Vectors

Pre-Class Questions:

Problem Set (due next time)
Ch 1 - 37, 42, 48, 49

Lecture Outline
1. Addition of Scalars Re-envisioned
2. Graphical Addition of Vectors
3. Vector Components
4. Analytical Addition of Vectors

Example 1: Use the number line to represent the equation $1+3=4$.

CONCEPTUAL **Physics** PRACTICE PAGE

Chapter 5 Newton's Third Law of Motion

Velocity Vectors and Components

1. Draw the resultants of the four sets of vectors below.

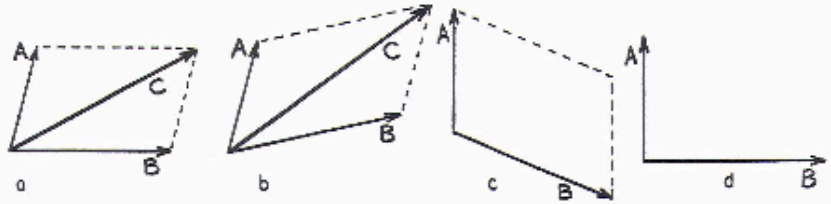
Name _____ Date _____

CONCEPTUAL **Physics** PRACTICE PAGE

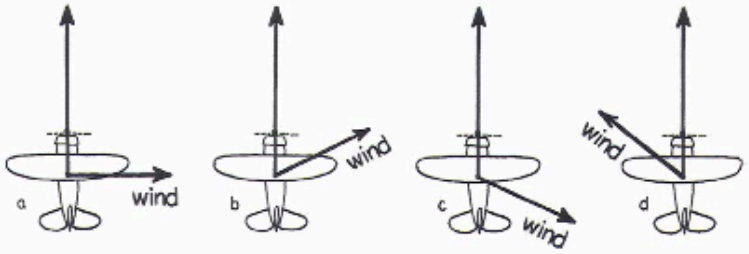
Chapter 5 Newton's Third Law of Motion

Vectors and the Parallelogram Rule

1. When two vectors **A** and **B** are at an angle to each other, they add to produce the resultant **C** by the *parallelogram rule*. Note that **C** is the diagonal of a parallelogram where **A** and **B** are adjacent sides. Resultant **C** is shown in the first two diagrams, *a* and *b*. Construct resultant **C** in diagrams *c* and *d*. Note that in diagram *d* you form a rectangle (a special case of a parallelogram).



2. Below we see a top view of an airplane being blown off course by wind in various directions. Use the parallelogram rule to show the resulting speed and direction of travel for each case. In which case does the airplane travel fastest across the ground? ____ Slowest? ____



3. To the right we see the top views of 3 motorboats crossing a river. All have the same speed relative to the water, and all experience the same water flow.

   Construct resultant vectors showing the speed and direction of the boats.

   a. Which boat takes the shortest path to the opposite shore?

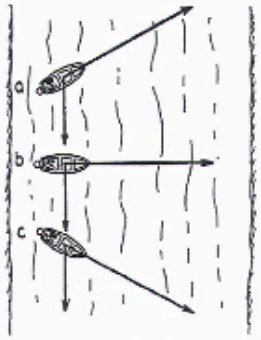
   _____

   b. Which boat reaches the opposite shore first?

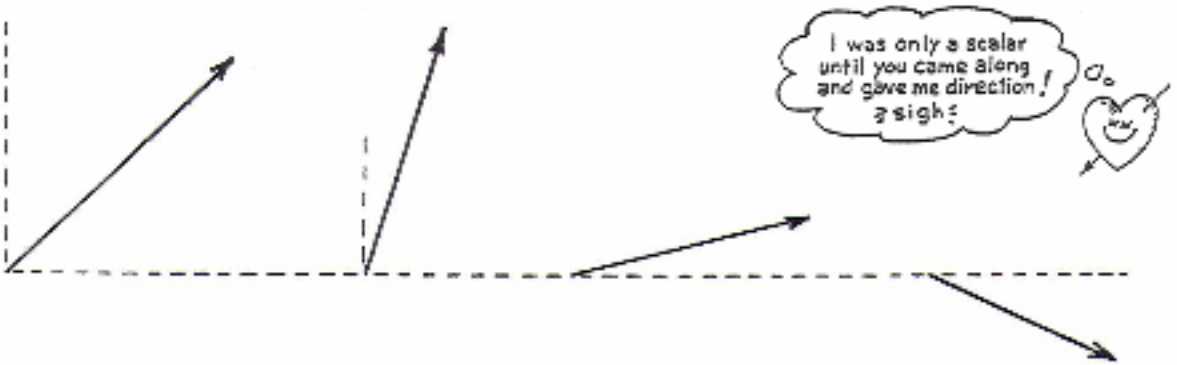
   _____

   c. Which boat provides the fastest ride?

   _____



2. Draw the horizontal and vertical components of the four vectors below.



Example 2: A hiker walks 20.0m NNE. Find the distance she has gone northward and the distance eastward.

Example 3: Find the total displacement of a hiker that walks 20.0m NNE then 5.00m due east.

Example 4: A car is traveling northward at 75.0km/h. It rounds a curve and is now heading westward at 75.0km/h. Find the change in the velocity of the car.

Lecture 05 - Summary

Coordinate Systems (importance & use)
Vectors (notation and properties)
Graphical Vector Addition
Vector Components $A_x = A\cos\theta \quad A_y = A\sin\theta$

Vector Addition $\vec{R} = \vec{A} + \vec{B}$ where $R_x = A_x + B_x$ and $R_y = A_y + B_y$