First Last
Ms. Tlucek
English 8
19 February 2010

Does Mass Affect Speed?

Abstract

This experiment was conducted to test the affects of mass on speed. To test the variable, the amounts of mass in model cars were changed to show a difference in speed. The results overall showed that the data was inconclusive to show if mass indeed has certain affects on an object.

Introduction

Many questions have been raised in the field of science, some by the greatest minds in history. But there has always been one topic that continues to fascinate minds. That topic is mass. Through a great amount of research, people have learned so much about mass. This research is designed to answer the question 'Does mass affect speed?'

Since the sixteenth century, scientists have tested the effect of mass on speed. Mass is required for speed of motion in objects. Mass is an object's inertia, an object's influence in a field of gravitational pull, and the amount of an object's matter (Young). Scientists utilize these properties to find an object's momentum, force, inertia, amount of energy, and even its amount of matter (Young). Many scientists have tested different theories throughout the centuries. Galileo Gallilei tested his theories around 1585 through 1592 ("Gallilei Galileo"). Isaac Newton

tested the effects of mass from 1664 through 1667 (Bruno). Due to these facts, it can be proven that mass has been tested since the sixteenth century.

Throughout the past, the topic of mass has interested many great minds. Some of history's most famous scientists have worked on this topic. Isaac Newton discovered his theory universal gravity by testing mass, including mass related to speed (Bruno). Galileo Gallilei tested mass and its affects using a hydrostatic balance in the cities of Florence and Pisa ("Gallilei Galileo"). Mass relating to speed has raised multiple scientific questions. Using the effects of mass allowed Isaac Newton to develop his Three Laws of Motion (Bruno). Along with Galileo's research using the hydrostatic balance, Isaac Newton showed that mass can greatly affect an object's speed ("Gallilei Galileo"). Mass allowed many great minds to create and test many theories.

This research will attempt to find whether or not mass has an effect on the speed of a moving object. If so, then how does it change the speed? Does a greater mass increase or decrease speed? The hypothesis was 'If the mass of a model car increases, then the car will reach the bottom of a ramp faster because the kinetic energy of the car will increase due to the increase in potential energy by the increase in mass, which will in turn, increase the speed.'

Methods

Using one meter of cardboard, three model cars, a stopwatch, duct tape, and a metric ruler, I attempted to conduct my experiment. I used the cardboard to create a ramp, held up by the duct tape, and then sent the three cars down, using the stopwatch to time how long it took the cars to reach the bottom. I measured the mass of the cars and then, using the time and distance, I

found the cars' speeds. I thought that using these methods would ensure an easily depict able change between speeds and would allow me to see these changes fairly easily.

Results

As shown in the graphs, the data collected during each trial conducted for the experiment, was inconclusive to support or dismiss the hypothesis, which was 'If the mass of a model car increases, then the car will reach the bottom of a ramp faster because the kinetic energy of the car will increase due to the increase in potential energy by the increase in mass, which will in turn, increase the speed.'

During the first trial, the data displays that the speed of the cars stayed relatively similar. The yellow car's speed increased slightly, though. The orange and red cars' speeds stayed at 0.83 m/s, while the yellow car's speed was 0.91 m/s (see Appendix 1 and 4). This is only a slight change in speed, but by this change, it can be said that the data supported the hypothesis.

Afterward, during the second trial, the data shows a complete difference. Specifically, the data showed that the orange and red car's speed was greater, 0.91 m/s, while the yellow car's speed was less, 0.83 m/s (see Appendix 1 and 4). Due to this difference, it can be said that the data did not support the hypothesis.

Then, conducting of the third trial showed that the red and yellow car went slower. The speeds of the red and yellow cars were 0.77 m/s, while the orange car's speed was 0.83 m/s (see Appendix 1 and 4). Over all, the third trial showed that the data did not support the hypothesis.

Finally, the data from the trials averages. The averages showed that the orange car, or the car with the lowest mass, had a speed of 0.85 m/s, while the two with higher mass, the red and

yellow cars, had a speed of 0.83 m/s (see Appendix 1 and 4). So, overall, the averages did not support the hypothesis.

Even though the data was inconclusive, there may have been some sources of error. One source of error may have been that the timing was not exact. Some other sources of error may have been that the measuring was not exact, or the texture of the ramp affected the car's ability to roll smoothly. One other source of error may have been that the cars were not released with the same amount of force each time.

