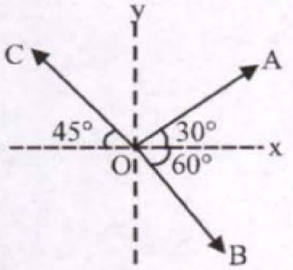
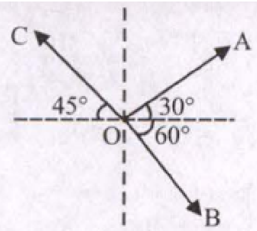
1. The magnitude of vectors $\overrightarrow{OA}, \overrightarrow{OB}$ and $\overrightarrow{OC}$ in the given figure are equal. The direction of $\overrightarrow{OA}+\overrightarrow{OB}-\overrightarrow{OC}$ with x-axis will be :- **[Aug. 26, 2021 (I)]**



(a) $\tan^{-1}\dfrac{(1-\sqrt{3}-\sqrt{2})}{(1+\sqrt{3}+\sqrt{2})}$ (b) $\tan^{-1}\dfrac{(\sqrt{3}-1+\sqrt{2})}{(1+\sqrt{3}-\sqrt{2})}$

(c) $\tan^{-1}\dfrac{(\sqrt{3}-1+\sqrt{2})}{(1-\sqrt{3}+\sqrt{2})}$ (d) $\tan^{-1}\dfrac{(1+\sqrt{3}-\sqrt{2})}{(1-\sqrt{3}-\sqrt{2})}$

1. **(a)**



Say, magnitudes of vectors is r.

$$\overrightarrow{OA}=r\left[\cos 30°\hat{i}+\sin 30\hat{j}\right]=r\left[\frac{\sqrt{3}}{2}\hat{i}+\frac{1}{2}\hat{j}\right]$$

$$\overrightarrow{OC}=r\left[\cos 45°(-\hat{i})+\sin 45\hat{j}\right]=r\left[-\frac{1}{\sqrt{2}}\hat{i}+\frac{1}{\sqrt{2}}\hat{j}\right]$$

$$\overrightarrow{OB}=r\left[\cos 60°\hat{i}-\sin 60\hat{j}\right]=r\left[\frac{1}{2}\hat{i}-\frac{\sqrt{3}}{2}\hat{j}\right]$$

$\therefore\ \overrightarrow{OA}+\overrightarrow{OB}-\overrightarrow{OC}$

$$=r\left[\left(\frac{\sqrt{3}+1}{2}+\frac{1}{\sqrt{2}}\right)\hat{i}+\left(\frac{1}{2}-\frac{\sqrt{3}}{2}-\frac{1}{\sqrt{2}}\right)\hat{j}\right]$$

$\therefore$ Angle made by vector with x-axis

$$\tan^{-1}\left[\frac{\frac{1}{2}-\frac{\sqrt{3}}{2}-\frac{1}{\sqrt{2}}}{\frac{\sqrt{3}}{2}+\frac{1}{2}+\frac{1}{\sqrt{2}}}\right]=\tan^{-1}\left[\frac{1-\sqrt{3}-\sqrt{2}}{\sqrt{3}+1+\sqrt{2}}\right]$$