2.2 Newton's Laws

Newton's First LAW

Isaac Newton's First Law of Motion
LAW OF INERTIA

→ An object at rest will remain at rest unless acted on by an unbalanced force. An object in motion continues with the same speed in the same direction unless acted upon by an unbalanced force.

or

→ An object stays at rest or continues to move in a straight line at constant speed unless acted on by a resultant force.

For example, A still ball will not move me or be in motion until someone applies force by Kicking it.

The ball will move in a straight line but eventually stop due to forces like gravity and friction will cause it to stop moving.

While the ball is rolling, it is rubbing against the grass and friction slows the ball down little by little and the force of gravity is pulling the ball downward. When the ball is still, all forces acting upon it are equal.

Galileo created the concept of Inertia while Newton confirmed this idea in 1687.

NEWTON'S SECOND LAW

Isaac Newton's Second Law of Motion

→The acceleration of an object is directly proportional to the net force acting on it and inversely proportional to its mass This means that if You apply force to an object, It will accelerate in the direction of that force The greater the force applied, the greater the acceleration, and the greater the mass, the less the acceleration for the same force.

$$\vec{F} = m\,\vec{a}$$

a is the acceleration of the object
F is the net (resultant) force
m is the mass of the object

or

→Acceleration is produced when a force acts on mass. The greater the mass of the object being accelerated, the greater the amount of force needed to accelerate the object.

Note: The vector arrowheads mean that the force and the acceleration always have to be in the same direction.

- The mass tells us how much influence that force has to produce a change in motion.
- As long as the force is being applied the acceleration is happening.

NEWTON'S THIRD LAW

Isaac Newton's Third Law of Motion

→When two objects interact, the forces they exert on each other are equal and opposite.

or

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

For example: A swimmer pushes against the pool wall with her feet and accelerates in the direction opposite to that of her Push. The wall has exerted an equal and opposite force back on the swimmer.

- The forces are equal in magnitude or size but opposite in direction.

- Whenever a force acts, then there is another force acting back again that is equal in size and Opposite in direction.