NOTES FOR THE MOTiONOFE

Name:

DO NOT LOSE!

Newton's 1st Law

- Every object in a state of uniform motion tends to remain in that state of motion unless an external force is applied to it.

- Inertia – Forces that resist to motion

Inertia

- An object in motion tends to stay in motion unless acted on upon by a force.
- An object at rest tends to stay at rest unless acted on by a force.

- Friction - The resistance encountered when one body is moved in contact with another.

The four types of friction

- Static friction- friction between two surfaces that are not moving past each other.
- Sliding friction- the force that opposes the motion of two surfaces sliding past each other.
- Rolling friction- the friction between a rolling object and the surface it rolls on.
- Fluid friction- when an object is moving in liquid or gas.

Friction

- Slows an object down until it stops
- Produces heat
- Wears object down

3rd Law of Motion

- For every action there is an equal and opposite reaction.

Newton's 2nd Law

- The relationship between an object's mass , its acceleration a, and the applied force is .

The net force on an object is equal to the mass of the object multiplied by its acceleration.

First law of energy (thermodynamics)

- All energy is either kinetic or potential.

Potential Energy: (PE) The energy stored by an object as a result of its position

- Potential Energy is the energy of position. Objects that are elevated have a high potential energy.
- Kinetic Energy is the energy of motion

PE = MGH

- PE = Energy (in Joules)
- m = mass (in kilograms)
- g = gravitational acceleration of the earth (9.8 m/sec2)
- h = height above earth's surface (in meters)

Kinetic Energy

- The energy that matter has because of its motion and mass.
- where m = mass of object
- v = speed of object
- KE = Energy in Joules

$$KE = \frac{1}{2} * m * v^2$$

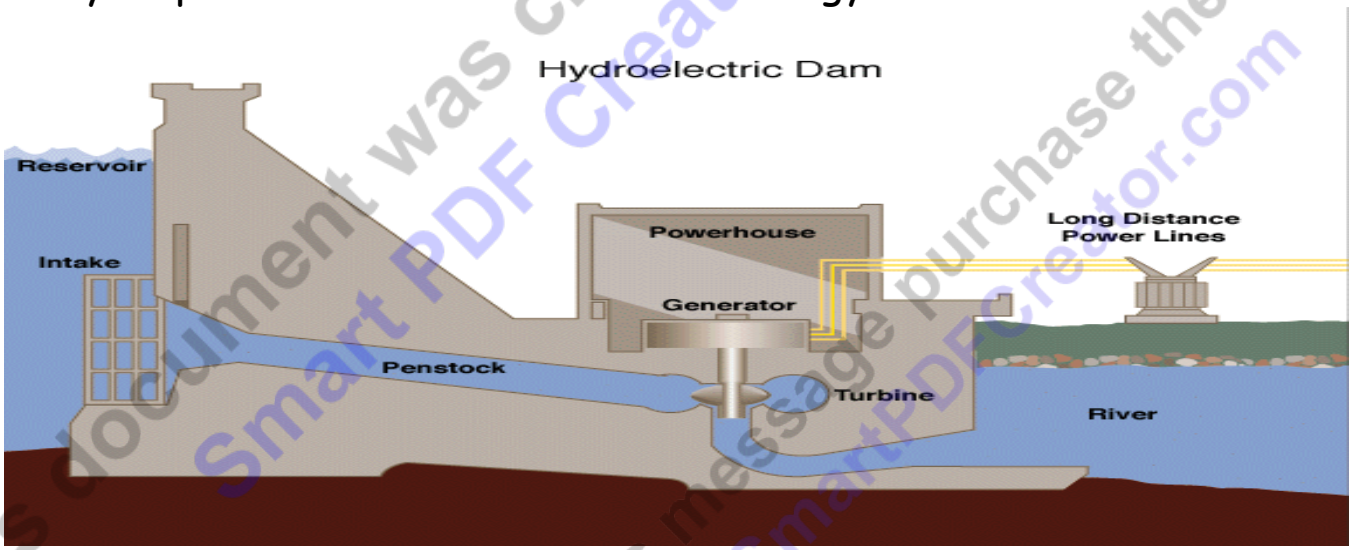
- Don't forget your order of operations.
- PEMDAS
- For KE, you must do exponents (E) before multiplying (M). So square the velocity first, and multiply by half of the mass.

Kinetic energy

- The energy that matter has because of its motion and mass.
- The flow of electrons or charged particles called electrical energy are all examples of kinetic energy.
- Amount of energy depends on both its mass and its velocity (speed).

