**Guided Notes: Force and Work Relationships**

**Big Idea**:

Force and work have a direct \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ when displacement is greater than zero.

**Key Concepts**:

• Force is a \_\_\_\_\_\_\_ or \_\_\_\_\_\_\_ on an object.

• The unit of force is the \_\_\_\_\_\_\_.

• Work occurs when a force acts on an object to \_\_\_\_\_\_\_ it a certain distance from its starting point.

• The distance an object moves from its starting point is called \_\_\_\_\_\_\_.

• The unit of work is the \_\_\_\_\_\_\_.

• Work can be calculated using the equation: W = \_\_\_\_\_\_\_ x \_\_\_\_\_\_\_

• No work occurs if an object's displacement is \_\_\_\_\_\_\_.

**Real World Examples**:

1. Bowling: When you roll a bowling ball down the lane, work is done as long as your hand is in \_\_\_\_\_\_\_ with the ball, applying force over a distance.

2. Push-ups: Even though you exert force during a push-up, no work is done because your body returns to its \_\_\_\_\_\_\_ position, resulting in zero displacement.

**Guided Notes: Pulleys and Inclined Planes**

**Big Idea**:

Simple machines like pulleys and inclined planes make work easier by \_\_\_\_\_\_\_\_\_\_\_\_\_ the amount of force needed or changing the \_\_\_\_\_\_\_\_\_\_\_\_\_ of force applied.

**Key Concepts**:

• Simple machines are basic mechanical devices that change the \_\_\_\_\_\_\_\_\_\_\_\_\_ or \_\_\_\_\_\_\_\_\_\_\_\_\_ of force needed to do work.

• A pulley system uses a \_\_\_\_\_\_\_\_\_\_\_\_\_ wrapped around a \_\_\_\_\_\_\_\_\_\_\_\_\_ to reduce the force needed to lift heavy loads.

• An inclined plane is a \_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_ surface that reduces the force needed to move objects upward.

• Mechanical advantage is the ratio of the \_\_\_\_\_\_\_\_\_\_\_\_\_ force to the \_\_\_\_\_\_\_\_\_\_\_\_\_ force.

• Pulleys and inclined planes \_\_\_\_\_\_\_\_\_\_\_\_\_ the force applied over a greater distance.

**Real World Examples**:

1. Skateboard Ramp: A skateboard ramp is an example of an \_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_ that allows skaters to gain height with less effort than jumping straight up.

2. Elevator: Elevators use a \_\_\_\_\_\_\_\_\_\_\_\_\_ system to lift heavy loads of people and objects to different floors of a building with less force.

**Guided Notes: Levers**

**Big Idea**:

Levers are simple machines that make work easier by changing the \_\_\_\_\_\_\_\_ or \_\_\_\_\_\_\_\_ of force required.

• A lever consists of a bar that pivots on a fixed point called the \_\_\_\_\_\_\_\_.

• Levers are classified into 3 types based on the position of the \_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_, and \_\_\_\_\_\_\_\_.

**Key Concepts:**

• In a class 1 lever, the fulcrum is located \_\_\_\_\_\_\_\_ the effort and load.

• In a class 2 lever, Real World Examples:

the load is located \_\_\_\_\_\_\_\_ the effort and fulcrum.

• In a class 3 lever, the effort is applied \_\_\_\_\_\_\_\_ the load and fulcrum.

• Levers can either \_\_\_\_\_\_\_\_ the force applied or change the \_\_\_\_\_\_\_\_ over which force is applied.

• Work is calculated using the formula: W = \_\_\_\_\_\_\_ x \_\_\_\_\_\_\_

**Real World Examples:**

1. Skateboard: A skateboard is an example of a class \_\_ lever, where the back truck acts as the \_\_\_\_\_\_\_\_, the rider's foot provides the \_\_\_\_\_\_\_\_, and the ground is the \_\_\_\_\_\_\_\_.

2. Baseball bat: A baseball bat is a class \_\_ lever, where the hands form the \_\_\_\_\_\_\_\_, the batter's arms provide the \_\_\_\_\_\_\_\_, and the end of the bat hitting the ball is the \_\_\_\_\_\_\_\_.

**Guided Notes: Efficiency of Machines**

**Big Idea**:

The efficiency of a machine can be improved by reducing the \_\_\_\_\_\_\_ required or decreasing \_\_\_\_\_\_\_ transfer to the environment.

**Key Concepts**:

• Efficiency measures how well a machine converts \_\_\_\_\_\_\_ energy/work into \_\_\_\_\_\_\_ energy/work.

• Efficiency is calculated as: (\_\_\_\_\_\_\_ work / \_\_\_\_\_\_\_ work) x 100%

• No machine can be 100% efficient due to \_\_\_\_\_\_\_ and other forces.

• Ways to improve efficiency include:

 - Reducing \_\_\_\_\_\_\_ between moving parts

 - Improving \_\_\_\_\_\_\_ of materials used

 - Optimizing the \_\_\_\_\_\_\_ and \_\_\_\_\_\_\_ of components

• Simple machines like levers, pulleys, and inclined planes can be made more efficient by:

 - Modifying the \_\_\_\_\_\_\_ point (for levers)

 - Using low-friction \_\_\_\_\_\_\_ and \_\_\_\_\_\_\_ (for pulleys)

 - Adjusting the \_\_\_\_\_\_\_ and surface \_\_\_\_\_\_\_ (for inclined planes)

**Real World Examples**:

1. Electric cars: More efficient than gas-powered cars because they convert over \_\_\_% of battery energy into motion, compared to \_\_\_% or less for gas engines.

2. LED light bulbs: More efficient than incandescent bulbs because they produce \_\_\_\_\_\_\_ heat, converting more electricity directly into light.