

## VECTOR ACTIVITY

### PURPOSE:

To help visualize the fact that vectors can be added in any order, tip to tail, and you will receive the same result. This can also be done graphically.

### Required definitions:

**RESULTANT:** A combination of 2 or more vectors.

**VECTOR:** A quantity that has both magnitude and direction.

Examples of vector quantities are:

Velocity as opposed to speed

Displacement as opposed to distance

Force as opposed to mass

### MATERIALS NEEDED:

- A set of Vector arrows. (The length of the arrow represents magnitude  
The direction is denoted on each)
- An identical set of maps.
- Trig tables, calculators, rulers, protractors

### PROCEDURE:

Choose a common starting point. Place any vector on the map at the designated starting point. Add another vector to the tip of the first. Repeat until all the vectors are lined up tip to tail. Determine where you will end up once you have added the vectors together. Try adding them again in a different order. Compare with others once you have arrived at an end point. Determine the total distance traveled, the displacement (remember that displacement needs both a magnitude and direction)

### ANALYSIS:

How far north or south are you from where you started? How far east or west are you from where you started?

Use this information to construct a right triangle in the space below, use X as your starting point, and the x displacement and y displacement as your triangle legs, Your resultant would be the hypotenuse. Using the Pythagorean theorem, calculate its magnitude, and use trig to calculate the direction in degrees.

### EXTENSION:

1. From this map, determine what would be the shortest way to travel to the end point from the starting point using the streets on the map. Write out directions for someone.
2. Can you find the elevation of the end point? (Hint: This is a topographical map)

## THREE DIMENSIONAL EXTENSION

Your resultant must have three coordinates to determine your displacement.

3. Find the object located at the end point in the lab by using the vector meter sticks. Assemble and label these vectors, and determine what is the end point by adding these vectors from your starting point. Your group will be instructed where to start.

- A. 54 centimeters North,
- B. 185 centimeters upward
- C. 84 centimeters West
- D. 130 centimeters South
- E. 66 centimeters downward
- F. 100 centimeters East
- G. 16 centimeters West
- H. 40 centimeters upward
- I. 80 centimeters South
- J. 250 centimeters East
- K. 34 centimeters downward
- L. 140 centimeters North