What effects acceleration

Aim: To find out what effects the acceleration of a small trolley with a weight of 1kg.

Variables: The variables I will keep the same are:

- the weight of the trolley
- the angle of the surface/slope
- length of the surface/slope
- the surface of the surface/slope

I am going to change the mass acting on the trolley through the pulley. This mass will be measured in grams. I will put on masses from 100g to 800g. I am going to measure the acceleration of the trolley in m/s as the mass on the pulley changes. As the masses will be acted on by gravity they will extent a force on the trolley and I will use g= 10N/K to work out the force for each mass.

Prediction: I predict that the larger the force in grams acting on the trolley the larger the acceleration of the trolley. I think this because by using the equation F=M*A. This shows me that force is proportional to acceleration. The greater the force the greater the acceleration. This graph shows me this:

Issac Newton said in his 2^{nd} law : 'The rate of change of momentum of a body is directly proportional to the external force acting on the body and takes place in the direction of the force.'

F   rate of change of momentum

F   change/time taken =   (mv)/   t = m   v/   t = ma

Diagram:

Equipment list:

- Light-gate
- String
- Masses
- 1kg trolley
- A ‘mask’
- Surface/slope

Method:

-Collect equipment

-Set up equipment (as shown on diagram)

-Attach the different masses on to the end of the string so it is running through the pulley.

-Release each weight making sure not to measure the acceleration once the weight hits the ground.

-For each weight measure the acceleration three times, this will enable you to take an average.

-Make sure the trolley is always starts in the same place. This will ensure that the test is fair , therefore giving the most accurate results possible.

In my experiment I have to use a 'mask.' This is a piece of card cut out especially so the light-gate can measure the acceleration of the trolley. The light-gate works on a set of timers that start and stop as it detects the card and the time when it doesn't.

In my experiment I may come across the fact that friction may affect my results. I could compensate by adding small weights at the start so that the trolley moves at a constant speed or perhaps tilt the runway. In either case the acceleration should remain zero and therefore make no difference to my results.

Results table:

Mass on pulley (g)	Force from mass on pulley (N)	Acceleration of Trolley 1m/s 1.	Acceleration of Trolley 1m/s 2.	Acceleration of Trolley 1m/s 3.	Average m/s
0	0.0	0.0	0.0	0.0	0.0
100	1.0	0.7	0.8	0.7	0.7
200	2.0	1.8	1.9	1.6	1.8
300	3.0	2.7	2.9	3.0	2.9
400	4.0	3.8	3.6	3.5	3.7
500	5.0	4.5	3.2	4.1	4.3
600	6.0	5.4	5.1	5.6	5.4
700	7.0	6.4	6.2	6.2	6.2
800	8.0	7.4	7.1	7.3	7.3

Analysis:
The straight line through my graph shows that acceleration is directly proportional to Force. This is in line with Newton's 2nd law which I mentioned in my prediction. My graph shows me that my results were accurate as they agree with his law and prove that my prediction was right. Therefore the force is definitely proportional to the acceleration of the trolley. My results have a rogue result which I have highlighted in red.

Evaluation:
I think my results were fairly reliable all the repeats were consistent. There was one anomalous result, but that was expected. They were reasonably accurate with all values of acceleration to 1d.p or 2 s.f which was the same as the force. Each test was repeated three times and an average was taken, this improves the accuracy and makes my results far more reliable. I could further my experiment by a change in mass and repeat the experiment. I should get similar results, but the acceleration will always be less e.g