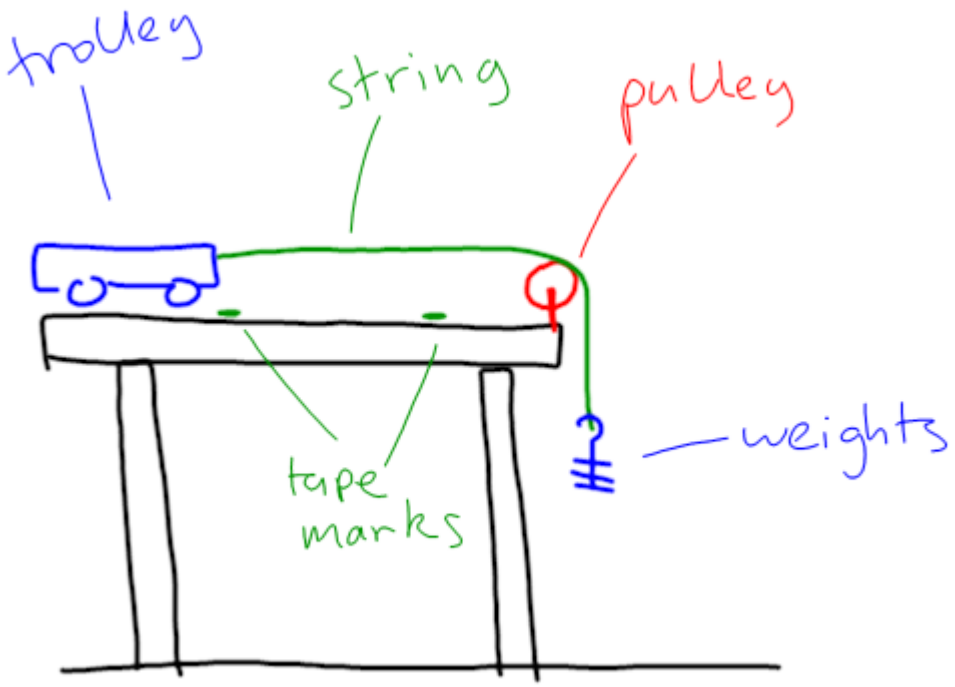
Investigating Newton's Second Law

In this experiment you will find the acceleration of a trolley being pulled by some weights.

Diagram



Method

Use tape to mark out a 50cm distance for the trolley to move through.

Attach a weight to the string, hang it over the pulley, and hold the trolley at the start mark.

Release the trolley (do not push it) and start the timer. Stop the timer when the trolley reaches the other tape mark.

Then increase the weight and repeat.

Results

pull force	distance	time	average speed	initial speed	final speed	acceleration
(N)	(m)	(s)	(m/s)	(m/s)	(m/s)	(m/s^2)
0.1	0.50			0		
0.2	0.50			0		
0.3	0.50			0		
0.4	0.50			0		
0.5	0.50			0		
0.6	0.50			0		

Analysis

For each weight, you know the distance the trolley moved and the time it took, so you can calculate the average speed of the trolley. Do this for each row of your table.

The trolley was accelerating uniformly, and it started at a speed of zero. Therefore for each row the final speed must have been twice the average speed. Calculate the final speed for each row in the table.

Since you know the initial speed (zero), the final speed, and the time, you can work out the acceleration. Do this for each row of your table.

Now plot a graph with pull force on the x-axis and acceleration on the y-axis. Add a line of best fit.

Conclusion

How does the pull force affect the acceleration of the trolley?

Does the graph tell you anything else interesting?

What other factors might affect the acceleration of the trolley?