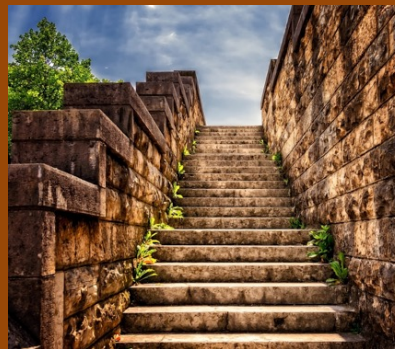
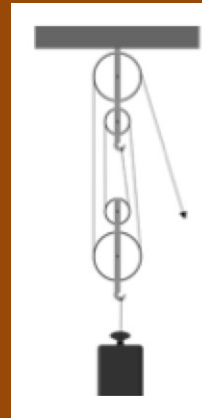


# Simple Machines

- What are Simple Machines?
- $Work = F \times d$
- Lever
- Inclined Plane
- Wheel and Axle
- Pulley
- Screw
- Wedge
- Compound Machines



# SAMPLE FILE

Thank you for your interest in my lesson.

The following slides will give you a good idea of how this lesson is structured although, much of the information has been removed.

For instance, when you see ....., that represent text that has been removed.

Note: This sample was created from the student version of the PowerPoint. Furthermore, the videos have also been removed.

If you have any questions, please send me an email –  
[devon@teachwithfergy.com](mailto:devon@teachwithfergy.com)

# What are Simple Machines?

- We use machines to make our work easier
- \_\_\_\_\_
- We exert force on things, all the time.
  - Movement requires force
  - Picking things up requires force
  - Writing and typing require force



# What are Simple Machines?

- To do useful work, humans need to apply forces on objects to make them move
- Machines help us move heavy objects and do other tasks by making the force that we exert larger
- \_\_\_\_\_
- They are simple so they do not usually have many (some have no) moving parts

# What are Simple Machines?

- \_\_\_\_\_

$$W = F \times d$$

- Work is energy and is measured in Joules (J), Force is measured in Newtons (N), and distance is how far the force is applied and is measured in meters (m)
- If you're doing a .....



# Work

- When you do something like lift a rock, a certain amount of work must be done
- For Example. If 100 J of work needs to be done to lift the rock; we could use 10 N of force x 10 m of distance  $\rightarrow 10 \text{ N} \times 10 \text{ m} = 100 \text{ J}$



- \_\_\_\_\_

- \_\_\_\_\_

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# Simple Machine Types

There are six types of simple machines.

