

Newton's 2nd Law of Motion

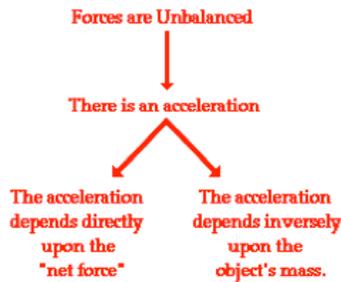
“Therefore when Jesus perceived that they were about to come and take Him by force, to make Him king, He departed again to the mountain by Himself alone.” John 6:15

Basics of Newton's Second Law

- pertains to the behavior of objects for which all existing forces are not balanced
- the acceleration of an object is dependent on two things:
 - 1) total force acting on the object
 - 2) mass of the object
- acceleration = total force on the object divided by mass of the object:

$$a = F / m$$

- NOTICE that as the force upon the object increases, the acceleration of the object increases
- NOTICE that as the mass of the object increases, the acceleration of the object decreases



The MAIN EQUATION for Newton's Second Law

- rearranging the acceleration equation above to solve for Force:
Force = mass of the object multiplied by the acceleration of the object

$$F = m \times a$$

- Remember that the unit of force is a Newton (N), so knowing all the units of force (N), mass (kg) and acceleration (m/s²) means

$$1 \text{ Newton} = 1 \text{ kg} \times \text{m/s}^2$$

- One Newton is defined as the amount of force required to give a 1kg mass an acceleration of 1 m/s/s (or m/s²)

Let's practice!

1. What is the force on a box that has a mass of 2 kg and is accelerated at 5 m/s²? Force = mass x acceleration --> Force = 2 kg x 5 m/s² = 10 N

2. What is the force you have to exert on your big brother whose mass is 75 kg to make him accelerate at 10 m/s²?

Force = mass x acceleration --> Force = 75 kg x 10 m/s² = 750 N (That's a lot of force! You must have used a canon!)

