SP211 Worksheet
Ch. 4.6-4.7, Relative motion

For relative motion problems

i. Identify the frames of reference, A and B (motion of the object is defined in frame A).

ii. Identify what you need to find (velocity of object in frames A or B, or relative velocity of frames).

iii. Use $\vec{v}_{PA} = \vec{v}_{PB} + \vec{v}_{BA}$ to solve the problem.

iv. For 2D problems, use vectors, and break them into $x$- and $y$-components.

1. As seen from the shore, a ship sails due north at 10 knots in a current that flows 2 knots in a direction 25° north of west. What is the speed of the ship relative to the current? Give your answer in knots and in m/s. (1 knot = .514 m/s)

2. A plane departs Madrid, Spain on a 6084 km, 9 hour flight across the Atlantic Ocean to Washington, DC; these cities have the same latitude (approximately). The plane maintains a heading of 10° south of west at an airspeed of 625 mph. What are the magnitude and direction of the wind?

*The plane is flying west with respect to the earth, but the planes “heading” is the direction it flies. The “airspeed” of an aircraft is its speed relative to the air.*