# EXERCISE 7.2

### Question # 1

Given $A(2,5)$ , $B(-1,1)$ and $C(2,-6)$

**(i)** $\overrightarrow{AB} = (-1-2)\underline{\hat{i}} + (1-5)\underline{\hat{j}} = -3\underline{\hat{i}} - 4\underline{\hat{j}}$

**(ii)** From above $\overrightarrow{AB} = -3\underline{\hat{i}} - 4\underline{\hat{j}}$

Also $\overrightarrow{CB} = (2+1)\underline{\hat{i}} + (-6-1)\underline{\hat{j}} = 3\underline{\hat{i}} - 7\underline{\hat{j}}$

Now

$$2\overrightarrow{AB} - \overrightarrow{CB} = 2\left(-3\underline{\hat{i}} - 4\underline{\hat{j}}\right) - \left(3\underline{\hat{i}} - 7\underline{\hat{j}}\right)$$
$$= -6\underline{\hat{i}} - 8\underline{\hat{j}} - 3\underline{\hat{i}} + 7\underline{\hat{j}}$$
$$= -9\underline{\hat{i}} - \underline{\hat{j}}$$

**(iii)** *Do yourself as above*

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### Question # 2

**(i)** $\underline{u} = \underline{\hat{i}} + 2\underline{\hat{j}} - \underline{\hat{k}}$

$\underline{v} = 3\underline{\hat{i}} - 2\underline{\hat{j}} + 2\underline{\hat{k}}$

$\underline{w} = 5\underline{\hat{i}} - \underline{\hat{j}} + 3\underline{\hat{k}}$

$$\underline{u} + 2\underline{v} + \underline{w} = \underline{\hat{i}} + 2\underline{\hat{j}} - \underline{\hat{k}} + 2\left(3\underline{\hat{i}} - 2\underline{\hat{j}} + 2\underline{\hat{k}}\right) + \left(5\underline{\hat{i}} - \underline{\hat{j}} + 3\underline{\hat{k}}\right)$$
$$= \underline{\hat{i}} + 2\underline{\hat{j}} - \underline{\hat{k}} + 6\underline{\hat{i}} - 4\underline{\hat{j}} + 4\underline{\hat{k}} + 5\underline{\hat{i}} - \underline{\hat{j}} + 3\underline{\hat{k}}$$
$$= 12\underline{\hat{i}} - 3\underline{\hat{j}} - 6\underline{\hat{k}}$$

**(ii)** *Do yourself*

**(iii)**

$$3\underline{v} + \underline{w} = 3\left(3\underline{\hat{i}} - 2\underline{\hat{j}} + 2\underline{\hat{k}}\right) + 5\underline{\hat{i}} - \underline{\hat{j}} + 3\underline{\hat{k}}$$
$$= 9\underline{\hat{i}} - 6\underline{\hat{j}} + 6\underline{\hat{k}} + 5\underline{\hat{i}} - \underline{\hat{j}} + 3\underline{\hat{k}}$$
$$= 14\underline{\hat{i}} - 7\underline{\hat{j}} + 9\underline{\hat{k}}$$

Now $\left|3\underline{v} + \underline{w}\right| = \sqrt{(14)^2 + (-7)^2 + (9)^2}$
$$= \sqrt{196 + 49 + 81} = \sqrt{326}$$

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### Question # 3

**(i)** $\underline{v} = 2\underline{\hat{i}} + 3\underline{\hat{j}} + 4\underline{\hat{k}}$

$$\Rightarrow \left|\underline{v}\right| = \sqrt{(2)^2 + (3)^2 + (4)^2}$$
$$= \sqrt{4 + 9 + 16} = \sqrt{29}$$

Unit vector of $\underline{v} = \underline{\hat{v}} = \dfrac{\underline{v}}{\left|\underline{v}\right|} = \dfrac{2\underline{\hat{i}} + 3\underline{\hat{j}} + 4\underline{\hat{k}}}{\sqrt{29}}$

$$= \frac{2}{\sqrt{29}}\underline{\hat{i}} + \frac{3}{\sqrt{29}}\underline{\hat{j}} + \frac{4}{\sqrt{29}}\underline{\hat{k}}$$