1. Lever



2. Inclined plane

3. Wheel and axle

4. Pulley

5. Screw

6. Wedge



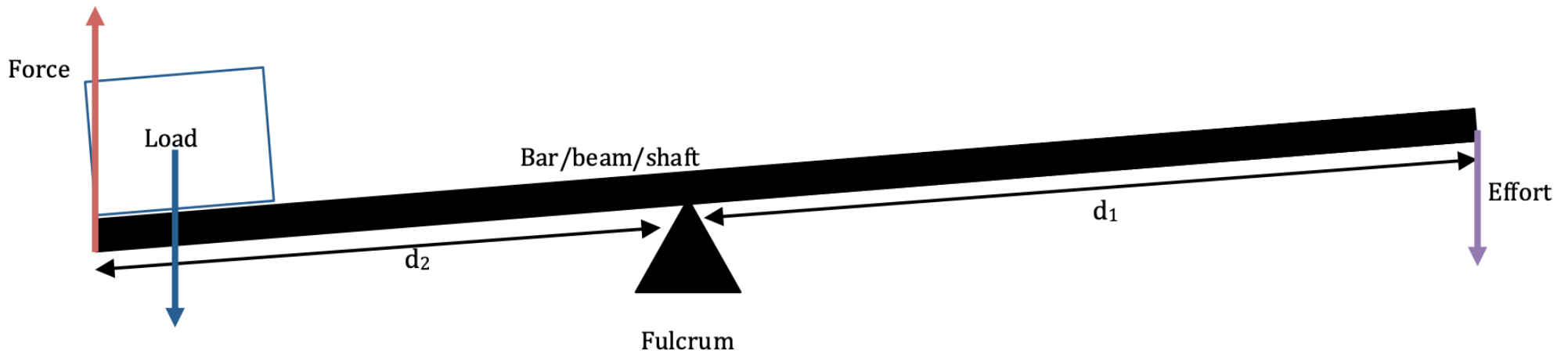
# Lever

Give me a lever long enough and a fulcrum on which to place it, and I shall move the world – Archimedes

1. What did Archimedes mean by this?
2. Do you think it's realistic?

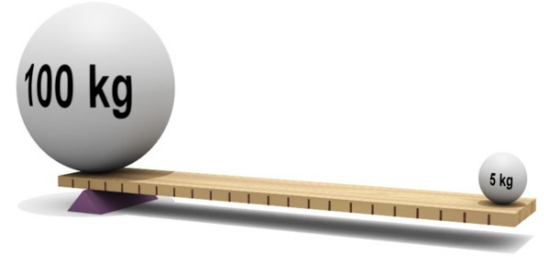
# Lever

- A lever adds force by increasing distance
- Recall: .....
- Levers are bars, beams, .....
- \_\_\_\_\_

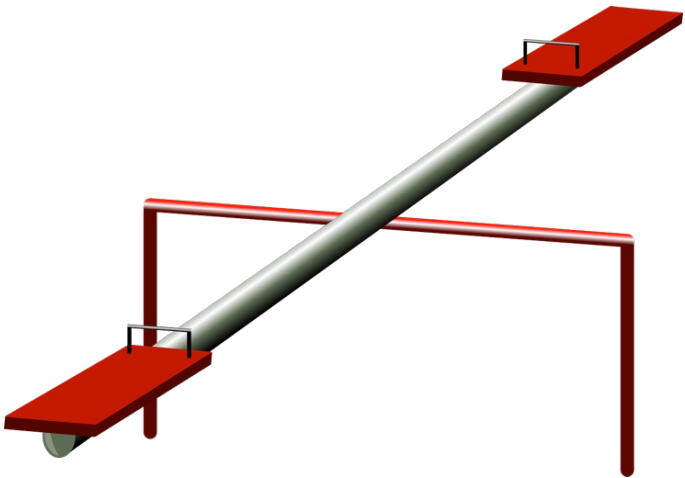


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# Lever



Examples of levers include \_\_\_\_\_



# Revisit

Give me a lever long enough and a fulcrum on which to place it, and I shall move the world – Archimedes

