Lab 1: Vectors

General Instructions: General instructions.

1. Work in groups of two or three.
2. Please check with me or one of the TAs before going on to the next exercise.
3. Please hand in only one write-up per group.

Consider again the following vectors:

- $\vec{a}$ = the displacement from COA to the Bar Harbor airport.
- $\vec{b}$ = the displacement from MDI High School to Thunder Hole.
- $\vec{c}$ = the displacement from Somesville to The Jackson Lab.

1. Specify vectors $\vec{a}, \vec{b}, \vec{c}$ by giving their components. Do not use trigonometry.
2. Use a ruler and a protractor to draw (to scale) the following:
   (a) $\vec{v} = 3\vec{a}$
   (b) $\vec{u} = \vec{b} + \vec{c}$
3. By measuring, determine the components of:
   (a) $\vec{a}$
   (b) $\vec{b}$
   (c) $\vec{c}$
   (d) $\vec{u}$
   (e) $\vec{v}$
4. What is the procedure for adding two vectors using component form
5. What is the procedure for scalar multiplication of vectors using component form?
6. Check with me or a TA. We'll ask you some questions and then give you the next sheet.

Right Triangles and Ratios

1. Using a ruler measure the p's and q's on each of the triangles in Fig. 1.
2. Determine values of p_1/q_1, p_2/q_2, and p_3/q_3.
3. Then do the same for the triangle on Fig. 2.
4. What does this ratio p/q tell you?
5. Invent a name for this ratio.
6. Get sheet three from Sanjeeva or me and do the problems on it.

Figure 1:

Figure 2:

Trigonmetry

1. Consider a vector $\vec{a}$ which is a 10 meter displacement, 37 degrees north of west. And let $\vec{b}$ be a 20 meter displacement 45 degrees west of south.
2. Write $\vec{a}$ and $\vec{b}$ in component form. Use trigonmetry.
3. Determine the following:
   (a) $\vec{a} - 2\vec{b}$
   (b) $3\vec{a}$
   (c) $5\vec{a} + 3vecb$

   express your answers both in component form and magnitude-direction form.

Sextants

1. Trigonometry Warm Up:
   (a) You stand 50 meters away from a flag pole. You have to look at an angle of 53 degrees from the horizon to see the top of the pole. What is the pole's height?
   (b) You stand 75 meters away from a tree that's 100 meters tall. At what angle must you tilt your head so that you look straight at the top of the tree?
2. Trigonometry and Trees:
   (a) Grab a sextant. Go outside and figure out how to use it. (Talk to or Cecily.)
   (b) Measure the height of the large pine tree on the North end of the field between the Blair/Tyson and the arts and sciences building.