Hence direction cosines of $\underline{v}$ are

$$\frac{2}{\sqrt{29}}, \frac{3}{\sqrt{29}}, \frac{4}{\sqrt{29}}.$$

**(ii)** *Do yourself as above.*

**(iii)** *Do yourself as (i)*

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### Question # 4

Since $\left|\alpha\underline{\hat{i}} + (\alpha+1)\underline{\hat{j}} + 2\underline{\hat{k}}\right| = 3$

$$\Rightarrow \sqrt{\alpha^2 + (\alpha+1)^2 + (2)^2} = 3$$
$$\Rightarrow \sqrt{\alpha^2 + \alpha^2 + 2\alpha + 1 + 4} = 3$$

On squaring both sides

$$2\alpha^2 + 2\alpha + 5 = 9$$
$$\Rightarrow 2\alpha^2 + 2\alpha + 5 - 9 = 0$$
$$\Rightarrow 2\alpha^2 + 2\alpha - 4 = 0$$
$$\Rightarrow \alpha^2 + \alpha - 2 = 0$$
$$\Rightarrow \alpha^2 + 2\alpha - \alpha - 2 = 0$$
$$\Rightarrow \alpha(\alpha+2) - 1(\alpha+2) = 0$$
$$\Rightarrow (\alpha+2)(\alpha-1) = 0$$
$$\Rightarrow \alpha + 2 = 0 \quad \text{or} \quad \alpha - 1 = 0$$
$$\Rightarrow \alpha = -2 \quad \text{or} \quad \alpha = 1$$

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### Question # 5

Given $\underline{v} = \underline{\hat{i}} + 2\underline{\hat{j}} - \underline{\hat{k}}$

$$\left|\underline{v}\right| = \sqrt{(1)^2 + (2)^2 + (-1)^2}$$
$$= \sqrt{1 + 4 + 1} = \sqrt{6}$$

Now

$$\underline{\hat{v}} = \frac{\underline{v}}{\left|\underline{v}\right|} = \frac{\underline{\hat{i}} + 2\underline{\hat{j}} - \underline{\hat{k}}}{\sqrt{6}}$$
$$= \frac{1}{\sqrt{6}}\underline{\hat{i}} + \frac{2}{\sqrt{6}}\underline{\hat{j}} - \frac{1}{\sqrt{6}}\underline{\hat{k}}$$

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### Question # 6

Given $\underline{a} = 3\underline{\hat{i}} - \underline{\hat{j}} - 4\underline{\hat{k}}$

$\underline{b} = -2\underline{\hat{i}} - 4\underline{\hat{j}} - 3\underline{\hat{k}}$

$\underline{c} = \underline{\hat{i}} + 2\underline{\hat{j}} - \underline{\hat{k}}$

Suppose that

$$\underline{d} = 3\underline{a} - 2\underline{b} + 4\underline{c}$$
$$\Rightarrow \underline{d} = 3\left(3\underline{\hat{i}} - \underline{\hat{j}} - 4\underline{\hat{k}}\right) - 2\left(-2\underline{\hat{i}} - 4\underline{\hat{j}} - 3\underline{\hat{k}}\right) + 4\left(\underline{\hat{i}} + 2\underline{\hat{j}} - \underline{\hat{k}}\right)$$
$$= 9\underline{\hat{i}} - 3\underline{\hat{j}} - 12\underline{\hat{k}} + 4\underline{\hat{i}} + 8\underline{\hat{j}} + 6\underline{\hat{k}} + 4\underline{\hat{i}} + 8\underline{\hat{j}} - 4\underline{\hat{k}}$$
$$= 17\underline{\hat{i}} - 13\underline{\hat{j}} - 10\underline{\hat{k}}$$

Now

$$\left|\underline{d}\right| = \sqrt{(17)^2 + (-13)^2 + (-10)^2}$$

$$= \sqrt{289+169+100} \quad = \sqrt{558} \quad = 3\sqrt{62}$$

Now

$$\hat{\underline{d}} = \frac{\underline{d}}{|\underline{d}|} = \frac{17\hat{\underline{i}} - 13\hat{\underline{j}} - 10\hat{\underline{k}}}{3\sqrt{62}}$$

$$= \frac{17}{3\sqrt{62}}\hat{\underline{i}} - \frac{13}{3\sqrt{62}}\hat{\underline{j}} - \frac{10}{3\sqrt{62}}\hat{\underline{k}}$$

