit} a \cdot \langle \text{bmit} b \rangle}{\langle \text{bmit} b \cdot \langle \text{bmit} b \rangle} = \frac{3}{2} (\langle \text{bmit} i - \langle \text{bmit} j \rangle)$$

$$\begin{array}{ll} \mathbf{b} & \langle \mathbf{bmit}a \cdot \langle \mathbf{bmit}b \rangle \\ & \langle \mathbf{bmit}a \cdot \langle \mathbf{bmit}b \rangle \\ & = \frac{1}{2}(8 \backslash \mathbf{bmit}i + 2 \backslash \mathbf{bmit}j - 3 \backslash \mathbf{bmit}i + 3 \backslash \mathbf{bmit}j) \\ & = \frac{1}{2}(5 \backslash \mathbf{bmit}i + 5 \backslash \mathbf{bmit}j) \end{array}$$

c Distance =
$$|\frac{1}{2}(5\backslash \mathbf{bmit}i + 5\backslash \mathbf{bmit}j)| = \frac{5\sqrt{2}}{2}$$

$$\overset{
ightarrow}{OA} = \backslash \mathrm{bmit} a = \backslash \mathrm{bmit} i + 2 \backslash \mathrm{bmit} j$$

$$\overrightarrow{OB} = \backslash \mathbf{bmit}b = 2\backslash \mathbf{bmit}i + \backslash \mathbf{bmit}j$$

$$\overset{
ightarrow}{OC} = \backslash \mathrm{bmit} c = 2 \backslash \mathrm{bmit} i - 3 \backslash \mathrm{bmit} j$$

$$\begin{array}{ll} \mathbf{a} & \overrightarrow{AB} = \overrightarrow{AO} + \overrightarrow{OB} \\ & = -\backslash \mathrm{bmit} i - 2 \backslash \mathrm{bmit} j + 2 \backslash \mathrm{bmit} i + \backslash \mathrm{bmit} j \\ & = \backslash \mathrm{bmit} i - \backslash \mathrm{bmit} j \end{array}$$

$$\begin{array}{ll} \textbf{b} & \text{The vector resolute} = \dfrac{\overrightarrow{AB} \cdot \overrightarrow{AC}}{\overrightarrow{AC} \cdot \overrightarrow{AC}} \overset{\rightarrow}{AC} \\ & = \dfrac{1+5}{26} (\backslash \text{bmit} i - 5 \backslash \text{bmit} j) \end{array}$$

$$= \frac{3}{13}(\langle bmiti - 5 \rangle bmitj)$$

$$\begin{array}{ll} \textbf{c} & \text{The shortest distance} = \overrightarrow{AB} - \frac{3}{13}(\begin{subarray}{c} \begin{subarray}{c} \begin$$

The shortest distance is the height of triangle
$$ABC$$
 wherethe base is taken as AC Therefore height $=|\frac{3}{13}(10\backslash \mathrm{bmit}i+2\backslash \mathrm{bmit}j)|=\frac{1}{13}\sqrt{104}=\frac{2}{13}\sqrt{26}$

d The area of the triangle
$$= \frac{1}{2} \times \frac{1}{13} \sqrt{104} \times \sqrt{26}$$

$$= 2$$

,