1. What did Archimedes mean by this?
2. Do you think it's realistic?

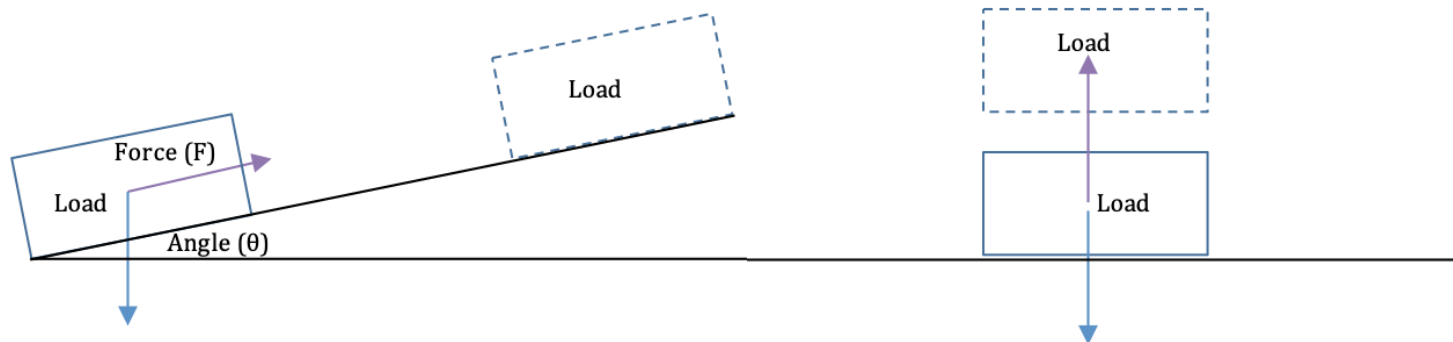
# Inclined Plane

- \_\_\_\_\_
- Inclined planes make it easier to lift heavy objects by increasing the distance the object is moved
- To move a load up a distance of 1 m (3 ft), an inclined plane of 2 m would decrease the needed force by half



# Inclined Plane

- The angle of the inclined .....
- The shallower (lower) the angle, the longer the plane, and the less force is needed (increase in  $d$  = a decrease in force)
- \_\_\_\_\_
- However, the distance over which the force is applied is greater in the left image, so less force is required.



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# Wheel and Axle

- \_\_\_\_\_
- Considered one of the greatest inventions .....
- Friction opposes motion so reducing it, makes moving the .....



# Wheel and Axle

- The part of the wheel touching .....
- This means the force of friction is similarly small
- \_\_\_\_\_



# Wheel and Axle

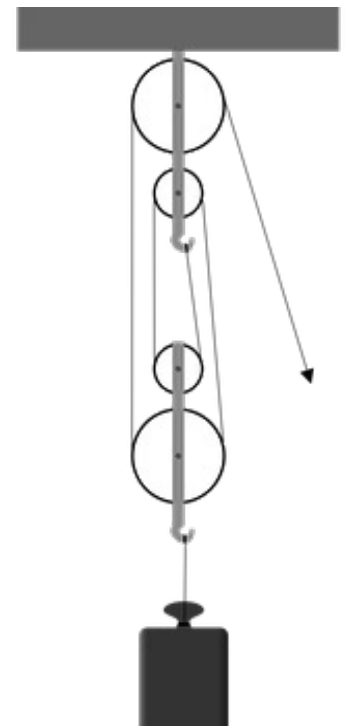
- Imagine pushing a heavy box along the ground
  - Friction between the box and the ground pushes back, making it difficult to move the box
  - The entire bottom surface is subject to friction the whole time you're moving it.
- Now imagine putting that box on a wheeled cart
  - \_\_\_\_\_