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## ***Question # 7***

Consider $\underline{a} = 2\hat{\underline{i}} - 3\hat{\underline{j}} + 6\hat{\underline{k}}$

$$|\underline{a}| = \sqrt{(2)^2 + (-3)^2 + (6)^2}$$

$$= \sqrt{4+9+36} \quad = \sqrt{49} = 7$$

Now

$$\hat{\underline{a}} = \frac{\underline{a}}{|\underline{a}|} = \frac{2\hat{\underline{i}} - 3\hat{\underline{j}} + 6\hat{\underline{k}}}{7}$$

$$= \frac{2}{7}\hat{\underline{i}} - \frac{3}{7}\hat{\underline{j}} + \frac{6}{7}\hat{\underline{k}}$$

Let $\underline{b}$ be a vector having magnitude 4

i.e. $|\underline{b}| = 4$

Since $\underline{b}$ is parallel to $\underline{a}$

therefore $\hat{\underline{b}} = \hat{\underline{a}} = \frac{2}{7}\hat{\underline{i}} - \frac{3}{7}\hat{\underline{j}} + \frac{6}{7}\hat{\underline{k}}$

Now $\underline{b} = |\underline{b}|\hat{\underline{b}} = 4\left(\frac{2}{7}\hat{\underline{i}} - \frac{3}{7}\hat{\underline{j}} + \frac{6}{7}\hat{\underline{k}}\right)$

$$= \frac{8}{7}\hat{\underline{i}} - \frac{12}{7}\hat{\underline{j}} + \frac{24}{7}\hat{\underline{k}}$$

***(ii)*** *Do yourself.*

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## ***Question # 8***

Given $\underline{u} = 2\hat{\underline{i}} + 3\hat{\underline{j}} + 4\hat{\underline{k}}$

$$\underline{v} = -\hat{\underline{i}} + 3\hat{\underline{j}} - \hat{\underline{k}}$$

$$\underline{w} = \hat{\underline{i}} + 6\hat{\underline{j}} + z\hat{\underline{k}}$$

Since $\underline{u}$, $\underline{v}$ and $\underline{w}$ are sides of triangle therefore

$$\underline{u} + \underline{v} = \underline{w}$$

$$\Rightarrow \ 2\hat{\underline{i}} + 3\hat{\underline{j}} + 4\hat{\underline{k}} - \hat{\underline{i}} + 3\hat{\underline{j}} - \hat{\underline{k}} = \hat{\underline{i}} + 6\hat{\underline{j}} + z\hat{\underline{k}}$$

$$\Rightarrow \ \hat{\underline{i}} + 6\hat{\underline{j}} + 3\hat{\underline{k}} = \hat{\underline{i}} + 6\hat{\underline{j}} + z\hat{\underline{k}}$$

Equating coefficient of $\hat{\underline{k}}$ only, we have

$3 = z$ i.e. $\boxed{z = 3}$

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## ***Question # 9***

Position vector (p.v) of point $A = 2\hat{\underline{i}} - \hat{\underline{j}} + \hat{\underline{k}}$

p.v of point $B = 3\hat{\underline{i}} + \hat{\underline{j}}$

p.v. of point $C = 2\hat{\underline{i}} + 4\hat{\underline{j}} - 2\hat{\underline{k}}$

p.v. of point $D = -\hat{\underline{i}} - 2\hat{\underline{j}} + \hat{\underline{k}}$

$\overrightarrow{AB} =$ p.v. of $B -$ p.v. of $A$

$$= 3\hat{\underline{i}} + \hat{\underline{j}} - 2\hat{\underline{i}} + \hat{\underline{j}} - \hat{\underline{k}} = \hat{\underline{i}} + 2\hat{\underline{j}} - \hat{\underline{k}}$$

$\overrightarrow{CD}$ = p.v. of $D -$ p.v. of $C$

$$= -\hat{\underline{i}} - 2\hat{\underline{j}} + \hat{\underline{k}} - 2\hat{\underline{i}} - 4\hat{\underline{j}} + 2\hat{\underline{k}}$$

$$= -3\hat{\underline{i}} - 6\hat{\underline{j}} + 3\hat{\underline{k}}$$

$$= -3\left(\hat{\underline{i}} + 2\hat{\underline{j}} - \hat{\underline{k}}\right) = -3\overrightarrow{AB}$$

i.e. $\overrightarrow{CD} = \lambda\overrightarrow{AB}$ where $\lambda = -3$

Hence $\overrightarrow{AB}$ and $\overrightarrow{CD}$ are parallel.

