Relative Velocity Worksheet

7 Practice Questions

Organic Chemistry Tutor

1. A boat heads north at 3.5 m/s directly across a 200 m wide river flowing east at 1.7 m/s. (a) What is the velocity of the boat relative to the shore? (b) How long will it take to cross the river? (c) How far downstream will the boat be when it crosses the river?

2. A swimmer aims his body north directly across an 80 m river at a speed of 1.2 m/s. If the river is moving west at 0.7 m/s, how far downstream will he land and how long will it take him to cross the river?

3. A boat heads north at 2.8 m/s across a river flowing east at 1.3 m/s. (a) What is the velocity of the boat relative to the shore. (b) What is the new position of the boat relative to its starting point after 5 seconds?

4. The speed of a motorboat in still water is 2.5 m/s. What upstream angle is required for the boat to head directly north on a river with a current flowing west at 1.6 m/s?

5. A boat whose speed in still water is 4.2 m/s must head at an upstream angle of 21^o east of north to travel directly north across the river.
(a) What is the velocity of the river?
(b) What is the speed of the boat with respect to the shore?

6. A plane heads east at 400 km/hr against a southeast wind traveling at 150 km/hr. What is the velocity of the plane with respect to the ground?

7. Car 1 travels north at 40 km/hr and car 2 travels west at 55 km/hr. What is the relative velocity of car 1 as seen by car 2?

Answers:

1a. 3.89 m/s @ 25.9^{o} East of North or 64.1^{o} CCW from the +x-axis.
1b. 57.1 s
1c. 97.1 m

2a. 46.7 m
2b. 66.7 s

3a. 3.09 m/s @ 24.9^{o} East of North or 65.1^{o} CCW from the +x-axis
3b. 6.5 m East and 14 m North. (6.5, 14). It's also 15.45 m @ 24.9^{o} East of North relative to its starting point.

4. 39.8^{o} East of North or 50.2^{o} CCW from the +x-axis.

5a. 1.5 m/s due West
5b. 3.9 m/s

6. 312.5 km/hr @ 19.9^{o} CCW from +x-axis

7. 68 km/hr @ 36^{o} North of East