

Answer on Question#39645 – Physics - Mechanics | Kinematics | Dynamics

a man swim across a river with speed of V_m perpendicular to the flow of direction of river .if water flows with the speed of V_w ,then what is direction of man to cross riverhow we place theta in this question.....how we know we hv to place theta either in x or y directionwith resultant velocity pls tell me

Solution:

V_m – velocity of the man reative to the water;

V_w – velocity of the current;

First, we can find the angle θ between the direction of velocity of the water and velocity of the man (\vec{V}_m and \vec{V}_w form a right-angled triangle because \vec{V}_m is perpendicular to the flow):

$$\text{triangle } BDE: X - \text{direction: } \tan \theta = \frac{V_m}{V_w} \Rightarrow$$

$$\theta = \arctan\left(\frac{V_m}{V_w}\right)$$

$$Y - \text{direction: } \sigma = 90^\circ - \theta = 90^\circ - \arctan\left(\frac{V_m}{V_w}\right)$$

Also we can find resultant velocity using Pythagoras' theorem:

$$\begin{aligned} \vec{V}_{result} &= \vec{V}_m + \vec{V}_w \\ V_{result}^2 &= V_m^2 + V_w^2 \Rightarrow \\ V_{result} &= \sqrt{V_m^2 + V_w^2} \end{aligned}$$

Answer: angle with x-direction: $\theta = \arctan\left(\frac{V_m}{V_w}\right)$;

y-direction: $\sigma = 90^\circ - \arctan\left(\frac{V_m}{V_w}\right)$;

resultant velocity: $V_{result} = \sqrt{V_m^2 + V_w^2}$.