Collectively, that data did not show enough of a change to say if the hypothesis was supported or not. Due to this fact, the data was inconclusive. Though it was found that mass does have an effect on speed. In which way is undeterminable, though, with this set of data.

Conclusion

The data was inconclusive to support the hypothesis. The car with the lowest mass had a speed of 0.85 m/s, while the two others with higher amounts of mass had a speed of 0.83 m/s (see Appendix 1 and 4). This slight change was too minimal to take into account, and allowed me to say that the data did not support the hypothesis.

Changes that I would make to my experiment after conducting it would be to increase the mass difference in the cars to possibly show a greater change in speeds. Also, I would increase the length and slope of the ramp to allow a much more accurate speed measurement. Taking my sources of error into account as well, I would try to make the timing much more exact and try to change the ramp to allow the cars to roll smoothly.

Based on the findings of the experiment, no new problem needs to be conceived due to the fact that the data was inconclusive. If a new problem was needed, though, an example of one would be 'Does a larger difference in mass allow for a greater change in speed?'

Continuing research into this topic would allow for a possible answer to the problem and may even allow for new and much more developed questions to be made. Extra research may also open up opportunities for new experiments to be done.

This scientific research could potentially benefit many people. It could help to show vehicle designers how to create a much more efficient vehicle design. Also, the research might open up new possibilities for human accomplishments, such as space vehicle design might allow for travel to other areas of the universe.

Works Cited

Bruno, Leonard C. "Isaac Newton." Gale Science Resource Center 2008. Thomson Gale. Heritage Middle School Library, Meridian, ID. 22 October 2009 <http://galenet.galegroup.com>.

"Gallilei Galileo." Gale Science Resource Center 2006. Thomson Gale. Heritage Middle School Library, Meridian, ID. 26 October 2009 <http://galenet.galegroup.com>.

Young, Robyn V. "Mass." Gale Science Resource Center 2006. Thomson Gale. Heritage Middle School Library, Meridian, ID. 20 October 2009<http://galenet.galegroup.com>.

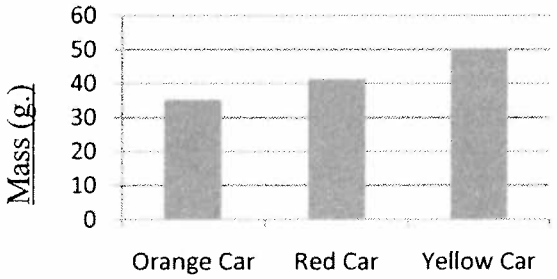
Appendix 1

Data Table 1: Mass Related to Model Cars' Speeds

Mass (g.)	Trial 1		Trial 2		Trial 3		Average	
Orange car: 35.3	Time	Speed	Time	Speed	Time	Speed	Time	Speed
	1.2 s.	0.83 m/s	1.1 s.	0.91 m/s	1.2 s.	0.83 m/s	1.17 s.	0.85 m/s
Red car: 41.4	1.2 s.	0.83 m/s	1.1 s.	0.91 m/s	1.3 s.	0.77 m/s	1.20 s.	0.83 m/s
Yellow car: 50.4	1.1 s.	0.91 m/s	1.2 s.	0.83 m/s	1.3 s.	0.77 m/s	1.20 s.	0.83 m/s

Appendix 2

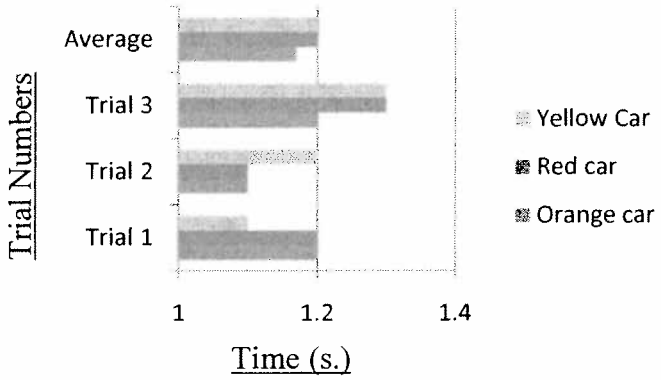
Graph 1: Mass of the Model Cars



Colors of Cars Used in Experiment

Appendix 3

Graph 2: Times of Cars



Appendix 4

Graph 3: Speeds of the Cars