Date of Lab 10/10 Date of Submission 10/17

Laboratory Report

Title Force table and equilibrium

Homeroom	Section	Name	
11-0	2		Yukiko Takahashi

Lab Partners Kazuma Oda

Summary

In this lab we used the force table to see how the net forces are when the weights were in balance or unbalanced. For experiments 1 and 2 we balanced it but in the 3rd experiment we intentionally unbalanced towards one side The result of these 3 experiments showed two things: one is that when in balance the net force ~~does~~ become zero or is very close to 0, and two, that when unbalanced the net force is way off from 0.

• Meet a deadline • Write logically • Write clearly • Write with your own words

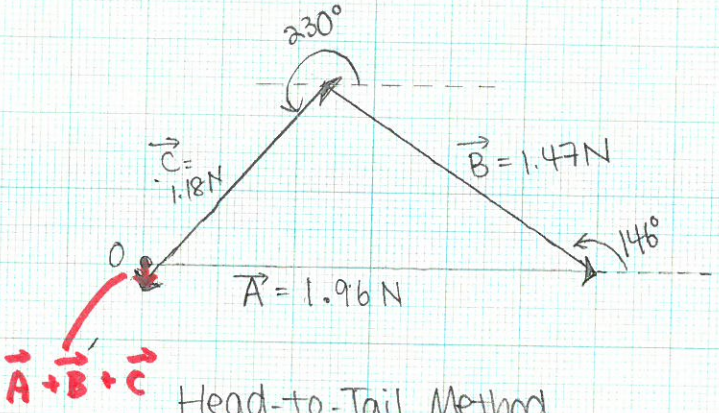
Teacher's Comments

Drawings are clean and beautiful. Wrong expressions about angles in the math method. Experiment are very good

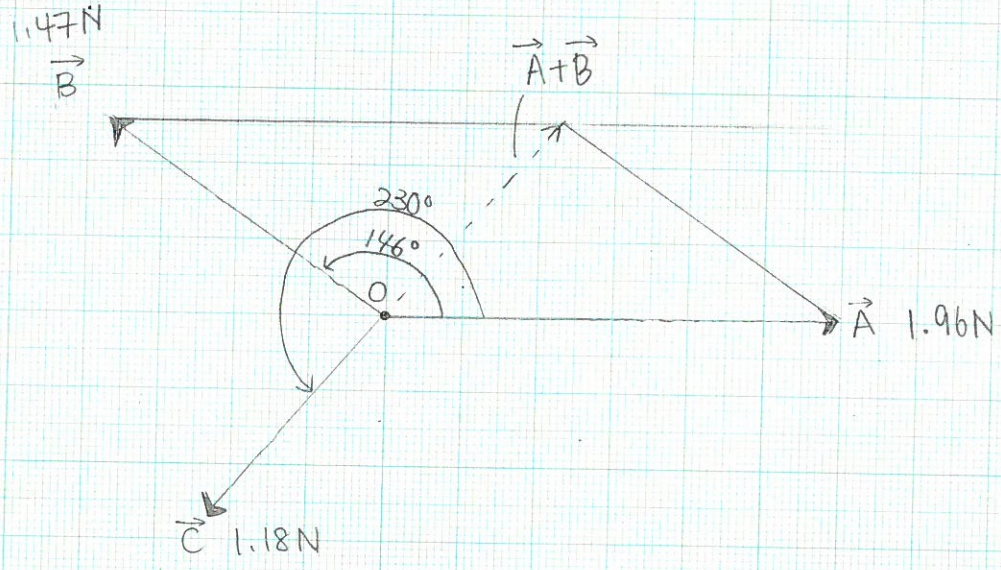
1	2	3	4	5	6	7	8	9
Due	Summary	Intro.	Method.	Results	Table/Fig.	Discussion	Clearness	General

* Use this form as a cover sheet.
* Submit your reports by the seventh day after your lab.