- Mechanical Energy (ME) – energy due to position and motion; sum of potential and kinetic energies. Includes heat and friction.

- Hydropower – Potential to Kinetic energy



- Speed = Distance over time
  - 80 km / 2 hrs = 40 km / hr
  - 80 miles / 2 hrs = 40 mph

- Velocity = Speed (distance / time) and direction.

- Acceleration = The rate of change in velocity.

- Acceleration = The final velocity – the starting velocity, divided by time.
- Deceleration – To slow velocity

- Momentum: A measure of the motion of a body equal to the product of its mass and velocity.
  - Momentum = Mass times velocity

- Amount of Work (w) done depends on two things:
  The amount of Force (F) exerted.

  The Distance (d) over which the Force is applied.

- Equation for Work - w = F x d

- Machines help us to do work!
- One Joule = N over a meter (N-m)

- Catapults - By the law of conservation of energy, the stored potential energy (U) is transferred into rotational kinetic energy (K), with some loss due to friction. U = K

- Trajectory – The path of flying object: the path that a projectile makes through space under the action of given forces such as thrust, wind, and gravity.

- Force: Is a PUSH or a PULL, that causes a change in the motion or shape of an object
  - Gravity, Electricity, Magnetism, and Friction
- F = w x d.
- W = F x d

Machines…

- Transfer force from one place to another.
- Change direction of a force.
- Increase the magnitude of a force.
- Increase the distance or speed of a force.

- Force is a quantity which is measured using the standard metric unit known as the Newton
- One Newton is the amount of force required to give a 1-kg mass an acceleration of 1 m/s/s.

$$1\ \text{Newton} = 1\ \text{kg} * \frac{\text{m}}{\text{s}^2}$$

- Acceleration – Change in velocity over time.
- Velocity – Rate of which an object changes it's position.
- Speed – A Measure of motion, = distance over time
- Mass – Amount of matter in an object

Simple machines

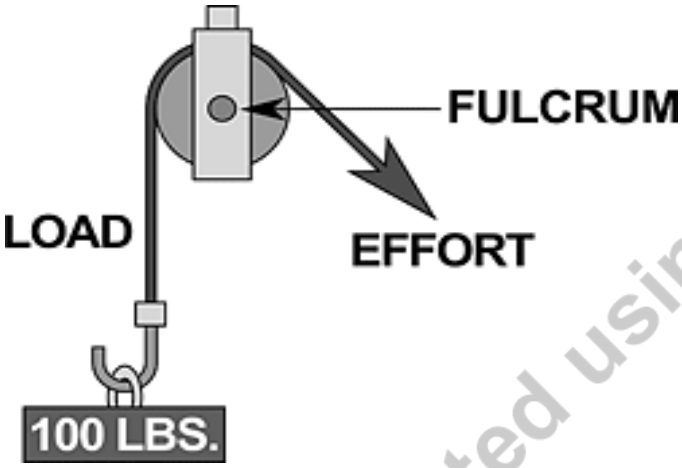
- Types of machines that do work with one movement.

Pulley

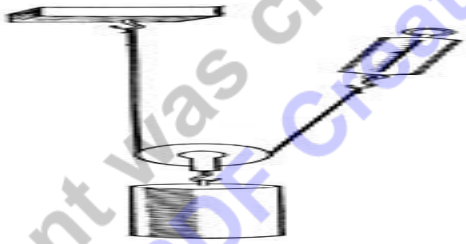
- Uses grooved wheels and a rope to raise, lower or move a load.

