PHYS221 Lab Report

2 – Vectors

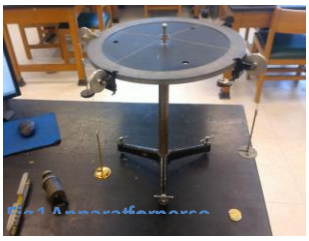
STUDENTS NAME.....

DATE PERFOMED.....

INTRODUCTION

The aim of this experiment was to enable as the learners be able to practice using vector the converting between magnitude and direction to component vectors and vice versa. It was also to introduce the learners into vector addition and weight as a force.

PROCEDURE



Equipment provided by the onsite lab:

- Force Table with four pulleys
- Small ring with four attached strings
- Four weight hangers
- Set of masses
- Protractors
- Paper to draw vectors

Equipment provided by the student:

- PC/Mac with Internet connection and Zoom
- Ruler, Protractor
- Pen, Calculator

The procedure followed was the manual “PHYS221 – Lab 2: Vectors, Fall 2021”

PROCEDURE SECTION

A. TWO STRINGS

1. By the use of common sense one should be able to get the force vector that is needed to balance the single vector that has been given.
2. The vector was decomposed into componets along x and y axes.

3. In order to get the vector that will balance the , net force and find the inverse of these component's.
4. The vector was converted from 3 above back into direction and magnitude.
5. The mass that was needed on the hanger to produce this force was determined.

B. THREE STRINGS

1. BY use of the common sense we were able to determine the force vector that needs to balance the single vector that has been provided.
2. The vector was decomposed into component's along x and y axes.
3. In order to get the vectors that will balance the net force, we gotten the inverse of this component's.
4. The vector was converted back from 3 back into the direction and magnitude.
5. The mass that was required to produce this force was determined.

C. FOUR STRING

1. Since its quite difficult to intuit the correct direction and magnitude of vector that will balance the forces that has been given an estimate was made.
2. The given vectors were decomposed in to its component's along x and y axes. The sum to find the net force.
3. The steps 3 and 4 were followed as in part A

D. ROTATIONAL INVARIANCE.

1. The setup from part B above and rotate all the vectors by the same number of degrees in the same direction as provided by the instructor.
2. The vectors were decomposed into component's along the NEW x and y axes . Then we summed to find the net force.

The complete description of where to find the basic procedure of this lab is from PHYS221 Lab 2 Manual vectors from fall 2021.

DATA ANALYSIS

PART A. FINDING THE INVERSE VECTOR

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Set	Part	m_A (g)	θ_A	m_B (g)	θ_B	m_C (g)	θ_C
1	A	50	0				
1	B	50	54	150	99		
1	C	150	67	150	260	50	9
1	D	Rotate Clockwise 9°					

The correct weight of the of one vector is 500newtons the direction will be downward manner.

The type of vector above is position vector.

The magnitude 50*10=500newtons.

How to find unit vector is by divinding the vector by its magnitude.

Assuming the vector has the position of 1,4

500sin50i+500cos 0j =883.03N

The negative of the resultant is the magnitude in the negatve cartesin of the x axis. 500sin130=-383.02N

The mass that will produce the necessary force to hold the mas is 38.3kg

Part B : adding two vectors and finding the inverse.

Set	Part	m_A (g)	θ_A	m_B (g)	θ_B	m_C (g)	θ_C
1	A	50	0				
1	B	50	54	150	99		
1	C	150	67	150	260	50	9
1	D	Rotate Clockwise 9°					

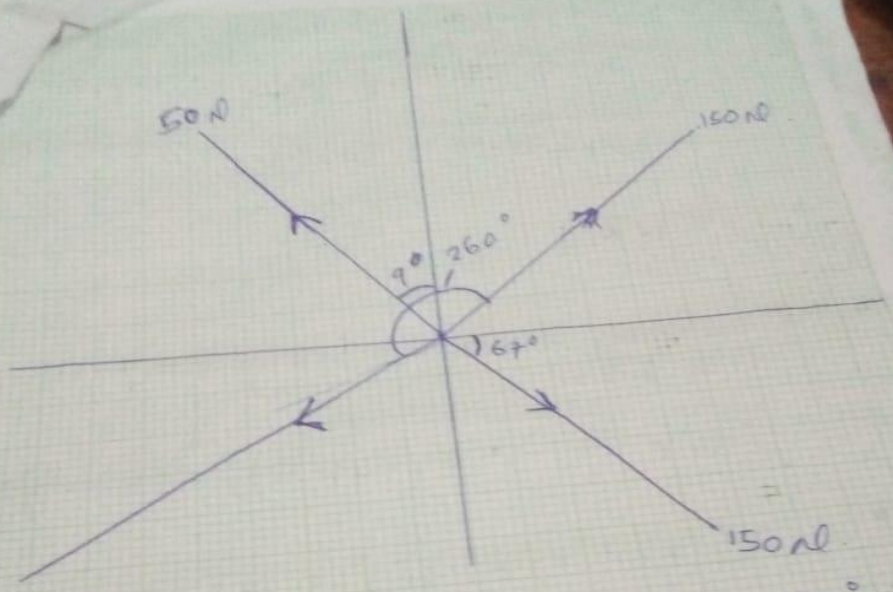
The weight recquired is the resultant vector of the two vectors ie the addition of the weight of the two vectors.

