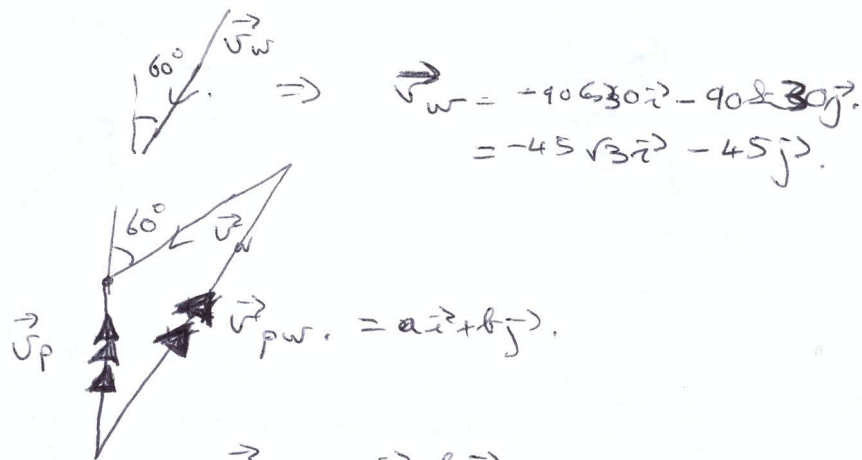


(H1992 Relativemotika)

$$|\vec{v}_{pw}| = 500 \text{ km/h}$$

$$|\vec{v}_w| = 90$$

$$\vec{v}_p = 24\vec{j}$$



$$\begin{aligned} \vec{v}_w &= -90\cos 30^\circ \vec{i} - 90\sin 30^\circ \vec{j} \\ &= -45\sqrt{3}\vec{i} - 45\vec{j} \end{aligned}$$

$$\vec{v}_{pw} = a\vec{i} + b\vec{j}$$

$$\vec{v}_w = -45\sqrt{3}\vec{i} - 45\vec{j}$$

$$\vec{v}_p = 0\vec{i} + 24\vec{j}$$

$$\vec{v}_p = \vec{v}_{pw} + \vec{v}_w \Rightarrow$$

To stay on course $a = 45\sqrt{3}$

But remember $|\vec{v}_{pw}| = 500 \Rightarrow a^2 + b^2 = 500^2$

$$\Rightarrow (45\sqrt{3})^2 + b^2 = 500^2$$

$$\Rightarrow 6075 + b^2 = 250000$$

$$\Rightarrow b^2 = 250000 - 6075$$

$$\Rightarrow b = \sqrt{243925}$$

$$\Rightarrow b = \pm 493.88$$

on way out: $b = +493.88$

$$\Rightarrow \vec{v}_{pw} = 45\sqrt{3}\vec{i} + 493.88\vec{j}$$

$$\text{dir}^\circ \text{ on way out} = \left[\tan^{-1} \frac{493.88}{45\sqrt{3}} \right]^\circ = \underline{81.03^\circ \text{ N}}$$

on way back: $b = -493.88$ [$a = 45\sqrt{3}$ still]

$$\Rightarrow \vec{v}_{pw} = 45\sqrt{3}\vec{i} - 493.88\vec{j}$$

$$\text{dir}^\circ = \left[\tan^{-1} \frac{493.88}{45\sqrt{3}} \right]^\circ \text{ S} = \underline{81.03^\circ \text{ S}}$$

$$(ii) \text{ Time Taken out} = \frac{1500}{y} = \frac{1500}{493.88 - 45} = \frac{1500}{448.88} = 3.34 \text{ hrs.}$$

$$\text{Time Take Back} = \frac{1500}{y} = \frac{1500}{493.88 + 45} = \frac{1500}{538.88} = 2.78 \text{ hrs.}$$

$$\text{Total} = 6.12 \text{ hrs.}$$

$$(ii) \text{ No wind Time out} = \text{Time Back} = \frac{1500}{500} = 3 \text{ hrs}$$

$$\Rightarrow \text{Total time} = 6 \text{ hours.}$$