Experiment 1: In balance with 3 weights



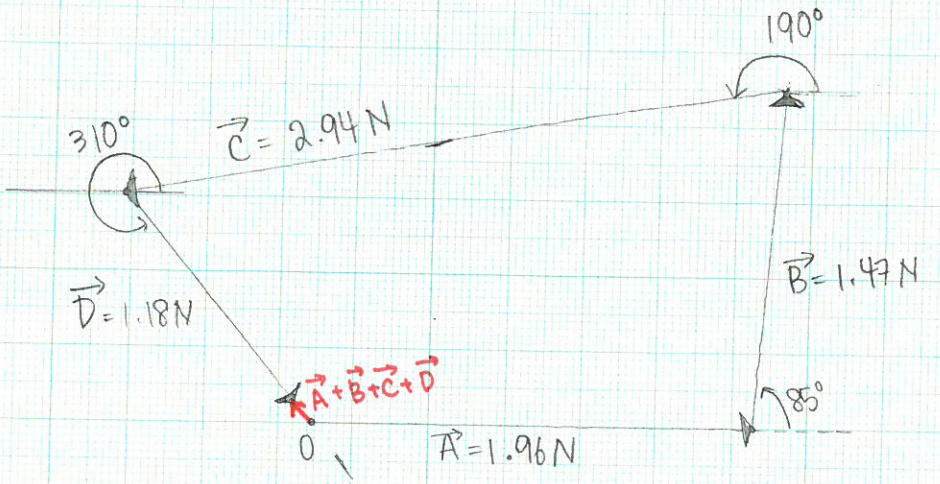
Head-to-Tail Method



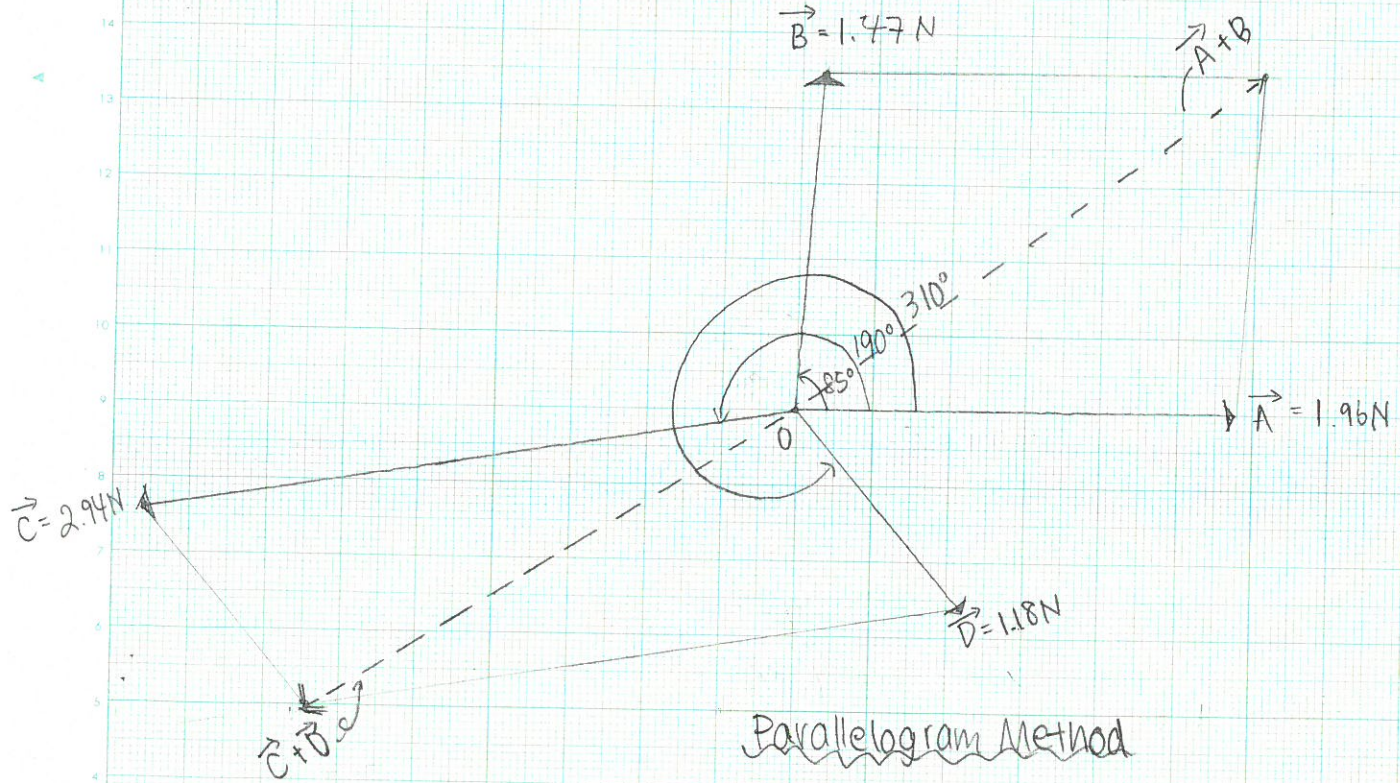
Parallelogram Method

(Length of an arrow
1N = 3cm)

