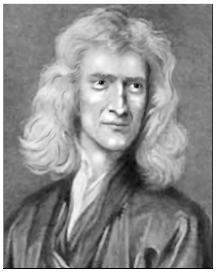
Name _____
Hour_____
Date_____



7th Grade Laws of Motion

Newton's First Law:

"An object in motion tends to stay in motion, and an object at rest tends to stay at rest, unless the object is acted upon by an outside force."

This means that if you leave a book on your coffee table over night, when you return in the morning, unless an outside force moved it, it will be in the same place. This also means that if you kick a soccer ball, it will continue moving until it hits something. However, we all know the ball will eventually stop even if it does not hit a wall—this is because of the friction between the ball and the ground, and between the ball and the air.

Newton's Second Law:

"If an unbalanced force acts on a body, that body will experience acceleration (or deceleration), that is, a change of speed."

It is easily expressed in the equation: Acceleration= Force/Mass or A=F/M or F=MA

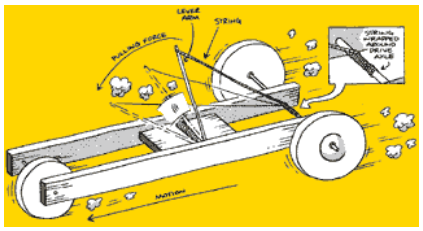
This basically means that that acceleration is produced when a force acts on a mass. The greater the mass of the object being accelerated, the greater the amount of force needed to accelerate the object. Everyone knows that heavier objects require more force to move the same distance than do lighter objects. The Second Law, however, gives us an exact relationship between force, mass, and acceleration.

Newton's Third Law:

"**Every action has an equal and opposite reaction"**

This is exemplified when you jump off of a boat into a lake; your foot and the boat exert force upon one another. You travel off in one direction and the boat drifts in the opposite

direction. Another example is if you and your friend are wearing roller blades and you push your friend in one direction, you will travel in the opposite direction.



Laws of Motion Exercises:

For the equations: **F** is measured in newtons
M (mass) is measured in kg
A (acceleration) is measured in m/s²

Equations: **F=MA** or **A=F/M**

1. A car weighs 1000kg, you can push it .05 m/s², how much force (F) are you applying to the car? Here we use F=MA:

F= 1000 x .05
F= 50 newtons

2. Another car weighs 2000kg, you can push it .05 m/s², how much force are you applying to the car? Again use F=MA.

3. A force of 5000 newtons is applied to a 1200 kg car at rest. What is its acceleration? (m/s²)

4. A 10kg body has an acceleration of 2 m/s². Find the net force (F) acting on the body.

5. An empty truck with a mass of 2500kg has an engine that will accelerate at a rate of 1.5 m/s². What will the force be if the truck is carrying an additional load of 1500kg?

6. A force of 700 newtons is applied to a 600 kg bowling ball. What is the acceleration of the bowling ball once the force is applied?

7. A baseball weighs 2.5 kg, after it is hit with a bat it has an acceleration of 36 m/s². How much force was used to make the ball travel that fast?

8. During a car crash a bus that weighs 5000kg is hit by a semi truck, the bus moves at a speed of 8m/s². How much force was used to make the bus travel that fast?

9. Mr. Sadowski (80kg) is sitting in his favorite desk chair having fallen asleep from all the hard work he does; a disobedient student pushes Mr. Sadowski down the hall with an acceleration of 10 m/s². How much force would the student have to use to get Mr. Sadowski to move that fast?

10. An old mousetrap car is sprung into motion and weighs 1000 kg. It is pulling a trailer with 1750 kg on it, travels with an acceleration of 20 m/s². What was the force of the mousetrap that enabled the car to move that fast?