Three types of pulleys

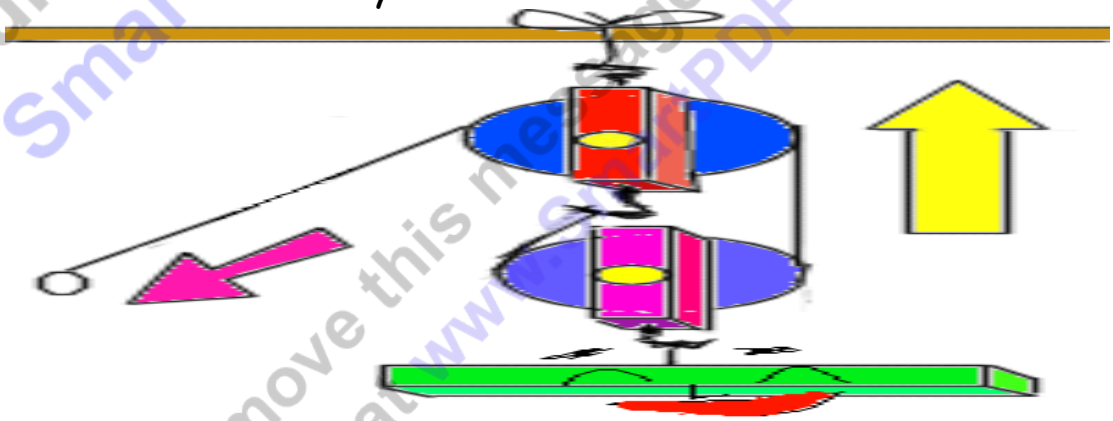
- Fixed pulley



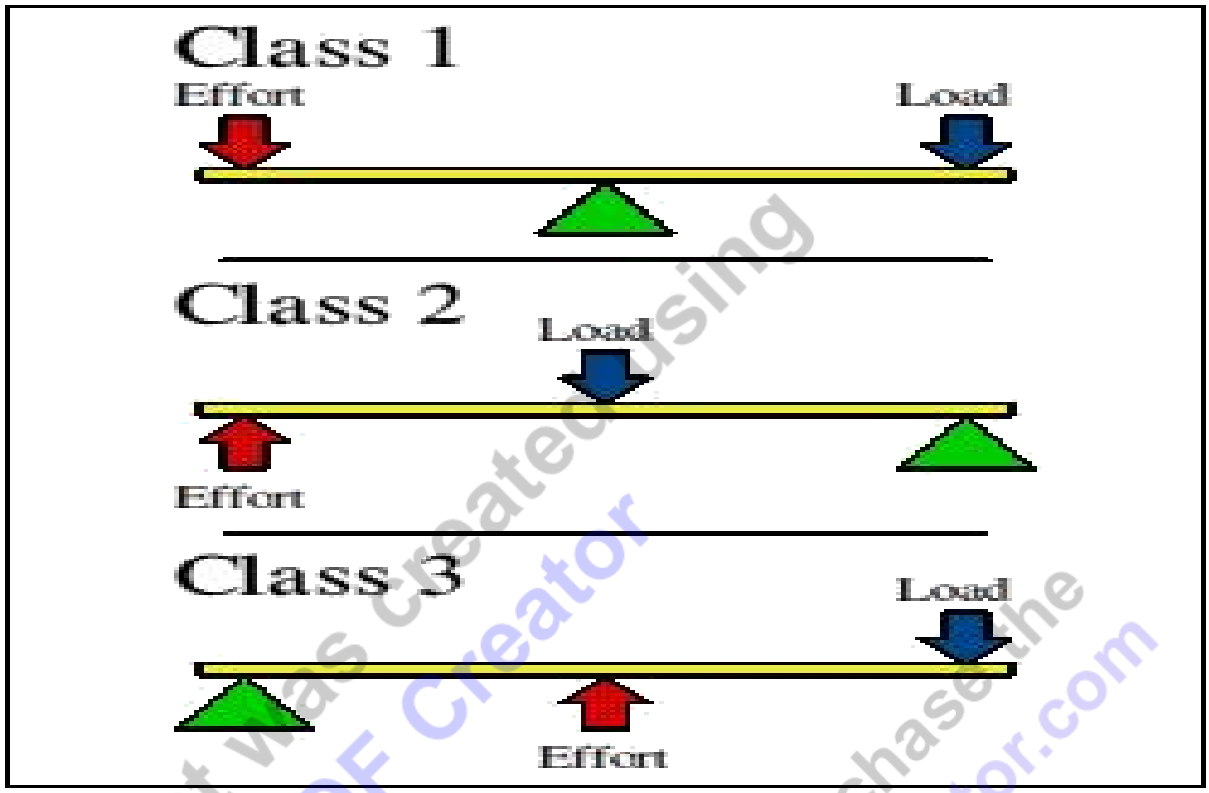
- Movable Pulley



- Combined Pulley / Block and tackle



- Lever
  - A stiff bar that rests on a support called a fulcrum which lifts or moves loads
- The 3 types of levers

- 

- Wedge: An object with at least one slanting side ending in a sharp edge, which cuts material apart.

- Wheel and Axle: A wheel with a rod, called an axle, through its center lifts or moves a load.

- An Inclined plane: A slanting surface connecting a lower level to a higher level

- Screw: An inclined plane wrapped around a pole which holds things together or lifts materials