Relative Motion

1. A ship is heading due west at a steady speed of 15 km/h. A current of 3 km/h is running due south. Calculate the velocity of the ship relative to the seabed.

2. A boat traveling at 3.0 m/s through the water keeps its bow pointing north across a stream that flows west at 5.0 m/s. What is the resultant velocity of the boat with respect to the shore?

3. An F-117A Nighthawk stealth fighter jet has a true airspeed of 1000 km/h due east. There is a cross wind blowing in a direction 60° E of S at 100 km/h. Calculate the velocity of the jet relative to the ground.

4. A plane leaves Atlanta flying northeast at 100 m/s. Another plane leaves Atlanta flying southwest at 150 m/s. What is their velocity relative to each other?

5. A ship is heading 30º north of east at 10 m/s. The ocean currents there are flowing north at 1 m/s. A man walked across the ship at 1 m/s in a direction perpendicular to the ship (30º west of north). Calculate the velocity of the man relative to the earth (add all of the vectors together).

Answers:
1. 15.3 km/h 11.3°S of W or 78.7°W of S
2. 5.8 m/s 59° W of N or 31° N of W
3. 1088 km/h 30° S of E or 60° E of S
4. 50 m/s southwest
5. 10.1 m/s 36° N of W or 54° W of N