

Newton's Second Law of Motion Exploration

by Nick

Sir Isaac Newton is considered by many to be the father of modern physics. He came up with a number of laws, the most famous of which is gravity, when he was supposedly hit on the head by a falling apple. He also came up with three laws of motion. Today you are going to explore his second law which states that an object's force is the combination of its mass and acceleration. His second law gives a formula telling us how much force is needed: $\text{Force} = \text{Mass} \times \text{Acceleration}$.

Force is what changes a state of rest or motion in an object.

Mass is the amount of matter (stuff) in an object.

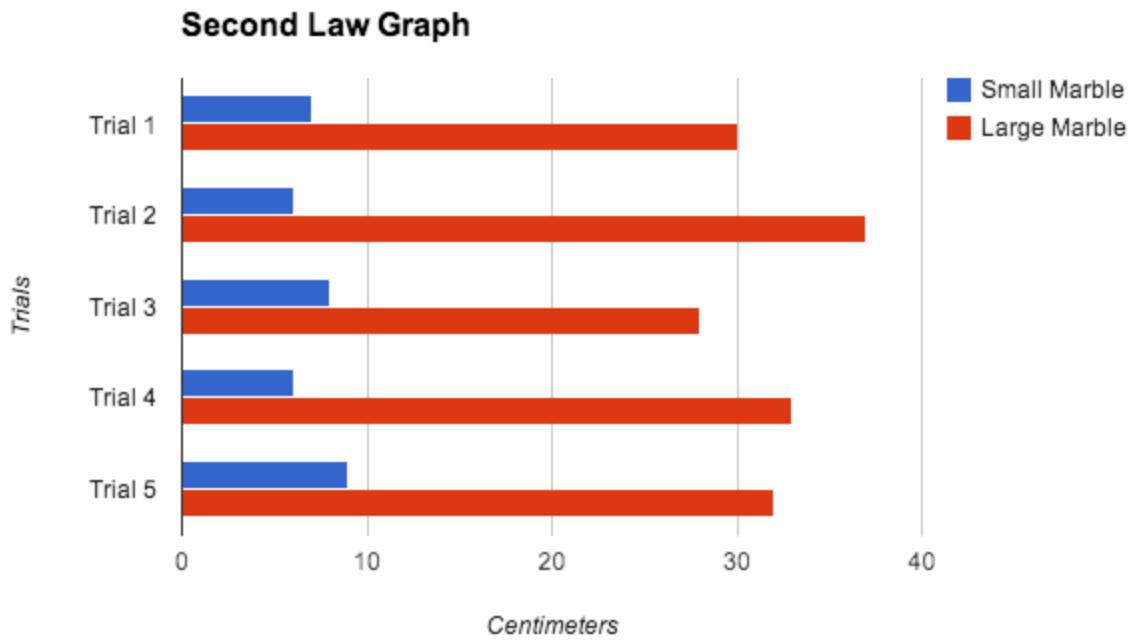
Acceleration is the measure of how fast speed changes. Example: An object is moving north at 10 meters per second. The object speeds up and now is moving north at 15 meters per second. Thus, the object has accelerated.

Data Collection Table

Trials	Small Marble (cm)	Large Marble (cm)
1	7cm	30cm
2	6cm	37cm
3	8cm	28cm
4	6cm	33cm
5	9cm	32cm
Total	36cm	160cm
Average	7.2cm	32cm

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Graph of Findings



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Observations:

These are the things I observed:

Small Marble

1. We built a ramp using rulers and dictionaries.
2. I rolled the marble down the ramp, it hit a cup, and the cup slid 7 cm.
3. Then it rolled 6 cm.
4. Then 8 cm.
5. Then 6 cm.
6. Finally, it rolled 9 cm.
7. Total of cm: 36 cm. Average: 7.2 cm.

Big Marble

1. I rolled the marble down the ramp, it hit a cup, and the cup slid 30 cm.
 2. Then it rolled 37 cm.
 3. Then 28 cm.
 4. Then 33 cm.
 5. Then 32 cm.
- Total of cm: 160 Average: 32 cm.

Conclusion (Remember . . . the word "because" is essential!):

After analyzing the data, it is my conclusion that the big marble hits and moves the cup farther than the small marble because bigger mass + a steep ramp that puts a lot of acceleration on the marble = bigger force that is applied to the cup. Gravity moves the cup downward so when the marble hit the cup, it went out of inertia because an unbalanced force acted upon it (the marble). Then the cup entered inertia again because of the table rubbing against the cup to stop it from moving, friction. Once it stopped moving, a balanced force acted upon it: gravity pulling downward and the table pushing up.