

Learning Intentions

- How to calculate the velocity produced by motion in two different directions.

Questions

1. A plane is pointing straight North, with an airspeed of 120 m/s. The wind is blowing at 50 m/s [E].
 - a. What is the resulting velocity of the plane, relative to an observer on the ground?
 - b. In what direction should the plane fly so that the resulting velocity is straight north? What will be the resulting velocity?

2. A hiker heading west comes across a river flowing south at 0.35 m/s . The hiker decides to swim directly across at a speed of 1.0 m/s .
 - a. What is the resulting velocity of the hiker?
 - b. If the river is 75 m wide, how long will it take the hiker to reach the other side?
 - c. How far downstream will the hiker reach the other side?
 - d. What direction should the hiker swim to reach the opposite shore of the river perpendicular to where she started?

Answers

1.
 - a. $\mathbf{v}_{\text{rel}} = 130 \text{ m/s } [23^\circ \text{ E of N}] = 130 \text{ m/s } [67^\circ \text{ N of E}]$
 - b. $\mathbf{v}_{\text{rel}} = 110 \text{ m/s } [\text{N}]$
 $\mathbf{v}_{\text{plane}} = 120 \text{ m/s } [25^\circ \text{ W of N}] = 120 \text{ m/s } [65^\circ \text{ N of W}]$
2.
 - a. $\mathbf{v}_{\text{rel}} = 1.0 \text{ m/s } [19^\circ \text{ S of W}] = 1.0 \text{ m/s } [71^\circ \text{ W of S}]$
 - b. $t = 75 \text{ s}$
 - c. $\mathbf{d}_y = 26 \text{ m } [\text{S}]$
 - d. $\mathbf{v}_{\text{hiker}} = 1.0 \text{ m/s } [20^\circ \text{ N of W}] = 1.0 \text{ m/s } [70^\circ \text{ W of N}]$
3.
 - a. direction = $[76^\circ \text{ W of S}] = [14^\circ \text{ S of W}]$
 - b. $v_{\text{rel}} = 480 \text{ km/h}$