**Purpose:**

* To determine the resultant of a vector by graphing to scale.
* To determine the resultant of a vector using the component method of vector addition.

**Materials List:**

* Graph paper
* Ruler
* Protractor

**Procedure:**

1. The goal of the lab is to complete a scaled sketch for each of the 3 problems along with its mathematical calculations. First start with problem #1 and draw each vector to scale using a ruler on a piece of graph paper. Make sure to start the sketch on the far left side of the graph paper.
2. Use the head to tail method of vector addition when completing the sketch. Make sure the sketch is to scale! Feel free to use any size scale that will give you the largest, most accurate diagram.
3. Once all the vectors are drawn for the problem, draw a straight line connecting the initial starting point and the final ending point. This will be the resultant of the vectors.
4. With your ruler, find the magnitude of your resultant with its correct units. With your protractor, find the direction of the resultant in degrees starting from the x-axis. Record your results for the measured resultant.
5. Once problem #1 is completed, repeat the same steps for problems #2 and #3 for drawing a scaled sketch and record your results.
6. After completing all the sketches for problems #1 through #3, use the component method of vector addition to solve for the resultant mathematically. Show all work for the component method in your lab notebook. Record your results for the calculated resultant.
7. After completing the measured and calculated resultant values for the problems, find the percent error for the magnitude of your resultants and record your data.

$$\left(\frac{Measured-Calculated}{Calculated}\right)x100= \\_\\_\\_\\_\\_\\_\\_\% Error$$

**Data:**

 Problem #1:

* A = 10.4 m/s @ 0°
* B = 8.0 m/s @ 45°

Problem #2:

* A = 7.0 m @ 0°
* B = 3.5 m @ 45°
* C = 5.0 m @ 90°

Problem #3:

* A = 8.0 m @ 0°
* B = 5.6 m @ 45°
* C = 3.0 m @ 90°
* D = 2.5 m @ 145°

**Results:**

 Problem #1:

* Calculated Resultant: \_\_\_\_\_\_\_\_\_\_\_\_\_\_@\_\_\_\_\_\_\_\_\_
* Measured Resultant:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_@\_\_\_\_\_\_\_\_\_
* Percent Error: ( r) \_\_\_\_\_\_ $\% error$ ( Ɵ) \_\_\_\_\_\_\_ *% error*

Problem #2:

* Calculated Resultant: \_\_\_\_\_\_\_\_\_\_\_\_\_\_@\_\_\_\_\_\_\_\_\_
* Measured Resultant:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_@\_\_\_\_\_\_\_\_\_
* Percent Error: ( r) \_\_\_\_\_\_ $\% error$ ( Ɵ) \_\_\_\_\_\_\_ *% error*

Problem #3:

* Calculated Resultant: \_\_\_\_\_\_\_\_\_\_\_\_\_\_@\_\_\_\_\_\_\_\_\_
* Measured Resultant:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_@\_\_\_\_\_\_\_\_\_
* Percent Error: ( r) \_\_\_\_\_\_ $\% error$ ( Ɵ) \_\_\_\_\_\_\_ *% error*