

Name: _____

Banner ID: _____

Lab Group ID: _____

Number of Lab Partners: _____

Data Sheet

Vector Addition Activity

Your group is responsible for the equipment at your station. Use the inventory list in the box to inventory all of the components prior to beginning the lab. If you are missing components or have broken components, please notify your TA.

Part I (20 points)

Group Score: _____

Using a geometric method, graphically add the following forces 3.00N at 0° and 2.00N at 120° to determine the Resultant Force. The angles are measured counter-clockwise from the x-axis. Each lab member must provide his or her own graphical representation in their own handwriting. After the drawing is complete, the student should record their estimate of the magnitude and angle of the Resultant Force on the drawing. Your TA will grade only one of the graphical representations from the group. The TA will select the graphical representation that he feels will result in the least amount of accuracy, and all group members will receive the same grade. The TA will actually measure the magnitude and angle of the Resultant Force and compare the results to the theoretical magnitude and angle; therefore a scale noting how many millimeters is equal to 1.00N must be recorded on the drawing. For each 0.5 degrees that the angle of the resultant Force is incorrect, 1 point will be deducted to a maximum of 10 points. Similarly, points will be deducted based on how inaccurate the length of the Resultant Force is drawn.

The last page of this procedure contains a piece of graph paper, and protractors and rulers will be provided. Each member must attach their graphical representation to this page. Although each student must provide a graphical representation in their own hand writing, the group is allowed to collaborate.

(A) TA's Theoretical Value for the Angle: _____

(B) Angle as Measured by the TA _____

(C) TA's Theoretical magnitude in N _____

(D) Theoretical Magnitude converted to mm using the Student's Scale: _____ mm

(E) Measured magnitude in mm _____

(F) Magnitude Percent Difference = $\frac{|D - E|}{D} \times 100\%$ = _____

Percent Difference	$\leq 0.5\%$	$\leq 1.0\%$	$\leq 1.5\%$	$\leq 2.0\%$	$\leq 3.0\%$	$> 3.0\%$
Points for Magnitude	10	9	8	6	4	2

Part II (20 points)

Group Score: _____

Using the same forces from Part I, calculate the Resultant Force utilizing trigonometry/geometry. The calculations should be performed on the back of the drawing, and all work must be shown in the student's own hand writing.

Part III (25 points)

Group Score: _____

Before beginning Part III, all members of the group must have completed Parts I and II and the TA has to issue the group scores.

Measuring counterclockwise from 0^0 , position pulleys on the force table at 0^0 and 120^0 . Using the provided string set, hang a 300g mass from the pulley at 0^0 and a 200g mass from the pulley at 120^0 . Hang an appropriate mass on a third pulley that is strategically positioned on the force table such that the system will be in equilibrium with the knot centered on the force table. Use $g = 10.0 \text{ m/s}^2$. Also remember that $F = m \cdot a$.

What is the relationship between the magnitude of the Equilibrium Force and the Resultant Force you found in Parts I and II?

What is the relationship between the angle of the Equilibrium Force and the angle of the Resultant Force you found in Parts I and II?

Part IV (25 points)

Group Score: _____

Your TA will remove your string set from your station, and provide you with information you will use to determine a new Equilibrium Force. Your goal is to determine the mass and the angle necessary to put the new system in equilibrium. After you have calculated the mass and the angle required to achieve equilibrium, your TA will return your string set, and the TA will witness how well your predictions put the system in equilibrium. Your grade will be based on how well the knot is centered.

200g at 0^0 300g at _____ (measured counter clockwise from 0^0)

Group's predictions: mass _____ angle _____

Part V (10 points)

Group Score _____

Please return all components to the plastic box/zip lock bag. Use the inventory list in the box to inventory all of the components. Lost parts will result in a grade deduction. Your TA needs to check your box prior to the group leaving to receive any of the 10 points.

