

H1993 Q2: (a)

sol (1)



$$\vec{v}_G = -11\hat{j}$$

$$\vec{v}_{WG} = a\hat{i}$$

$$\vec{v}_W = \vec{v}_{WG} + \vec{v}_G$$

$$\vec{v}_W = -a\hat{i} - 11\hat{j}$$

\vec{v}_W same for both

$$-a\hat{i} - 11\hat{j} = -b\hat{i} + b - 22\hat{j}$$

$$\hat{i} \Rightarrow -a = -b \Rightarrow \boxed{a=b}$$

$$\hat{j} \Rightarrow -11 = b - 22 \Rightarrow \boxed{b=11}$$

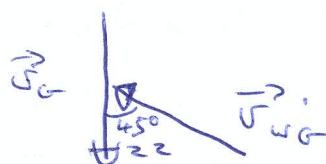
$$\therefore \vec{v}_W = -11\hat{i} - 11\hat{j}$$

$$\therefore |\vec{v}_W| = \sqrt{(-11)^2 + (-11)^2} = \sqrt{2(11)^2} = 11\sqrt{2} = 15.56 \text{ m/s}$$

dirⁿ:

W 45° S i.e. SW

sol (2)



$$\vec{v}_G = -22\hat{j}$$

$$\vec{v}_{WG} = -b\hat{i} + b\hat{j}$$

$$\vec{v}_W = -b\hat{i} + b\hat{j} + (-22\hat{j})$$

$$\vec{v}_W = -b\hat{i} + (b-22)\hat{j}$$

(b)



$$\vec{v}_C = \frac{5}{6}\hat{i}$$

$$|\vec{v}_{BC}| = \frac{5}{9}$$

(i) To cross as quickly as possible he should head straight across

$$\vec{v}_B = \vec{v}_{BC} + \vec{v}_C = \frac{5}{9}\hat{i} + \frac{5}{6}\hat{j} = \frac{5}{6}\hat{i} + \frac{5}{9}\hat{j} \text{ m/s}$$

$$\text{Time to cross} = \frac{\text{Dist across}}{(\vec{v}_B)_{\text{across}}} = \frac{50}{\frac{5}{9}} = 50 \times \left(\frac{9}{5}\right) = 90 \text{ sec}$$

$$\begin{aligned} \text{(ii) Downstream distance} &= (\text{Time to cross}) (\vec{v}_B)_{\text{downstream}} \\ &= 90 \left(\frac{5}{6}\right) \\ &= 75 \text{ m} \end{aligned}$$

EASY!