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# Pulley

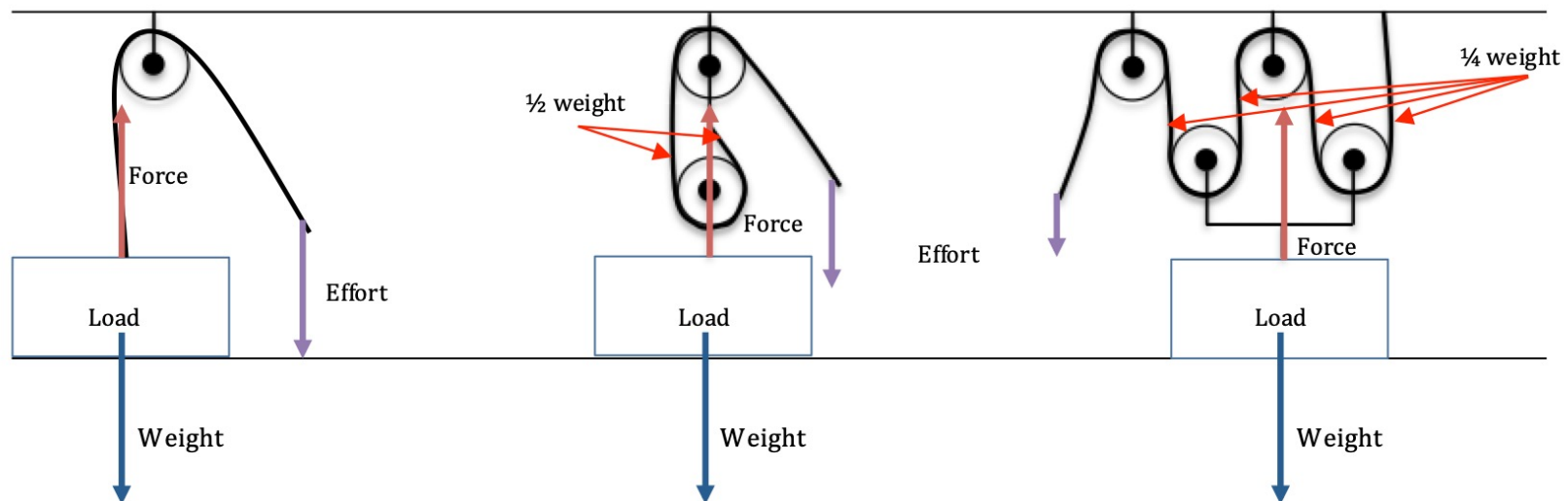
- The power of pulleys, however, is really seen in a system with multiple wheels, called a block and tackle
- \_\_\_\_\_
- The more pulleys and the longer the rope, the greater the distance
  - .....



Block and Tackle System

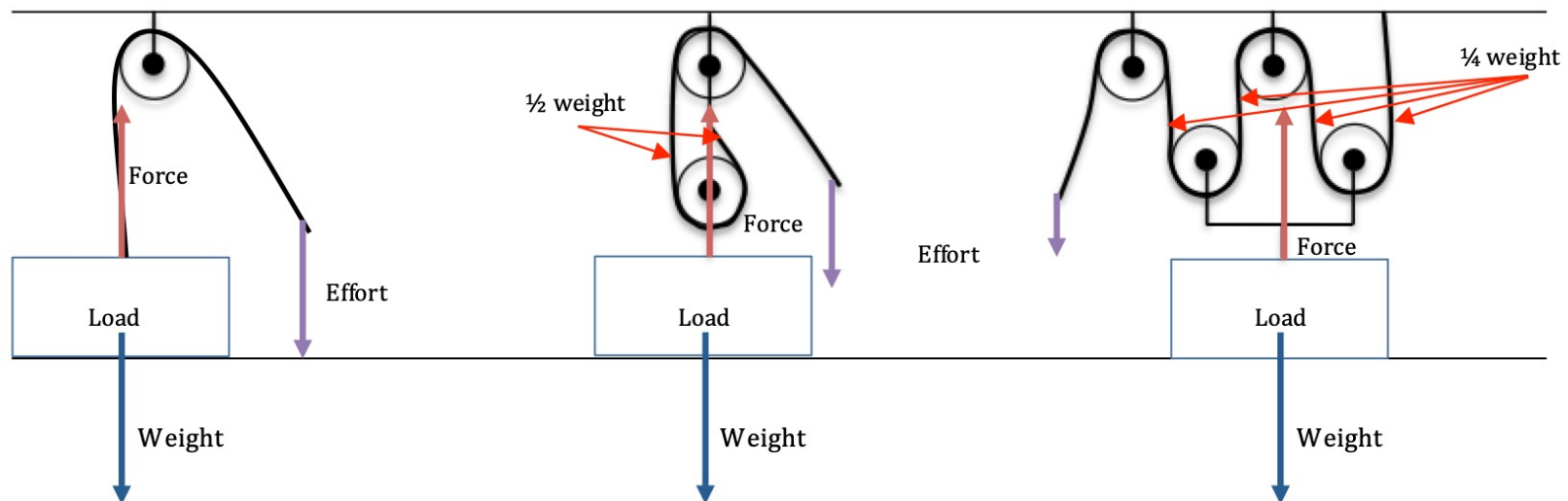
# Pulley

- In a two-pulley system, one end of the rope is attached to a stationary beam
- This rope is then looped around a pulley attached to the .....



