Work and Machines

Work –

2 things are needed for work to be done:



How are work and energy related?

Calculating Work

Work depends on \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Equation for Work:

Force is measured in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Distance is measured in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Work is measured in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Power –

Equation for Power:

Power is measured in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1 kilowatt = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Power and Energy

Power is produced when \_\_\_\_\_\_\_\_\_\_\_\_\_\_ is transferred. If no work is done, you can find the power produced with the equation:

Machine –

3 ways machines make work easier:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Increase force – You do the same amount of work if you apply a **\_\_\_\_\_\_\_\_\_\_\_\_\_** force over a **\_\_\_\_\_\_\_\_\_\_\_\_** distance, or a **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** force over a **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** distance

* Example:

Increase distance - **\_\_\_\_\_\_\_\_\_\_\_** amount of work lifting or pushing, so if I **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** the distance, I **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** the force needed making it **\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

* Example:

Change direction – often easier to apply a downward force especially if the force needs to go upward or out.

* Examples:

2 forces involved when machines do work

1. Effort force – ( )
2. Resistance force – ( )

Since there are 2 kinds of forces used, there are **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

1. Work done by you on a machine = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Work done by machine on object = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Law of Conservation of Energy –

A machine cannot create energy so output work \_\_\_\_\_**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** than input work

Since some energy is changed to heat from friction, output work is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ than input work

Ideal machines – would be a machine with no **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** so input work **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** output work

Mechanical Advantage (MA) –

Equation:

If only \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is changed, then effort force and resistance force are

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ so the mechanical advantage is \_\_\_\_\_\_\_\_\_\_\_

Machines that lose less energy to friction are said to be more **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

Efficiency –

Equation:

Because friction causes output work to be less than input work, efficiency of a real machine is

always **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

To increase efficiency –

Simple machine –

\_\_\_\_\_\_ types of simple machines:

|  |  |
| --- | --- |
|  |  |

Lever –

Parts of a lever

1. Fulcrum –
2. Effort arm –
3. Resistance arm –

**\_\_\_\_\_\_\_\_\_\_** different classes of levers based on location of **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**, **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**, and **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

1st Class Levers

* **\_\_\_\_\_\_\_\_\_\_\_\_** is between **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** and **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
* Used to **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** and always **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
* Examples:

2nd Class Levers

* **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** is between **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** and **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
* Used to **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
* Examples:

3rd Class Levers

* **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** is in between **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** and **\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
* **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** that resistance force is applied but **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
* Examples:

Pulley –

3 types:

Fixed pulley –

* Only \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ so IMA =

Movable pulley –

* It can **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.** Fixed end supports **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** so you only apply **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
* IMA =

Block and tackle –

* IMA =
* The more pulleys involved, the more **\_\_\_\_\_\_\_\_\_\_\_\_\_** and the **\_\_\_\_\_\_\_\_\_\_\_\_** the mechanical advantage

Wheel and Axle –

* Usually effort force is exerted on **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** and resistance force is exerted by **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
* Effort arm = **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**  and Resistance arm = **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**
* IMA =
* Gear –

Inclined Plane –

* IMA =

Screw –

Wedge –

Compound machine –

|  |  |  |
| --- | --- | --- |
| http://www.edinformatics.com/math_science/simple_machines/lever_quiz_image.png |  | **Figure 1** |

**1. Figure 1 is an example of:**  
a) Inclined Plane  
b) Pulley  
c) Screw  
d) Lever

**2. Which of the following statement is true for Figure 1.**  
a) b is the fulcrum, c is the resistance, a is the effort  
b) b is the resistance, c is the fulcrum, a is the effort  
c)b is the fulcrum, a is the effort, c is the resistance.  
d) b is the resistance, a is the fulcrum, c is the effort

**3. In figure 1, if the distance from a to b is 20cm, and the distance from a to c is 80 cm, then the mechanical advantage of the system is.**  
a)20  
b) 80  
c)4  
d) 1/4

**4. Given that the mass at (b) is 1 kilogram. What mass would the block at (c) have to be to lift block (b)? Note: Use the distance values given in question 3.**  
a) 1000 grams  
b) 250 grams  
c) 80 grams  
d) 400 grams

**5. If the mechanical advantage of a simple machine is 4, then the**  
a) output force is 4 times the effort  
b) effort is 4 times the output force  
c) efficiency is 4%  
d) the work output is 4 times the input

**6. A simple machine that is actually a kind on inclined plane is a**  
a) pulley  
b) wedge  
c) gear  
d) balance

**7. A pulley system has 3 sections of ropes that lift the load. The mechanical advantage of the system is**   
a) 0  
b) 1  
c) 2  
d)3.

**8. The efficiency of a simple machine**  
a) is always less than 100%  
b) is equal to 100%  
c) is always 50%  
d) is always more than 100%

**9. A knife is an example of** a (an)

a) Inclined Plane  
b) Wedge  
c) ramp  
d)pulley

**10. Decreasing the slant of an inclined plane increases its.**  
a) effort force  
b) Mechanical Advantage  
b) Power  
d) Work output