150N +50N=200N

The given vectors are 150N and 50N.

The vector magnitude is just the same as the weight. So nothing will change 50N and 150N....

50sin54i +150cosj



Decomposing into unit

~~26~~ $150\sin 260^\circ i + -50\cos 9^\circ j + 150\cos 67^\circ$ ~~$\cos k$~~

It has three units that is i, j and k

to get the resultant vector we add.

$150\sin 260 + -50\cos 9j + 150\cos 67$

$-147.72N + -49.38N + 58.609N$

$= -138.49N$

Translating back to magnitude and direction form.

$= |50\sin 54\,\hat{i}| + |150\cos\,\hat{j}|$

In direction form

$= 50\sin 54\,\hat{i} + 150\cos\,\hat{j}$

= The resultant vector is 16.98N

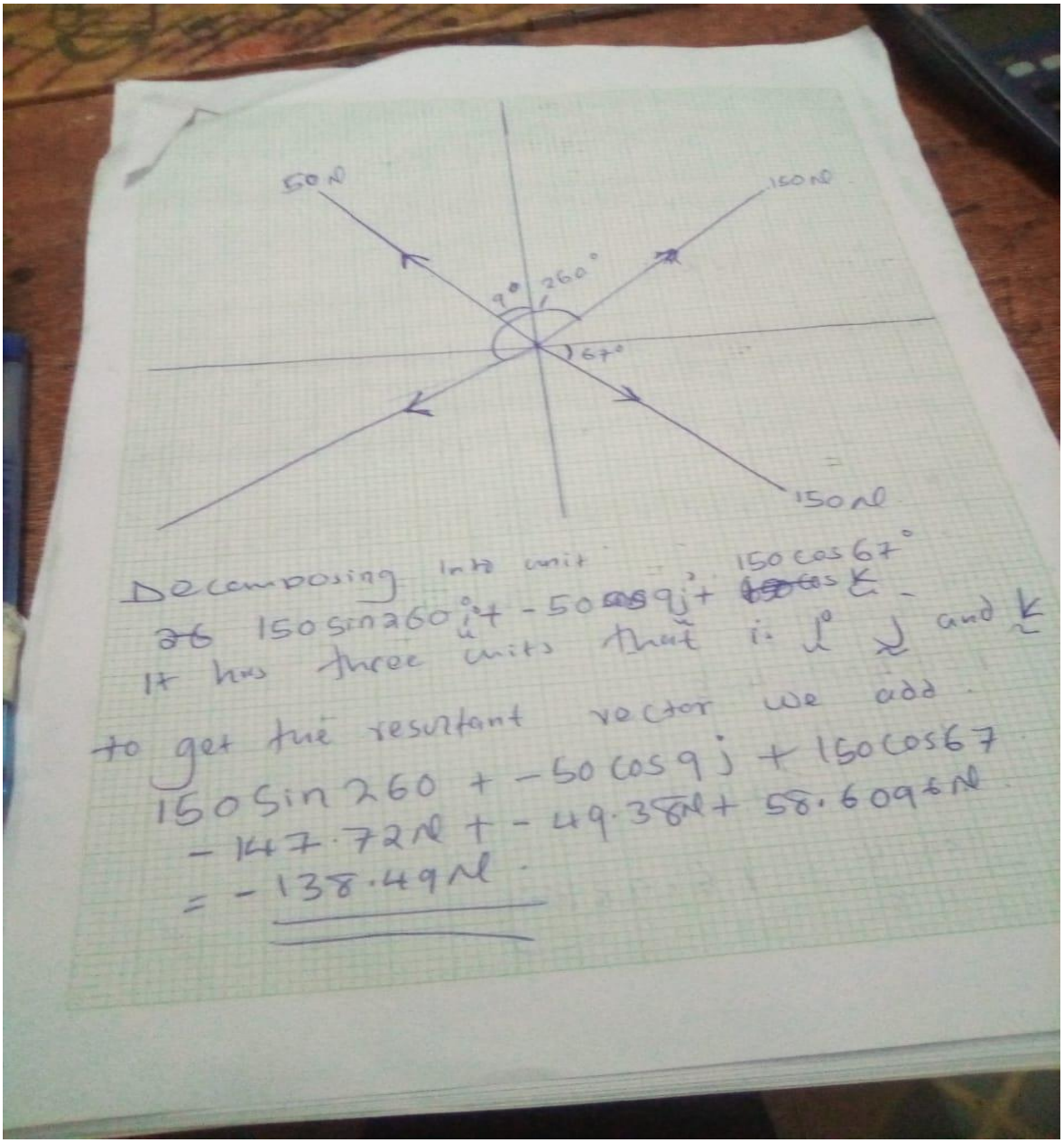
So we will require a force of 16.98N

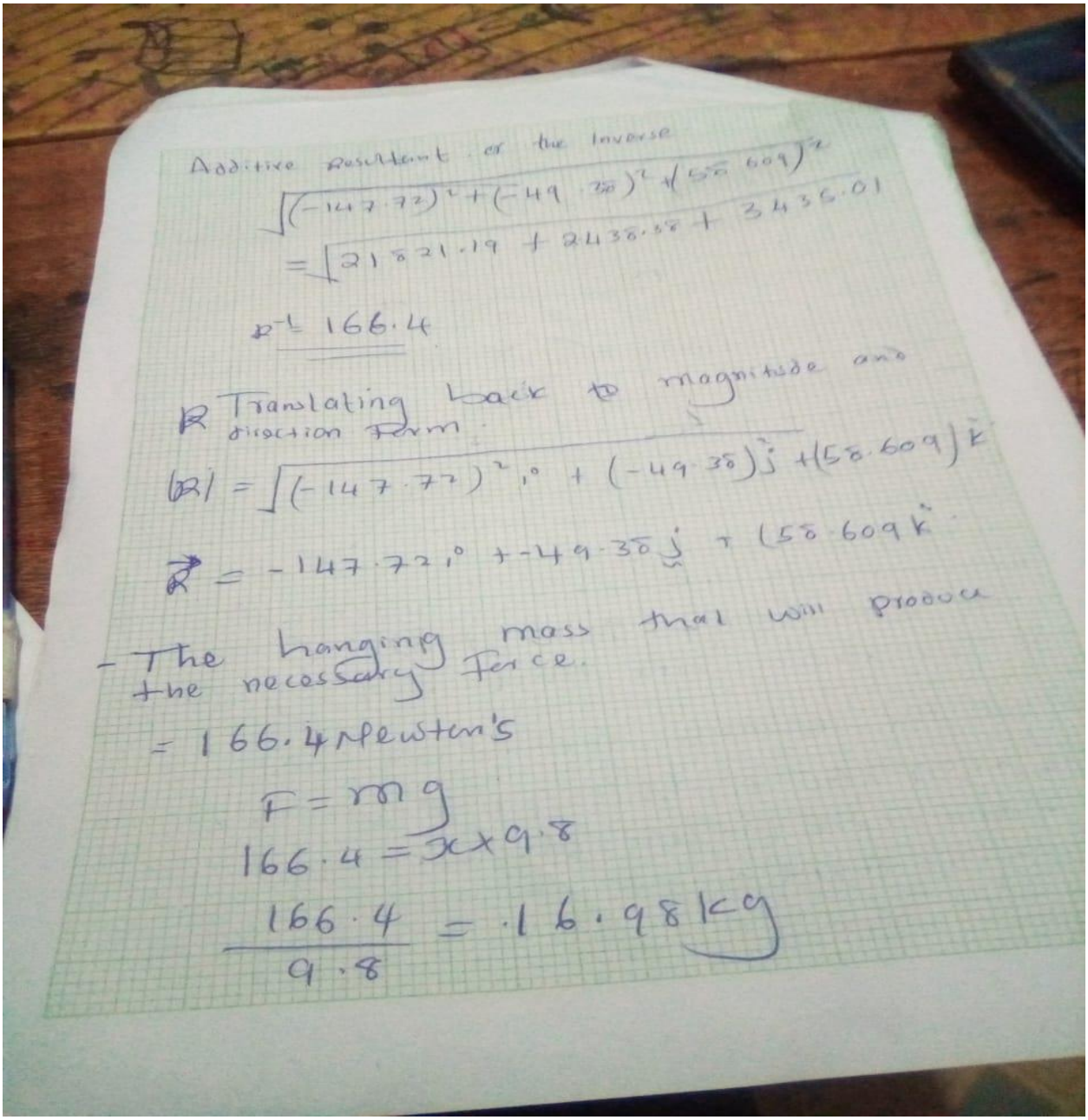
PART C: Adding three vectors and finding the inverse

The weight recquired is the sum of the resultant magnitude.

150+150+50=350N.

The magnitude is the same as the weight so the magnitude ie 150N 150N AND 50N STILL REMAINS.





CONCLUSION....

IN conclusion the objective of the experiment was achieved since the mass weight and calculations involving vectors were successfully done. Also the resultant vector under different strings were able to be calculated.

IMPORTANCE OF KNOWING UNCERTAINITY OF A MEASUREMENT AND SUBSEQUENTLY CALCULATED VALUE

A calibration is a matter of qualifying the results under test. Only by knwing the limitations of the materials its is possible to calculate the errors of the results obtained and also helps in determining to what extent the results has deviated from the true values. By help of uncertainties of the material one is able to determine the actual value and to what extend the results have deviated from the true values.