# Pulley

- This increases the length of rope attached to the load by adding a second section of rope
- This second section takes half the weight of the load
- \_\_\_\_\_
- With four wheels, you quadruple (4X) the distance and only have to apply one-quarter the amount of force



# Pulley

Among other places, pulleys are used in window shades/blinds, elevators, flagpoles, sailboat sails, fishing nets, rock climbing equipment, and cranes



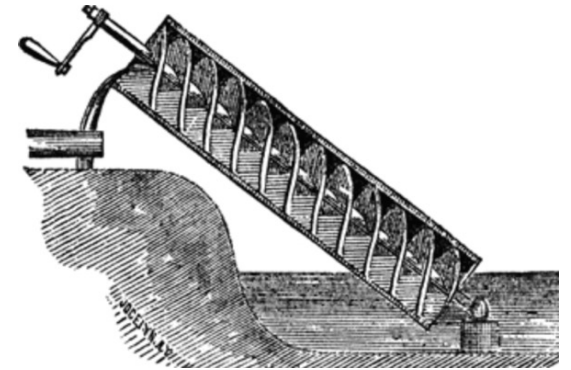
# Screw

- \_\_\_\_\_
- We typically use screws to connect things like wood and metal together but screws can also be used to magnify force or transform motion

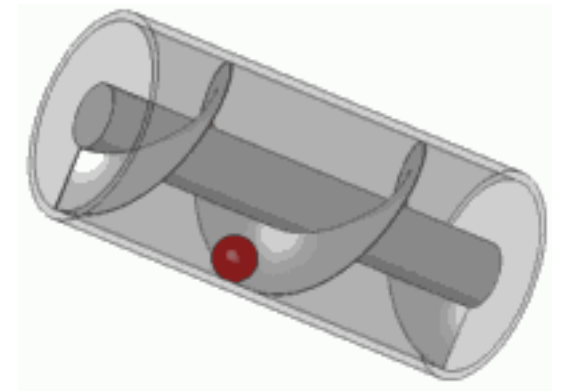


# Screw

- A device called a  
.....



- It was a large screw inside a  
pipe
- \_\_\_\_\_



Water (Archimedes') Screw

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# Screws

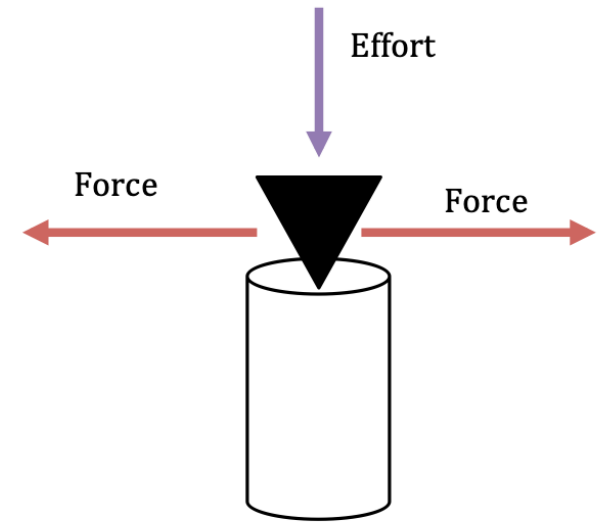
Examples of screws \_\_\_\_\_



# Wedge

- \_\_\_\_\_

- Like levers and pulleys, they transform motion force
- Pushing a wedge in a forward direction generates sideways force



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# Compound Machines

- \_\_\_\_\_
- Examples include wheelbarrows (lever + wheel and axle), can openers (lever + wedge), shovels (lever + wedge), car jacks (lever + screw), cranes (lever + pulley), and bicycles (wheel and axle + pulley)

