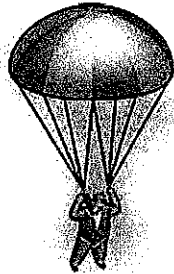


# Science Report: Gravity

by [REDACTED] 4/5



# Question



Why does the weight of different objects:

- a rock
- a rubber
- a highlighter
- a stick
- a leaf

change the time it takes for the parachute we made (and is attached to these objects) to fall to the ground when dropped from a height

?



# History/Background

If something falls or is dropped it heads towards earth. Famous scientist, Isaac Newton (1642-1727) thought about why objects on earth drop when they fall. Gravity is a force that causes objects to fall to the ground. Newton studied and learned a lot about gravity.

His law of gravity says that the gravitational force pulling an object down is proportional to the mass of the object.

Gravity affects all objects with any mass similarly. More massive objects however, experience a greater gravitational pull. It does not matter if an object is very heavy or very light, all objects are accelerated towards the earth's surface at the same rate.

The only difference with light objects is the effect of air resistance. If you drop a bowling ball and a feather, the ball will land first because the feather has been slowed by air resistance. In a total vacuum they would both land at the same time.

Parachutes are used for many things. They are used by dragster racing cars, aircraft, the space shuttle and skydivers to slow them down. The parachute slows the speeding body down because it causes air resistance (the friction between an object and the air that it is moving through). The larger an object is the bigger the surface area it will have and the larger surface area causes more air molecules to be moved aside which leads to more air resistance.

When a skydiver is in free fall, gravity pulls them towards the ground. Gravity has a lot of force and objects falling including humans, can fall very fast. The parachute creates air resistance and slows the falling person down using air resistance. Air fills the parachute and causes it to rise against the fall which creates an opposing force to gravity making the skydiver's trip much slower. This experiment tests the effect of gravity using a parachute.

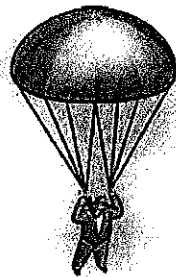
# Hypothesis

Based on my research, my hypothesis is that the greater the mass of the objects chosen, i.e. rock, rubber, highlighter, stick and leaf, the faster the attached parachute will fall to earth.

If the objects have a greater weight then the effect which gravity will have on them will be bigger.

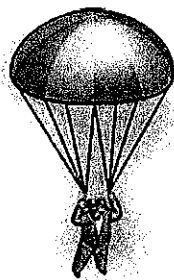
While the parachute slows down the speed at which all of objects will fall because it increases air resistance, the heaviest objects will still fall to earth the fastest.

My prediction is that the objects that fall to earth quickest will be the heaviest ones through to the lightest object that will fall the slowest. Based on the weight of each object the fastest to fall will be the rock followed by the highlighter, then the rubber, then the stick and finally the leaf. Since some of the objects have a similar weight I would not expect a great difference in the time it takes for some of the to fall to earth.



# Procedure

- Firstly, we made the five parachutes. This was done using a piece of paper towel and putting a hole in each corner of the paper towel.
- Then four pieces of equal length string were threaded through the holes. The ends of the string were then joined together.
- In turn each of the objects - a highlighter, a rubber, a rock, a stick and a leaf were attached separately to each parachute.
- One at a time for the actual experiment, the parachutes with the different objects attached were all dropped from the same height.
- Using a stopwatch to record the time from when the parachute was dropped to when it hit the ground, all results were recorded as accurately as possible so that they could then be plotted onto a simple graph.



# Data Collection/Results

The first set of data collected at school (see copy of log book at the back of this report) was not done very accurately at all.

Controls in the experiment such as the height from which the objects were dropped and the construction of the parachutes were flawed which meant that results were not what I had thought or predicted.

However, the second set of data that I collected at home (tested twice and appears in the table below) was carried out more carefully and in a more controlled way and showed clearly that the heavier the object on the parachute the faster it fell to earth. The tables below show my predictions were right. Although the second set of results have a greater range between the slowest and fastest falling parachutes they still show the same pattern. The minor changes in the results come from the difficulty in accurately reading the speed of the fall with the stopwatch as it was done using the human eye and timing the exact time of impact in such a situation was very difficult.

The results showed that the greater the weight of the object the faster the parachute fell. The objects from heaviest to lightest were:

- rock
- highlighter
- rubber
- stick
- leaf

Rock	1.26 seconds	1.20 seconds
Highlighter	1.27 seconds	1.30seconds
Rubber	1.35 seconds	1.38 seconds
Stick	1.40 seconds	1.46 seconds
Leaf	1 .82 seconds	2.12 seconds

# Reflection/Conclusions

My prediction that the heaviest objects would fall to earth the quickest was proven correct when the experiment was conducted at home by ensuring controls were implemented.

The results showed that the heavier the object on the parachute the faster it fell to earth and the second set of tests I carried out at home proved me right. This was not the case when we conducted the experiment at school because we failed to implement certain controls into the experiment.

What I have learnt is that if you do not conduct a scientific experiment correctly, then the results will be incorrect and not match my predictions or research. When the experiment was first carried out at school certain things were not controlled as well as they could have been and we achieved strange results by not ensuring the height from which the objects were dropped was exactly the same and by not using the same parachute each time. This was brought about because the parachutes that we made kept breaking.

I have learnt that you need to have all necessary controls in any experiment you conduct to ensure its validity.

