**Mass Effecting Force**

**Background:**

 Mass and weight might be the same thing, but it’s actually not. Mass is the amount of matter (atoms and molecules) in an object. Differently, weight is the pull of gravity on an object. Mass and weight are only known as the same thing on Earth. Earth’s gravity is the standard gravity and so the weight of any object is about the same no matter where the location is.

 A force is a push or a pull. Things can exert (put) force and force moves things. Force cannot be seen, but people can see the effect of the force being applied. Gravity is another major science thing. Gravity connects to force. Gravity is a force which tries to pull two objects forward each other. The bigger an object is, the bigger its gravitational pull is.

**Research Question:**

 How will increasing the mass of cart affect the distance the block moves?

**Hypothesis:**

 If the amount of mass of the cart increases, then the distance the block moves will more further because the mass is so heavy, the cart will have gravity pulling it down with the added mass. The speed of the cart will increase and the more impact there is, the further the block moves.

**Materials:**

* One 33 cm brown piece ramp
* Two 57 cm track pieces
* One 53.7 gram cart
* One meter stick (use centimeter)
* One 45.8 gram wooden block
* One basket
* One pencil
* One lab sheet
* Three 49 gram cylinder mass
* One Calculator

**Procedure:**

1. Gather all the materials for this lab.
2. Set up the brown plastic ramp near the end of the table.
3. Then, connect the two white plastic track pieces. The track that says X should be connected to the ramp first, then connect the track that says Y.
4. Use the meter stick to measure 5cm from the bottom edge of the brown plastic ramp and mark it with a pencil.
5. Place the wooden block’s edge on the pencil mark, with the sign on the wooden block that says “Up.”
6. Put the meter stick next to the pencil mark.
7. First, do five trials with no mass added to the cart. Make sure the cart’s rear wheel axle is on the release point! Make sure the final measurements are measured on the first end of the wooden block.
8. Now, do five trials with one cylinder mass added to the cart. Put the cylinder in the open space in the cart.
9. Next, do five trials with two cylinders mass added to the cart.
10. Lastly, do five trials with three cylinders mass added to the cart.
11. Record to your lab sheet!
12. Then, find the average. To find average, add up the five weight numbers. Then, the sum of the five numbers divided by five because there are five trials.
13. Clean up your lab!

**Data:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Trials** | **0 Cylinder** | **One Cylinder** | **Two Cylinders** | **Three Cylinders** |
| **1** | 15.6 cm | 28 cm | 59 cm | 63.5 cm |
| **2** | 15.6 cm | 35.5 cm | 56 cm | 65.5 cm |
| **3** | 19 cm | 38 cm | 53 cm | 66.5 cm |
| **4** | 15.6 cm | 41 cm | 55 cm | 67 cm |
| **5** | 15 cm | 34 cm | 51 cm | 67 cm |
| **Average** | 16.16 cm | 35.3 cm | 54.8 cm | 65.9 cm |

**Data Analysis:**

 After completing the data, the data confirms the hypothesis*, if the amount of mass of the cart increases, then the distance the block moves will further because the mass is so heavy, the cart will have gravity pulling it down with the added mass. The speed of the cart will increase and the more impact there is, the further the block moves.* This is because the more mass that is added, the block moves further because the impact is harder and so when the cart and block heats, the wooden block travels further. This is because there are heavier and weighs more. Increasing the mass of the cart affects the amount of force applied on the block because there is more force when the mass increases.

 The independent variable of the experiment is the amount of mass in the cart. The independent variable an experiment means the one thing you change in a lab. The dependent variable (the results) that will be measured is how far the block goes. Make sure to keep all the materials and the same release point, A.

**Conclusion:**

 In conclusion, the purpose of this lab experiment is to see if mass affect force. Also, it’s to see how mass affect force. Based on the data, the data supports the hypothesis *if the amount of mass of the cart increases, then the distance the block moves will further because the mass is so heavy, the cart will have gravity pulling it down with the added mass. The speed of the cart will increase and the more impact there is, the further the block move.* Furthermore, a new research question that could be tested is how far the metal block goes if there were two carts going down the ramp.

The limitations (things that affected the experiment’s accuracy) in this experiment is that people might happen to have human errors (incorrect reading the measurements). Also, teams can do the math calculation wrong for the average. Not having the same materials for each trial, not releasing the cart with the rear wheel axle on the Release Point A, and someone might push the cart down instead of releasing/letting it go.