*Newton’s First Law (N1L) & Inertia*

In the late 1600’s and early 1700’s Newton was integral in setting the course for physics over the next 150 years. He made models about gravity and motion, theorized about the particle nature of light, and helped to invent calculus as mathematics for science.

# Inertia

Inertia is an object’s unwillingness to change from its present state. If it is at rest, it wants to stay at rest. If it is moving at constant velocity, it wants to stay at constant velocity. Imagine a rock in deep space. If it is moving, there is nothing around to stop it, so it just wants to “keep on doin’ what its doin’.”

Pick up a rock and a marble. Move the rock quickly from side-to-side. You can feel that the rock is heavy compared to the marble. This “heaviness” is actually the rocks resistance to motion. It is the rock’s **inertia**. Heavier objects have larger amounts of inertia than smaller ones.

# Newton’s First Law (N1L)

Newton wanted to somehow explain inertia, so he did it in his first law:

*“Objects at rest want to stay* ***at rest*** *and objects in motion want to stay* ***in constant motion****, unless they are acted upon by an unbalanced external net force.”*

Explain the following using N1L:

A tablecloth is pulled out from under dishes:

A rocket is moving sideways in deep space, with its engines off, from point A to B. Its engines turn on at point B and left on for 2s while the rocket travels from B to C. Draw and explain the shape of the path from B to C, and after point C knowing N1L.

A B

C

# Inertial Reference Frames

An inertial reference frame is one that is at rest or moving at constant velocity. Any frame of reference that is accelerating in non-inertial.

Are these inertial or non-inertial?

* A jet landing on a runway
* A cop speeding up to catch a criminal
* A magnetic train with its engines turned off
* A boat floating down a river

In an inertial frame, all of Newton’s laws are VALID! In an accelerating frame, the laws are invalid.

How do we know what type of frame we are in? Fuzzy Dice Test: