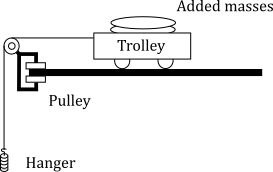
Investigation: Finding gravitational acceleration by accelerating masses

**Take-Home**

Cecil Andrews College 2023

Mark: \_\_\_\_\_\_\_\_/15 Name:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

30% of inquiry task

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The time squared that it takes for the trolley to travel from the start line to the finish line is given by:

(1)

Where is the distance from the start to finish, , is gravitational acceleration, is the total mass of the trolley plus added masses, and is the mass of the hanger.

1. (Hard question) Use Newton’s second law (, show that the above equation is correct (3 marks)

Miss Tee decides to investigate the effect of the trolley mass on the trolley’s travel time. She records her control variables and results below.

**Control variables**

Mass of the hanger + weights, g

Distance between the start line and finish line, 80 cm

Mass of the trolley without weights, g

**Results**

|  |  |  |
| --- | --- | --- |
| Mass of trolley and weights,  (kg) | Average time,  (s) | Time squared,  (\_\_) |
| 0.2 | 0.56 |  |
| 0.7 | 0.91 |  |
| 1.2 | 1.05 |  |
| 1.7 | 1.25 |  |
| 2.2 | 1.42 |  |

**Analysis**

1. Fill in the final column by taking the average time and squaring it. Include the units for time squared in the gap provided. (1 marks)
2. On the grid paper provided, plot the data using on the -axis and on the -axis. (4 marks)
3. Using a ruler, draw the Line of Best Fit. (1 mark)
4. Calculate the gradient of the Line of Best Fit. Show your construction lines, and include units. (3 marks)

Gradient = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Using equation (1) and the value you calculated for the gradient, determine the experimental value of gravitational acceleration, . Comment on your answer; do you think it is correct? (3 marks)

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**End of Take-home Investigation**