Vectors

**Unit:** Relative Motion

### Knowledge/Understanding Goals:

* what a relative motion is
* How is it applied to velocity and vectors

### Skills:

* adding & subtracting vectors

### Language Objectives:

* Understand and correctly use the terms “relative motion”
* Accurately describe and apply the concepts described in this section using appropriate academic language.

### Notes: (Definitions and general notes)

Relative motion: Relative motion is the calculation of the motion of an object with regard to some other moving object.

**3.6 Relative Motion**

Relative motion problems are difficult to do unless one applies vector addition concepts.

Define a vector for a swimmer’s velocity relative to the water, and another vector for the velocity of the water relative to the ground. Adding those two vectors will give you the velocity of the swimmer relative to the ground.

Practice Problems

You are paddling a canoe in a river that is flowing at 4.0 mph east. You are capable of paddling at 5.0 mph.

1. If you paddle east, what is your velocity relative to the shore?
2. If you paddle west, what is your velocity relative to the shore?
3. You want to paddle straight across the river, from the south to the north. At what angle to you aim your boat relative to the shore? Assume east is 0o.

**1. Sample Problem**

You are flying a plane with an airspeed of 400 mph. If you are flying in a region with a 80 mph west wind, what must your heading be to fly due north?

**Free Response Practice Problem**

1. Graphically determine the resultant of the following vectors. Use your own graph paper. Clearly indicate the magnitude and direction of the resultant on your drawing.

**A**: 60 m at 40o **B**: 90 m at 175o **C**: 50 m at -45o

1. On the reverse side of your graph paper, check your graphical addition by doing a component addition. Again, clearly indicate the magnitude and direction of the resultant.