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## ***Question # 10 (i)***

$$\underline{v} = 2\hat{\underline{i}} - 4\hat{\underline{j}} + 4\hat{\underline{k}}$$

$$|\underline{v}| = \sqrt{(2)^2 + (-4)^2 + (4)^2}$$

$$= \sqrt{4+16+16} \quad = \sqrt{36} \quad = 6$$

Now $\hat{\underline{v}} = \frac{\underline{v}}{|\underline{v}|} = \frac{2\hat{\underline{i}} - 4\hat{\underline{j}} + 4\hat{\underline{k}}}{6}$

$$= \frac{1}{3}\hat{\underline{i}} - \frac{2}{3}\hat{\underline{j}} + \frac{2}{3}\hat{\underline{k}}$$

The two vectors of length 2 and parallel to $\underline{v}$ are $2\hat{\underline{v}}$ and $-2\hat{\underline{v}}$.

$$2\hat{\underline{v}} = 2\left(\frac{1}{3}\hat{\underline{i}} - \frac{2}{3}\hat{\underline{j}} + \frac{2}{3}\hat{\underline{k}}\right) = \frac{2}{3}\hat{\underline{i}} - \frac{4}{3}\hat{\underline{j}} + \frac{4}{3}\hat{\underline{k}}$$

$$-2\hat{\underline{v}} = -2\left(\frac{1}{3}\hat{\underline{i}} - \frac{2}{3}\hat{\underline{j}} + \frac{2}{3}\hat{\underline{k}}\right) = -\frac{2}{3}\hat{\underline{i}} + \frac{4}{3}\hat{\underline{j}} - \frac{4}{3}\hat{\underline{k}}$$

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## ***Question # 10 (ii)***

Given $\underline{v} = \hat{\underline{i}} - 3\hat{\underline{j}} + 4\hat{\underline{k}}$ , $\underline{w} = a\hat{\underline{i}} + 9\hat{\underline{j}} - 12\hat{\underline{k}}$

Since $\underline{v}$ and $\underline{w}$ are parallel therefore there exists $\lambda \in \mathbb{R}$ such that

$$\underline{v} = \lambda\underline{w}$$

$$\Rightarrow \ \hat{\underline{i}} - 3\hat{\underline{j}} + 4\hat{\underline{k}} = \lambda\left(a\hat{\underline{i}} + 9\hat{\underline{j}} - 12\hat{\underline{k}}\right)$$

$$\Rightarrow \ \hat{\underline{i}} - 3\hat{\underline{j}} + 4\hat{\underline{k}} = a\lambda\hat{\underline{i}} + 9\lambda\hat{\underline{j}} - 12\lambda\hat{\underline{k}}$$

Comparing coefficients of $\hat{\underline{i}}$ , $\hat{\underline{j}}$ and $\hat{\underline{k}}$

$1 = a\lambda$ .............$(i)$

$-3 = 9\lambda$ .............$(ii)$

$4 = -12\lambda$ .............$(iii)$

From $(ii)$ $\lambda = -\frac{3}{9} \quad \Rightarrow \quad \lambda = -\frac{1}{3}$

Putting in equation $(i)$

$1 = a\left(-\frac{1}{3}\right) \Rightarrow \ -3 = a$ i.e. $\boxed{a = -3}$

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## ***Question # 10 (c)***

Consider $\underline{v} = \hat{\underline{i}} - 2\hat{\underline{j}} + 3\hat{\underline{k}}$

$$|\underline{v}| = \sqrt{(1)^2 + (-2)^2 + (3)^2}$$

$$= \sqrt{1+4+9} \quad = \sqrt{14}$$

Now

$$\hat{\underline{v}}=\frac{\underline{v}}{|\underline{v}|}=\frac{\hat{\underline{i}}-2\hat{\underline{j}}+3\hat{\underline{k}}}{\sqrt{14}}$$
$$=\frac{1}{\sqrt{14}}\hat{\underline{i}}-\frac{2}{\sqrt{14}}\hat{\underline{j}}+\frac{3}{\sqrt{14}}\hat{\underline{k}}$$

