

Candidate 4 evidence

Finding the relationship between braking distance and mass

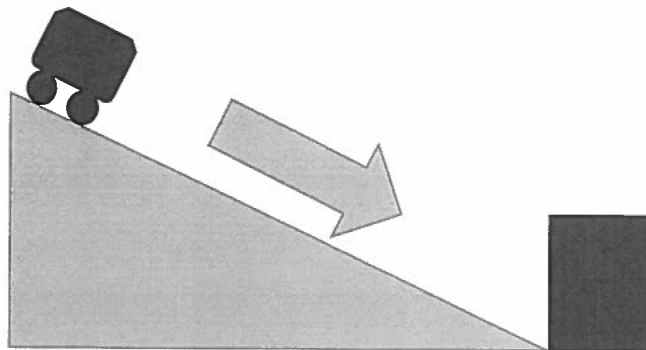
Aim:

To investigate the relationship between the braking/stopping distance and the mass of a vehicle.

Method

- First you need a trolley ,slope and a block
- Put a ruler (meter stick) along side the slope just after so that you can measure how far it has been moved
- Place the trolley on top of the slope and put the block in front of the slope
- Let the trolley down the slope and the hit the block
- Measure the stopping distance of the trolley
- Repeat 5 times each time adding 100g of weights

Diagram



Underlying physics

$$E_w = f \times d$$

The vehicle at the top of the slope/ramp has potential energy before it is released from the top. The vehicle had potential energy and then when it descends that energy turns into kinetic energy.

Double vehicle weight – Double your stopping distance



Double vehicle speed – Quadruple your stopping distance



The experiment is used by car manufactures to measure the rating that a car needs and they use this in the equation:

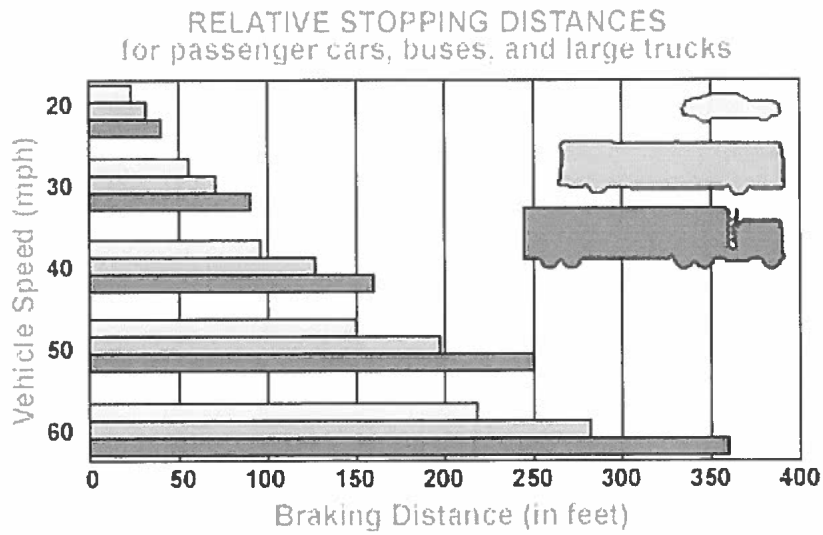
$$\text{Stopping distance} = \text{thinking distance} + \text{braking distance}$$

This experiment is important because if the breaks were too weak the car wouldn't stop fast enough and there would be an accident, but if the breaks were too strong the car would just end up flipping over and crashing. This next graph shows us real statistics of different vehicles breaking distance.

Other equation is:

$$\text{Driver's reaction time} + \text{Brake lag} + \text{Braking distance.}$$

The time it takes for a human to see an accident or hazard away to happen and apply the brakes, are approximately 3/4 of a second.



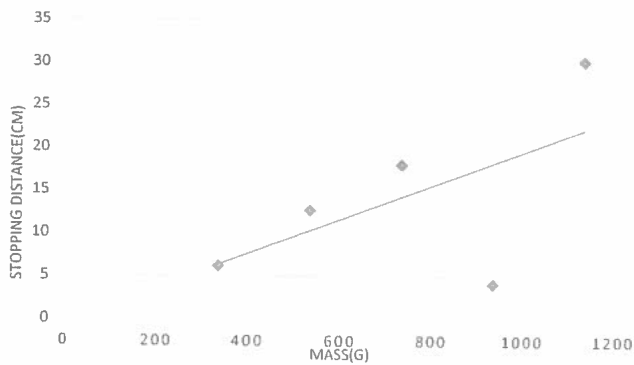
Sources:

http://www.truckitsmart.com/latest-news/tips_for_driving_in_poor_weather

<https://www.sgi.sk.ca/individuals/licensing/studyguides/airbrake/brakes/stopping.html>

Results table:

Mass(g)	Stopping Distance (cm)			
	1 st	2 nd	3 rd	Average
332.9	6.1	5.8	6.6	6.17
532.9	12.5	12.9	12.6	12.67
732.9	17.9	18.1	17.9	18.0
932.9	24.6	23.8	23.8	24.1
1132.9	28.4	31.1	31.1	30.2



Analysis

I found that my results were similar to the sources in the word document

Conclusion:

The relationship between the braking distance and the mass of a vehicle is that if you increase the mass, the braking distance will increase also.

Evaluation

The measuring of the stopping distance used by a ruler could have been done a lot more efficient, in the future I would advise to making sure that I and other people correctly measure the distance correctly.