Unit 7: Forces and Motion
Content Outline: Gravity and Motion (7.2)

I. **Gravity**
- A. This is the *natural phenomenon* by which *all* physical bodies are *attracted* to each other.
- B. All objects are affected by gravity.
  1. The amount of gravity *"pull"* is affected by *mass* and *distance* between objects, but the force of gravity is *constant* at 9.8 m/sec^2.
  2. Gravity "pull" increases with increased mass and increases with less distance between objects.
     - a. The relationship between mass and gravity is referred to as *directly proportional*. (Both values increase or decrease basically.)
     - *b.* The relationship between distance and gravity is referred to as *inversely proportional.* (One value increases and the other decreases.)

II. **Acceleration (a)**
- A. This term is used for the *rate of change* in the *position of an object* over time.
- B. All objects *accelerate* at the same rate due to *gravity. (9.8 m/sec^2)*
  1. **Accelerate**
     - a. This term refers to the *increase* in movement of an object.
  2. **Decelerate**
     - a. This term refers to the *slowing* in movement of an object.
- C. **Acceleration = Force/mass; a = f/m** You may have seen the equation as: F = ma
  1. Acceleration can be *affected* by *mass* and *force*.
     - a. The *heavier* an object (more mass), the *more* force needed to *move or stop* the object.
     - b. The *greater* the amount of force, the faster or slower an object will accelerate or decelerate.
       - i. To *decelerate* an object, *requires* a force working in the *opposite direction.* (*Inversely* proportional)
       - ii. To *accelerate* an object, *requires* the force to be in the *same direction* as the objects movement. (*Directly* proportionate)

III. **Velocity (v)**
- A. This is defined as the *rate of change* in the *position* of an object.
- *B.* It is measure in *speed* and *direction.*
  1. **Speed**
     a. Defined as *magnitude* (amount) in velocity. For example, 55 miles per hour. 55 tells the magnitude of movement over a given time period.
  2. **Direction** – north, south, west, east, up, down, left, right
  3. The formula is: Δv = distance /time with direction

IV. **Resistance**
- A. This term refers to any *opposite* and *opposing* force to *hinder* or *reduce* movement.
  1. This can be from forces such as friction (such as on car brakes) or air (such as wind blowing in the opposite direction you are walking.)
- B. Resistance can reduce velocity and cause deceleration of objects.

V. **Inertia**
- A. This term refers to the *resistance* of any physical object to *any change* in its current state of motion, speed, or direction.
- B. The concept was proposed by Sir Isaac Newton in his book *Principia Mathematica in 1687.*

1. This is perhaps the *greatest* math and science text ever written.