Name:_____ Class:_____ Date:_____

Two-Dimensional Motion and Vectors

Diagram Skills

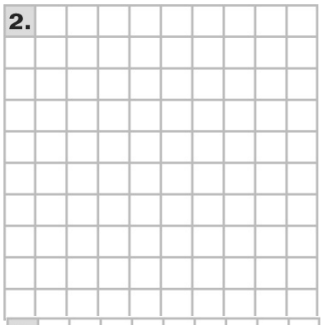
Relative Motion

The water current in a river moves relative to the land with a velocity $\mathbf{v_{WL}}$, and a boat is traveling on the river relative to the current with a velocity $\mathbf{v_{BW}}$.

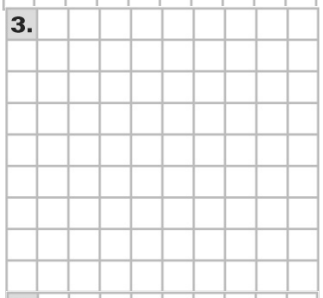
1. How is the velocity of the boat relative to the land ($\mathbf{v_{BL}}$) related to $\mathbf{v_{WL}}$ and $\mathbf{v_{BW}}$?

   _____

2. Suppose that both the boat and the water current move in the same direction and that the boat is moving twice as fast as the current. Draw a vector diagram to determine the velocity of the boat relative to the land, $\mathbf{v_{BL}}$.



3. Suppose that the boat travels in the opposite direction of the current and that the boat is moving twice as fast as the current. Draw a vector diagram to determine the velocity of the boat relative to the land, $\mathbf{v_{BL}}$.



4. Suppose that the boat travels in a direction perpendicular to the current and that the boat is moving twice as fast as the current. Draw a vector diagram to determine the velocity of the boat relative to the land, $\mathbf{v_{BL}}$.

5. Assume that the boat travels with a speed of 4.0 km/h relative to the current and that the current moves due east at a speed of 2.0 km/h relative to the land. Determine the velocity of the boat relative to the land for each of the situations described in items 2–4.

   a. $\mathbf{v_{BL}}$ for item 2 _____

   b. $\mathbf{v_{BL}}$ for item 3 _____

   c. $\mathbf{v_{BL}}$ for item 4 _____

© Houghton Mifflin Harcourt Publishing Company