**Factors that can affect the severity of a crash**



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**Abstract:**

In this experiment we were trying to find out how mass and friction affects acceleration, force and velocity of a moving object. We used a Ticker tape timer and ticker tape to conduct the experiment on 0.08kg, 0.1kg, 0.12kg, 0.14kg and 0.16kg for a cardboard ramp and a bubble ramp. What we found out was that as the friction increased the acceleration decreased.

**Introduction:**

The purpose of this investigation is to find out how different variables affect the acceleration of an object on an angled ramp and how it links into Newton’s Laws of Motion. The aim was to find out how mass or friction affect the affect the acceleration of a car and the force required to stop the object, and how they are linked to Newton’s Laws of Motion. My Hypothesis is If the mass of the cart increases, the acceleration will decrease. If friction is increased, the acceleration will decrease.

**Materials:**

The materials we used for this investigation are

* Cardboard ramp
* Ticker tape/timer
* A plastic cart
* Plasticine
* Tape
* Scales
* Bubble Wrap

**Method:**

The class split into groups of four or five and we gathered materials. Two blocks of cardboard were placed on top of one another to create an angled ramp that the cardboard could be placed upon. We then measured the height of the blocks and the length of the ramp to work out the angle that the ramp was at. The timer was placed on top of the blocks and next to the ramp and was then plugged into the wall. We started by doing the 80g of mass in the cart and we measured that by weighing the plasticine on the scales to get the right weight. The measuring paper also had to be measured to be the same length as the ramp and then taped to the back of the car. The measuring paper was then placed under a pin so when we let go of the paper the cart would start rolling. This same process was repeated three times to make the experiment as reliable as it could. Once the process was done for the 80g it was repeated for the other four at 100g, 120g, 140g and 160g. After we had got the results for the cardboard ramp, we changed the ramp to bubble wrap and repeated the whole experiment again. After we got our results, we examined the dots drawn by the ticker tape timer and counted every ten dots. Every ten dots equalled to one second and one second was equivalent a metre (m/s)

**Variables:**

Independent: The independent variables of the investigation are the Friction and mass because that is what we will be changing

The Dependant variable is the Acceleration of each mass, which is shown by the dots on the measuring paper.

The Controlled variable was the incline of the ramp, the cart, the plasticine, the timer and the toy car.

**A screenshot of a cell phone

Description automatically generatedA screenshot of a cell phone

Description automatically generatedResults:**

**Discussion:**

As you can see, the results show that as the mass increases, the velocity and the acceleration increase which as well doesn’t support my hypothesis. The Cardboard ramp with the cart with 0.08kg had an average acceleration of 0.034m/s/s, 0.1kg had an average acceleration of 0.046m/s/s, 0.12kg had an average acceleration of 0.049m/s/s, 0.14kg had an average of 0.053m/s/s and 0.16kg had an average acceleration of 0.055m/s/s. The bubble wrap ramp as the weight increased the velocity increased as well 0.08kg had an average acceleration of 0.019m/s/s, 0.1kg had an average acceleration of 0.021m/s/s, 0.12kg had an average acceleration of 0.024m/s/s, 0.14kg had an average acceleration of 0.029m/s/s and 0.16kg had an average acceleration of 0.030m/s/s. In the results you can see that there is a relation between mass, force, acceleration and velocity. It shows us that as the mass increases, the acceleration and velocity increase with it.

**Evaluation:**

To improve the validity and reliability of this experiment, all of the groups could use the same cart as one cart could be made differently to the others, this could mean that one groups cart is heavier than another groups cart. To make the experiment more valid, we could make sure that the car doesn’t get played around with or moved while the ticker tape timer was being reset. A limitation of this experiment was that it had to be performed over two lessons meaning that some of the equipment could have been changed or modified. Another limitation was not having anything for the cart to roll onto after it had rolled down the ramp meaning that the measuring tape could just snap.

**Conclusion:**

In Conclusion I found out that my hypothesis didn’t support my results. From my results I can see that the cardboard ramp was more solid and had less friction then the bubble wrap ramp. I understand more clearly how mass affects acceleration and velocity.