

Newton's Laws of Motion

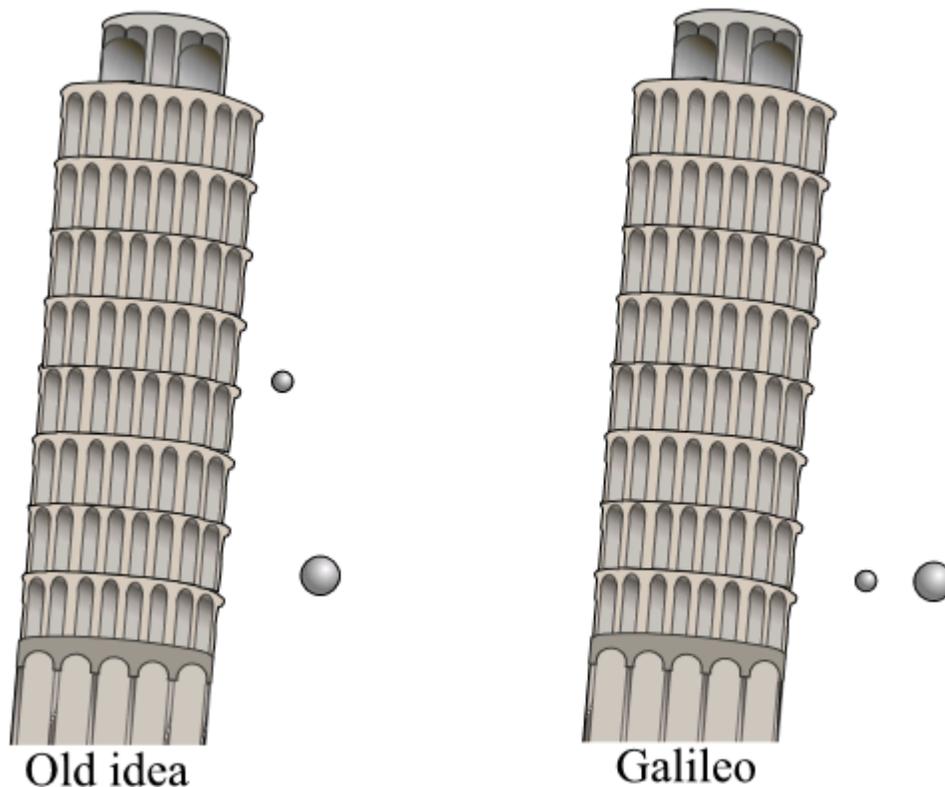
February 28, 2017 7:45 AM

Kinematics was the study of how objects move. Dynamics is the study of why they move. It explains where accelerations come from.

There are four fundamental forces in nature.

- Strong Nuclear: holds the nucleus together
- Weak Nuclear: determines nuclear radiation
- Electromagnetic: A repulsive or attractive force that is determined by electric charges
- Gravitational: Only attractive force (that we know of) of two pieces of matter on each other.

A force is a push or pull experienced by an object. Before Galileo, people thought that heavier objects fell faster than light ones. Galileo showed this was wrong.



Galileo died the same year Isaac Newton was born (1642). Isaac Newton published his famous laws of motion describing the study of kinematics and dynamics. In his work, he noted three laws of motion.

Newton's FIRST Law of Motion

If no net force acts on an object, it maintains its state of rest OR its constant speed in a straight line.

An object at rest tends to stay at rest and an object in motion tends to stay in motion.

Newton's SECOND Law of Motion

If an unbalanced force acts on an object, the object accelerates in the

direction of the force.

$$\sum F = ma$$

$$F_{net} = ma$$

Do this Separately for
the horizontal forces
and the Vertical forces.

Variables

Force

Symbol: \vec{F}

SI Unit: Newton (N direction)

Mass

Symbol: m

SI Unit: kilogram (kg)

The acceleration varies directly with the unbalanced force.

The acceleration varies inversely with the mass of the object

Newton's THIRD Law of Motion

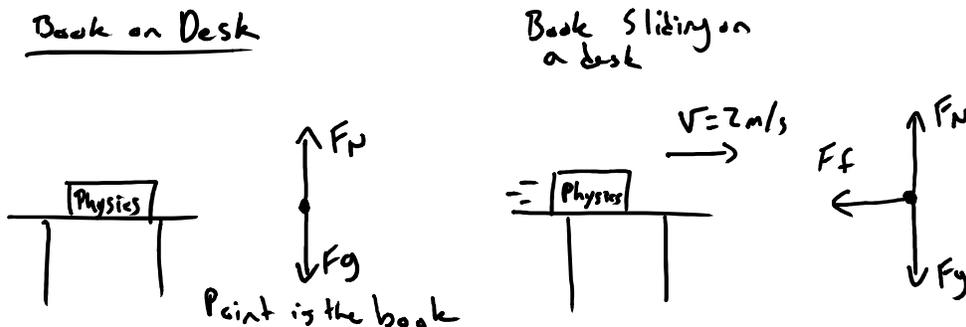
For every action force, there is an equal and opposite reaction force.

<http://www.youtube.com/watch?v=XjwO9InuFJK>

Kinematics and Dynamics have one variable in common - **acceleration**.

This is the only thing that we can tie to the topics together. Kinematics is still important as many questions we will be trying will require you to use acceleration.

Force Diagram:



Steps to solve these problems

Step 1: Draw a picture

Step 2: Draw a force diagram

Step 3: Write out your F_{net} equations for the horizontal and vertical forces and solve