Experiment 2 : In balance with 4 weights



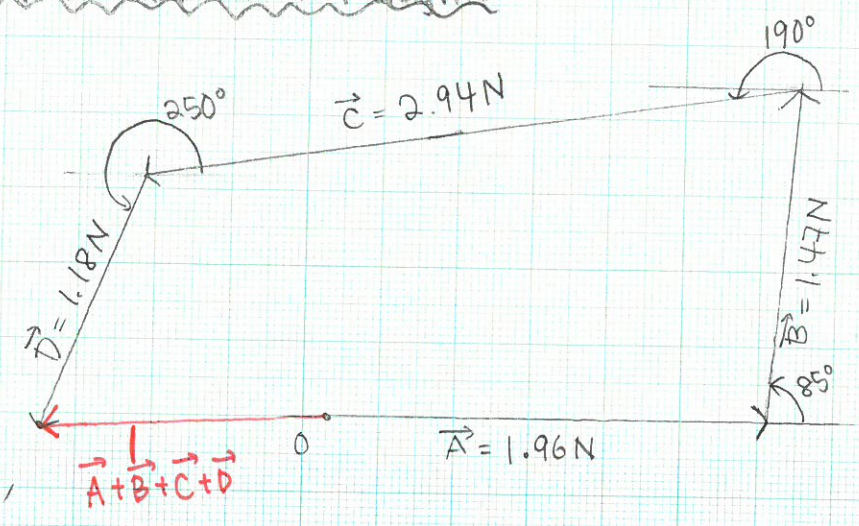
Head-to-Tail Method



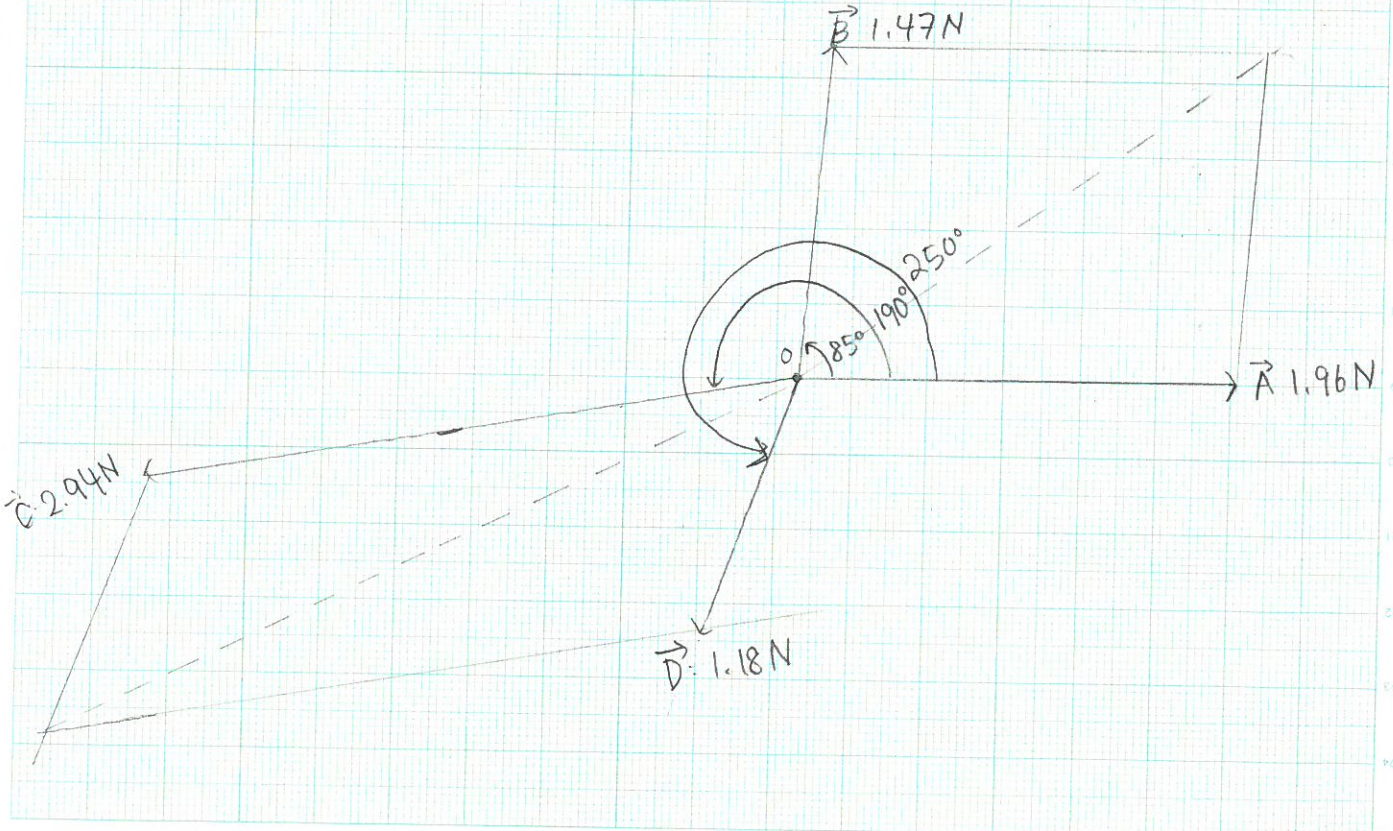
Parallelogram Method

(Length of an arrow
1N = 3cm)

Experiment 3: In unbalance with 4 weights



Head-to-Tail Method



Results

Experiment 1: In balance with three hangers, length of an arrow 1N = 3cm

Experiment 1	Mass of Weight (kg)	Force (N)	Arrow (cm)	Angle(°)
A	0.20 kg	1.96 N	5.88cm	0°
B	0.15kg	1.47N	4.41cm	146°
C	0.12kg	1.18N	3.54cm	230°

Experiment 2: In balance with four hangers, length of an arrow 1N = 3cm

Experiment 2	Mass of Weight (kg)	Force (N)	Arrow (cm)	Angle(°)
A	0.20 kg	1.96 N	5.88cm	0°
B	0.15kg	1.47N	4.41cm	85°
C	0.30kg	2.94N	8.82cm	190°
D	0.12kg	1.18N	3.54cm	310°

Experiment 3: In unbalance with four hangers, length of an arrow 1N = 3cm

Experiment 3	Mass of Weight (kg)	Force (N)	Arrow (cm)	Angle(°)
A	0.20 kg	1.96 N	5.88cm	0°
B	0.15kg	1.47N	4.41cm	85°
C	0.30kg	2.94N	8.82cm	190°
D	0.12kg	1.18N	3.54cm	250°

