

# Newton's 2<sup>nd</sup> Law – Thought Experiment

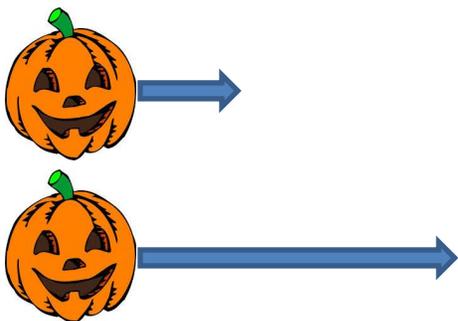
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Name: \_\_\_\_\_ Date: \_\_\_\_\_

Newton's 2<sup>nd</sup> Law describes a **mathematical and universal relationship** between the **unbalanced/net force** applied to an object, the **mass** of the object and the resulting **acceleration** of the object.

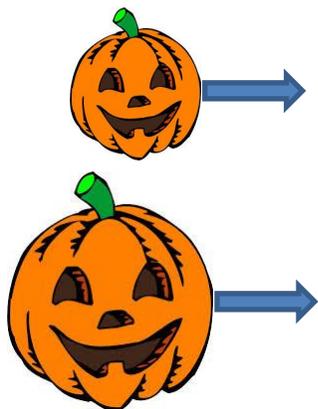
Let's consider a situation where each of these variables is held constant and one of the other variables is changed. We can all agree that when an unbalanced/net force is applied to an object it will change its state of motion (i.e. accelerate)

1. Imagine a pumpkin with a fixed mass has a net force acting on it. What would happen to the pumpkins acceleration if the force were increased?



What type of relationship is this? \_\_\_\_\_

2. Now, image that the force acting on the pumpkin remains constant, but the pumpkin gains mass. What would happen to the acceleration of the pumpkin?



What type of relationship is this? \_\_\_\_\_

Can you write a mathematical relationship with these three variables that holds to these two relationships? Try it!

Newton's 2<sup>nd</sup> law was first developed by \_\_\_\_\_ as the \_\_\_\_\_ caused by a \_\_\_\_\_.

The law gives a mathematical relationship between the \_\_\_\_\_ applied to an object, the \_\_\_\_\_ of the object and the resulting \_\_\_\_\_ caused by the unbalanced force.

The relationship is...



The **units** for force are therefore...

Units of force is therefore, \_\_\_\_\_

also known as a \_\_\_\_\_

From the equation we can deduce that

- If the **mass is constant** and the force increases – the acceleration will increase
- If the **force is constant** and the mass increases – the acceleration will decrease
- If the **acceleration is constant** and the mass increases – the force must increase to maintain the acceleration.

**Basic Example:**

An object with a mass of 30kg has a force acting on it making it accelerate at 2.0 m/s/s. Calculate the force.