Let $\underline{a}$ be a vector having magnitude 5 i.e. $|\underline{a}|=5$

Since $\underline{a}$ is parallel to $\underline{v}$ but opposite in direction,

therefore

$$\hat{\underline{a}}=-\hat{\underline{v}}=-\frac{1}{\sqrt{14}}\hat{\underline{i}}+\frac{2}{\sqrt{14}}\hat{\underline{j}}-\frac{3}{\sqrt{14}}\hat{\underline{k}}$$

Now

$$\underline{a}=|\underline{a}|\hat{\underline{a}}=5\left(-\frac{1}{\sqrt{14}}\hat{\underline{i}}+\frac{2}{\sqrt{14}}\hat{\underline{j}}-\frac{3}{\sqrt{14}}\hat{\underline{k}}\right)$$
$$=-\frac{5}{\sqrt{14}}\hat{\underline{i}}+\frac{5}{\sqrt{14}}\hat{\underline{j}}-\frac{5}{\sqrt{14}}\hat{\underline{k}}$$

## Question # 10 (d)

Suppose that $\underline{v}=3\hat{\underline{i}}-\hat{\underline{j}}+4\hat{\underline{k}}$ and

$\underline{w}=a\hat{\underline{i}}+b\hat{\underline{j}}-2\hat{\underline{k}}$

$\because$ $\underline{v}$ and $\underline{w}$ are parallel

$\therefore$ there exists $\lambda\in\mathbb{R}$ such that

$$\underline{v}=\lambda\underline{w}$$

$\Rightarrow\ 3\hat{\underline{i}}-\hat{\underline{j}}+4\hat{\underline{k}}=\lambda\left(a\hat{\underline{i}}+b\hat{\underline{j}}-2\hat{\underline{k}}\right)$

$\Rightarrow\ 3\hat{\underline{i}}-\hat{\underline{j}}+4\hat{\underline{k}}=a\lambda\hat{\underline{i}}+b\lambda\hat{\underline{j}}-2\lambda\hat{\underline{k}}$

Comparing coefficients of $\hat{\underline{i}}$ , $\hat{\underline{j}}$ and $\hat{\underline{k}}$

$3=a\lambda$ ............$(i)$

$-1=b\lambda$ ............$(ii)$

$4=-2\lambda$ ............$(iii)$

From equation $(iii)$

$$-\frac{4}{2}=\lambda\quad\Rightarrow\quad\lambda=-2$$

Putting value of $\lambda$ in equation $(i)$

$$3=a(-2)\quad\Rightarrow\quad\boxed{a=-\frac{3}{2}}$$

Putting value of $\lambda$ in equation $(ii)$

$$-1=b(-2)\quad\Rightarrow\quad\boxed{b=\frac{1}{2}}$$

## Question # 11 (i)

$$\underline{v}=3\hat{\underline{i}}-\hat{\underline{j}}+2\hat{\underline{k}}$$
$$|\underline{v}|=\sqrt{(3)^2+(-1)^2+(2)^2}$$
$$=\sqrt{9+1+4}=\sqrt{14}$$

Let $\hat{\underline{v}}$ be unit vector along $\underline{v}$. Then

$$\hat{\underline{v}}=\frac{\underline{v}}{|\underline{v}|}=\frac{3\hat{\underline{i}}-\hat{\underline{j}}+2\hat{\underline{k}}}{\sqrt{14}}$$
$$=\frac{3}{\sqrt{14}}\hat{\underline{i}}-\frac{1}{\sqrt{14}}\hat{\underline{j}}+\frac{2}{\sqrt{14}}\hat{\underline{k}}$$
$$\hat{\underline{v}}=\left[\frac{3}{\sqrt{14}},-\frac{1}{\sqrt{14}},\frac{2}{\sqrt{14}}\right]$$

Hence the direction cosines of $\underline{v}$ are

$$\frac{3}{\sqrt{14}},-\frac{1}{\sqrt{14}},\frac{2}{\sqrt{14}}.$$

## Question # 11 (ii)

$$\underline{v}=6\hat{\underline{i}}-2\hat{\underline{j}}+\hat{\underline{k}}$$
$$|\underline{v}|=\sqrt{(6)^2+(-2)^2+(1)^2}$$
$$=\sqrt{36+4+1}=\sqrt{41}$$