Math Method

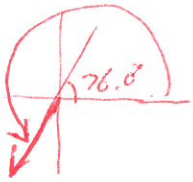
Experiment 1: In balance with three hangers

Experiment 1	F [N]	θ [°]	Fx=Fcos θ	Fy=Fsin θ
A	1.96 N	0°	1.96N	0N
B	1.47N	146°	-1.22N	0.82N
C	1.18N	230°	-0.76N	-0.90N
		ΣFx, ΣFy	-0.02N	-0.08N

$F=\sqrt{(-0.02)^2+(-0.08)^2}$ = 0.08

$\theta = tan^{-1}\frac{-0.08N}{-0.02N}$ =76.0°

180°+76.0°=256°



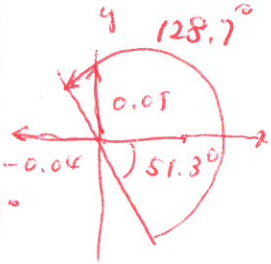
Experiment 2: In balance with four hangers

Experiment 2	F [N]	θ [°]	Fx=Fcos θ	Fy=Fsin θ
A	1.96 N	0°	1.96N	0N
B	1.47N	85°	0.13N	1.46N
C	2.94N	190°	-2.89N	-0.51N
D	1.18N	310°	0.76N	-0.90N
		ΣFx, ΣFy	-0.04N	0.05N

$F=\sqrt{(-0.04)^2+(0.05)^2}$ = 0.06

$\theta = tan^{-1}\frac{0.05N}{-0.04N}$ =-51.3°

180-51.3°=128.7°



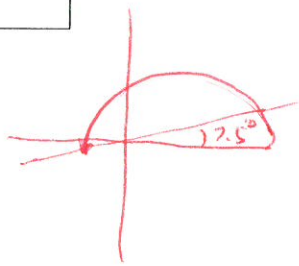
Experiment 3: In unbalance with four hangers

Experiment 3	F [N]	θ [°]	Fx=Fcos θ	Fy=Fsin θ
A	1.96 N	0°	1.96N	0N
B	1.47N	85°	0.13N	1.46N
C	2.94N	190°	-2.89N	-0.51N
D	1.18N	250°	-0.40N	-1.11N
		ΣFx, ΣFy	-1.20N	-0.16N

$F=\sqrt{(-1.20)^2+(-0.16)^2}$ = 1.21

$\theta = tan^{-1}\frac{-0.16N}{-1.20N}$ =7.5°

180°+7.5°=187.5°



Discussion:

In this lab we were able to see that the sum of the force does really become zero in equilibrium when we add up the forces of each weight. The equilibrium formula for force is $F_1 + F_2 = 0$. For example in experiment 1 and 2, Fx, Fy and F is very close to zero because we tried to balance the weights to become equal. The two experiments are almost at equilibrium, and that makes sense because the weights balanced out the ring in the middle. The reason that the force isn't completely equal is because the ring wasn't truly in balance, and in the experiments they were slightly slanted towards one weight. On the other hand in experiment 3 where we intentionally make the weights in unbalance, we saw in the result that Fx, Fy and F do not even come close to 0. This makes sense, because it was unbalanced and was very slanted towards one side. This experiment proved the equilibrium formula for force showing that when in balance the sum of forces equals zero.

Conclusion:

When forces are balanced, the sum of Fx and Fy equals to or is very close to zero.

Opinion:

I thought that it was a very interesting and fun experiment. I didn't get the concept of the forces balancing each other out very well but through the experiment and drawing out the parallelogram and head-to-tail methods, I was able to have a deeper understanding of how forces work. On the other hand I was also able to see how the forces will not be equal once the weights become unbalanced. Although it was a very frustrating experiment at first because I couldn't find the perfect angle where the weights balanced each other out, it was a great experiment and laboratory overall.