2020 Sec 3 Physics Practical 4 ANSWERS

Dynamics : Forces in Equilibrium (Pair Work)

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Results:

(g) *Table 1*: **α**, **β**, T_1, T_2, T_1^2, T_2^2 and **Q**

α / °	β / °	T_1 / N	T_2 / N	T_1^2 / N^2	T_2^2 / N^2	Q / N^2
0	90	3.43	0.00	11.8	0.00	11.8
10	80	3.40	0.66	11.6	0.44	12.0
20	70	3.13	1.17	9.80	1.37	11.2
30	60	3.01	1.68	9.06	2.82	11.9
40	50	2.65	2.23	7.02	4.97	12.0
45	45	2.44	2.44	5.95	5.95	11.9

(h) *Table 2*:

#	α / °	β / °	T_1 / N	T_2 / N
1	30	30	2.09	2.02
2	45	45	2.44	2.44
3	60	60	3.43	3.40
4	15	45	2.86	1.05
5	60	45	2.59	3.16
6	45	60	3.16	2.59
7	0	90	3.43	0.03

Questions:

Q1 State and explain one possible source of error in this experiment.

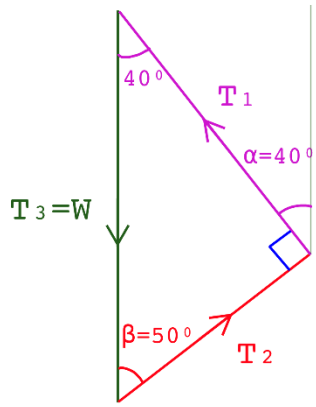
- There could be human judgment error in reading the angles to the nearest degree.
- There could be human judgment error in judging the exact alignment of the junction over the centre of the protractor.
- There could be human judgement error in aligning each string to the length of each hook on the sensor.
- There may be friction over the edge D of the bench.

From the results in Table 1:

Q2 What do you notice about the values of **Q**?

The values of Q are (approximately) the same value
and are equal to the square of the weight of the load L (using Pythagoras' theorem).

Q3



Refer to Diagram 1 plan (top) view of forces!

Q4 What is the weight of the load **L**?

Weight of load, L = tension in supporting string = T_3.

T_3 = W can be found from Pythagoras' theorem. i.e. square root of Q.
Q ≈ 10 to 12 N
W = √Q ≈ 3.1 to 3.5 N

From the results in Table 2:

Q5 What relationship do you see for row #1-3?

With angles α and β being identical (α = β), the tensions in the two strings are identical ($T_1 = T_2$).

As the angles (α and β) increase from row #1 to 3, the tensions in the strings also increase.

Q6 What relationship do you see for row #4-7?

With angles α and β being different, the tension in the two strings will be different.

The string with the smaller angle has a larger tension.

Note: Compare the relationships deduced with the diagram in Q3.