Let $\hat{\underline{v}}$ be unit vector along $\underline{v}$. Then

$$\hat{\underline{v}}=\frac{\underline{v}}{|\underline{v}|}=\frac{6\hat{\underline{i}}-2\hat{\underline{j}}+\hat{\underline{k}}}{\sqrt{41}}$$
$$=\frac{6}{\sqrt{41}}\hat{\underline{i}}-\frac{2}{\sqrt{41}}\hat{\underline{j}}+\frac{1}{\sqrt{41}}\hat{\underline{k}}$$
$$\hat{\underline{v}}=\left[\frac{6}{\sqrt{41}},\frac{-2}{\sqrt{41}},\frac{1}{\sqrt{41}}\right]$$

Hence the direction cosines of $\underline{v}$ are

$$\frac{6}{\sqrt{41}},\frac{-2}{\sqrt{41}},\frac{1}{\sqrt{41}}.$$

## Question # 11 (iii)

$$P=(2,1,5),\ Q=(1,3,1)$$
$$\overrightarrow{PQ}=(1-2)\hat{\underline{i}}+(3-1)\hat{\underline{j}}+(1-5)\hat{\underline{k}}$$
$$=-\hat{\underline{i}}+2\hat{\underline{j}}-4\hat{\underline{k}}$$
$$\left|\overrightarrow{PQ}\right|=\sqrt{(-1)^2+(2)^2+(-4)^2}$$
$$=\sqrt{1+4+16}=\sqrt{21}$$

Let $\hat{\underline{v}}$ be unit vector along $\overrightarrow{PQ}$. Then

$$\hat{\underline{v}}=\frac{\overrightarrow{PQ}}{\left|\overrightarrow{PQ}\right|}=\frac{-\hat{\underline{i}}+2\hat{\underline{j}}-4\hat{\underline{k}}}{\sqrt{21}}$$
$$=\frac{-1}{\sqrt{21}}\hat{\underline{i}}+\frac{2}{\sqrt{21}}\hat{\underline{j}}-\frac{4}{\sqrt{21}}\hat{\underline{k}}$$
$$\hat{\underline{v}}=\left[\frac{-1}{\sqrt{21}},\frac{2}{\sqrt{21}},\frac{-4}{\sqrt{21}}\right]$$

Hence the direction cosines of $\overrightarrow{PQ}$ are

$$\frac{-1}{\sqrt{21}},\frac{2}{\sqrt{21}},\frac{-4}{\sqrt{21}}.$$

## Question # 12(i)

$45^\circ,45^\circ,60^\circ$ will be direction angles of the vectors if

$$\cos^2 45^\circ+\cos^2 45^\circ+\cos^2 60^\circ=1$$

L.H.S $=\cos^2 45^\circ+\cos^2 45^\circ+\cos^2 60^\circ$

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

$$=\frac{1}{2}+\frac{1}{2}+\frac{1}{4} \quad = \frac{5}{4} \neq \text{R.H.S}$$

Therefore given angles are not direction angles.

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### *Question # 12(ii)*

$30^\circ, 45^\circ, 60^\circ$ will be direction angles of the vectors if

$$\cos^2 30^\circ+\cos^2 45^\circ+\cos^2 60^\circ=1$$

$$\text{L.H.S} =\cos^2 30^\circ+\cos^2 45^\circ+\cos^2 60^\circ$$

$$=\left(\frac{\sqrt{3}}{2}\right)^2+\left(\frac{1}{\sqrt{2}}\right)^2+\left(\frac{1}{2}\right)^2$$

$$=\frac{3}{4}+\frac{1}{2}+\frac{1}{4} \quad = \frac{3}{2} \neq \text{R.H.S}$$

Therefore given angles are not direction angles.

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### *Question # 12 (iii)*

$30^\circ, 60^\circ, 60^\circ$ will be direction angles of the vectors if

$$\cos^2 45^\circ+\cos^2 60^\circ+\cos^2 60^\circ=1$$

$$\text{L.H.S} =\cos^2 45^\circ+\cos^2 60^\circ+\cos^2 60^\circ$$

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

$$=\frac{1}{2}+\frac{1}{4}+\frac{1}{4}$$

$$= 1 = \text{R.H.S}$$

Therefore given angles are direction angles.

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