

## Lab 1: Vectors

**General Instructions:** General instructions.

1. The goal of this lab is to practice working with and thinking about vectors.
2. Work in groups of two or three.
3. Please check with me or one of the TAs before going on to the next exercise.
4. Please hand in only one write-up per group.

### 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.

## 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 is 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.

## Vector Operations with Components

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 trigonometry.
3. Determine the following:

(a)  $\vec{a} + 2\vec{b}$

(b)  $3\vec{a}$

Illustrate these with a picture, and express your answers both in component form and magnitude-direction form.

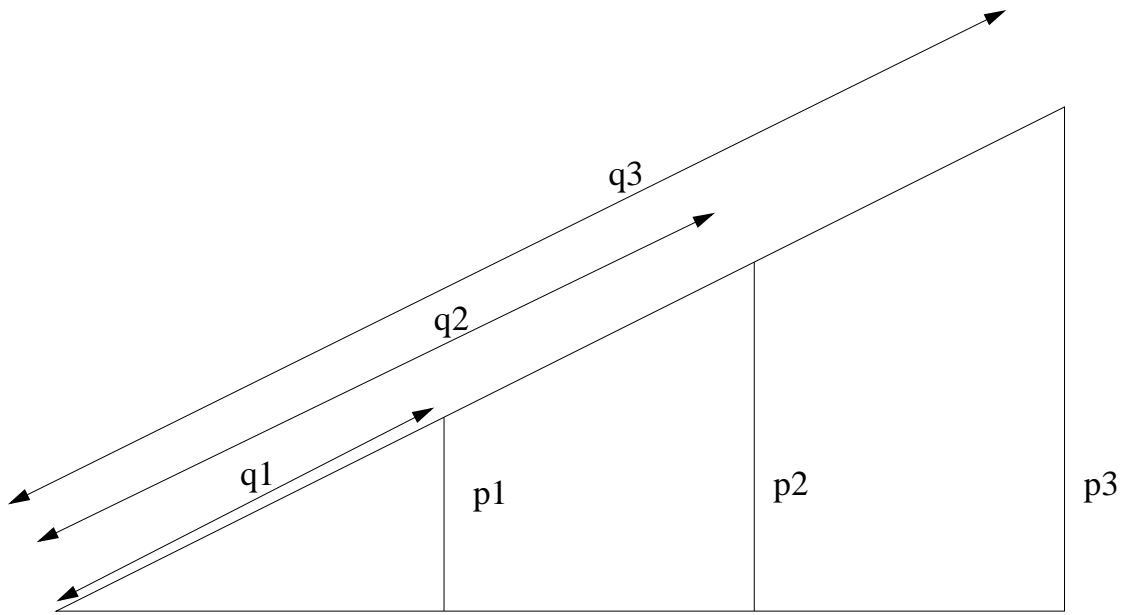


Figure 1:

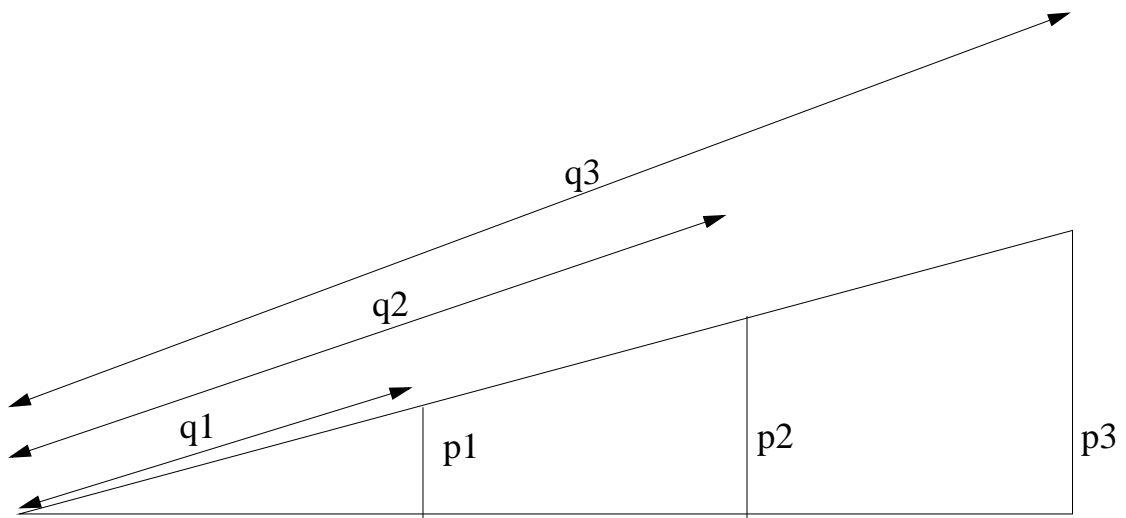


Figure 2: