Newton's 1st Law and Forces

Force - A push or pull

Contact Force - when an external object touches the system (stuff you are concerned about) and exerts a force.

Field Forces - A force that can act on the system without contact. Ex. Gravitational force and magnetic force.

Force is measured in Newton's (N)

** There needs to be an agent (specific and identifiable cause of the force) and a system on which the force is exerted.

Free-body diagrams - Use vectors to represent all forces that act on your system.

1. Represent your system with a dot (•)
2. Draw any field forces (you will usually only have gravitational) and label them
3. Draw any contact forces and label them
   a. Separate ALL diagonal forces into its x & y component when needed

Force	Symbol	Definition	Direction
Friction	F_f	Oppose sliding motion and air resistance	Parallel to the surface & opposite the direction of motion.
Normal	F_N	Exerted by a surface on an object	Perpendicular to & away from the suface
Spring	Fs	Force a spring applies while trying to restore to its original shape	Opposite direction that the spring was deformed
Tension	F_T	The pull by a string, rope, or cable	Away from the object & parallel to the string
Weight	F_g or w	Gravitational attraction between objects	Straight down toward the center of the earth

** if given mass (kg), multiple by 10 to get weight in Newton's**

Newton's 1st Law - An object that is at rest will remain at rest, and an object that is moving will continue to move in a straight line with constant speed, if and only if the net force acting on the object is zero.

Inertia - Newton's 1st law is sometimes called the law of inertia. Inertia is ***NOT A FORCE!!!*** It is an object resistance to a change in motion.

When the object is at rest it will remain at rest

When an object is moving it will continue to move at that velocity (speed and direction)

** MASS is a measure of an objects inertia**

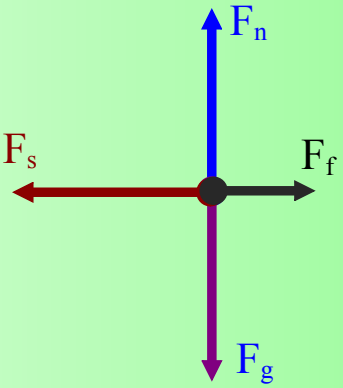
Equilibrium - When the sum of the forces are equal to zero then the object is in equilibrium and that means the objects motion (velocity) won't change.

** If the object's forces don't equal zero than the objects motion will change**

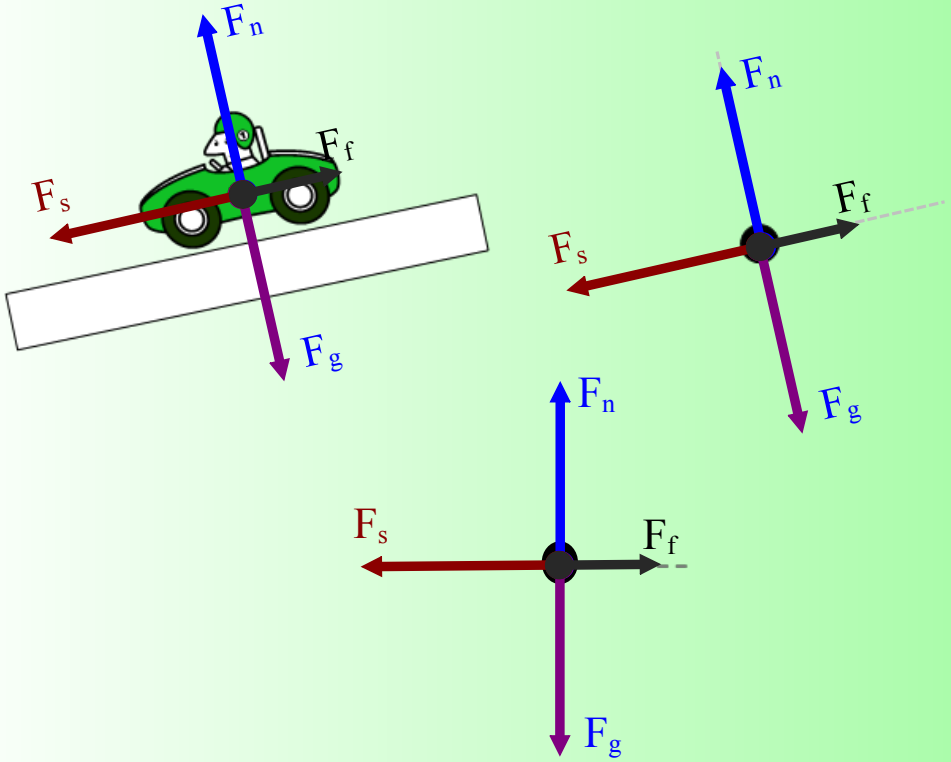
Example 1 – A toy car is sitting on a table not moving.

Example 2 – A toy car is coasting on the counter at a constant velocity assuming air resistance is negligible.

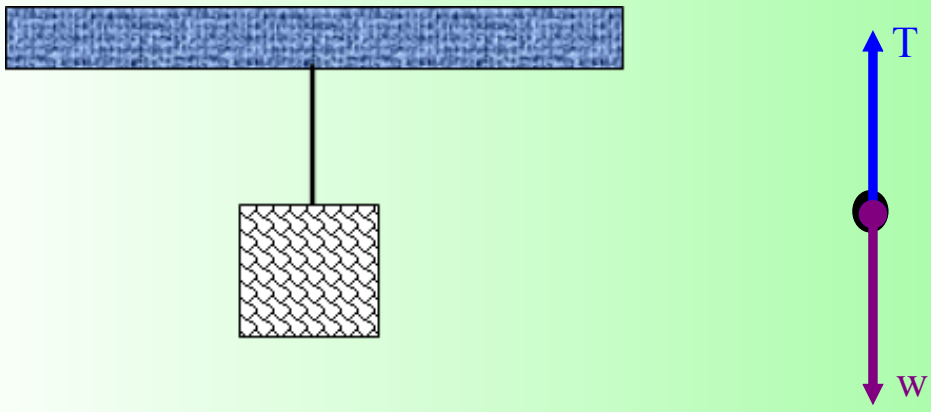
Example 3 – A toy car is moving because a spring has been stretched out and the car was then released. Assume there is friction in this case.



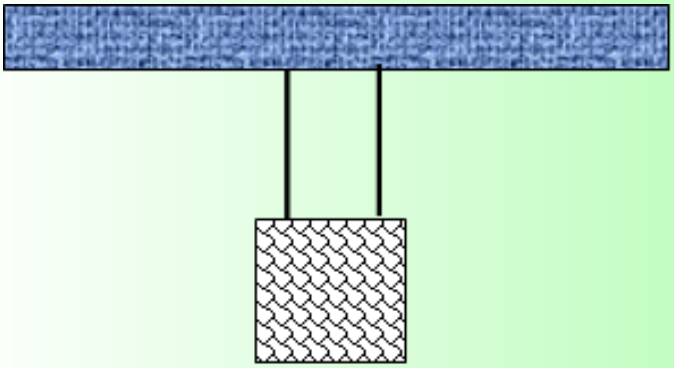
Example 4 – A toy car rolling down an inclined ramp. Assume there is friction

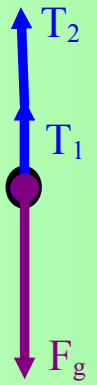


Example 5 - A box is hanging from a string



Example 6 - A box is hanging by two strings





Example 7 - A box is hanging by one string