

Introduction to

SIMPLE MACHINES

WHAT ARE THEY?

Simple machines are machines
with few or no moving parts
that are used to make work easier

TYPES OF SIMPLE MACHINES

Wedge

Wheel and Axle

Lever

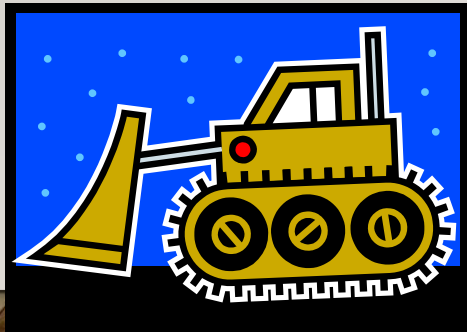
Inclined Plane

Screw

Pulley

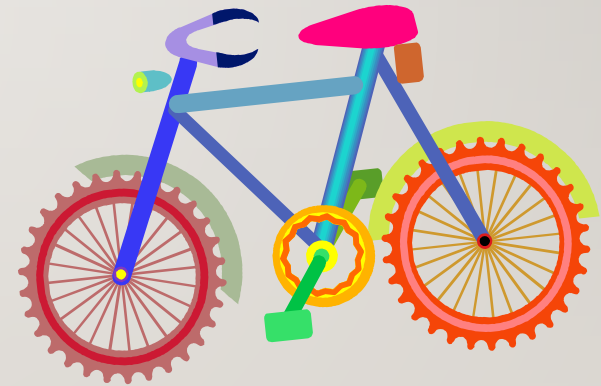
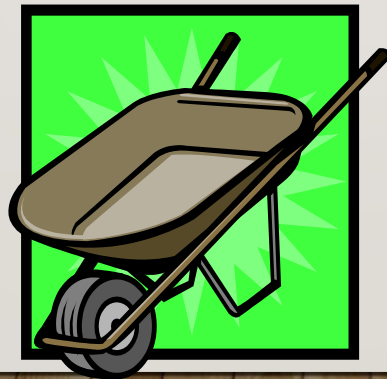
WEDGE

- Pushes materials apart, cuts things
- **Examples:** axe, doorstop, chisel, nail, saw, jackhammer, bulldozer, snow plow, horse plow, zipper, scissors, airplane wing, knife, fork, bow of a boat or ship



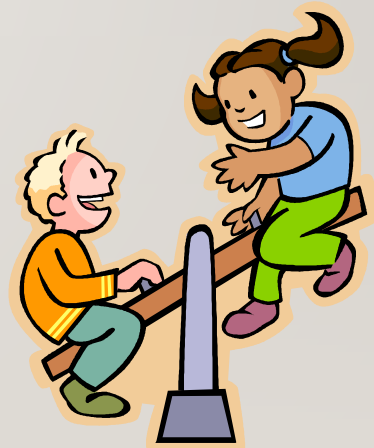
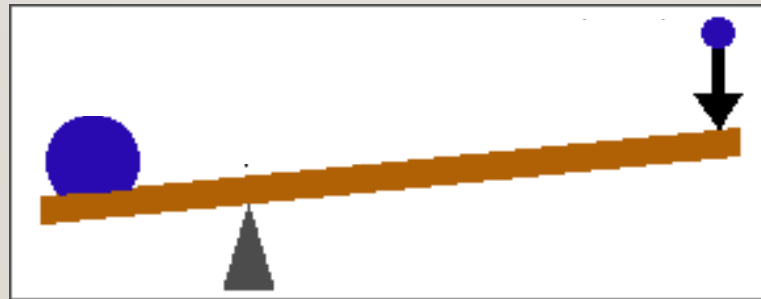
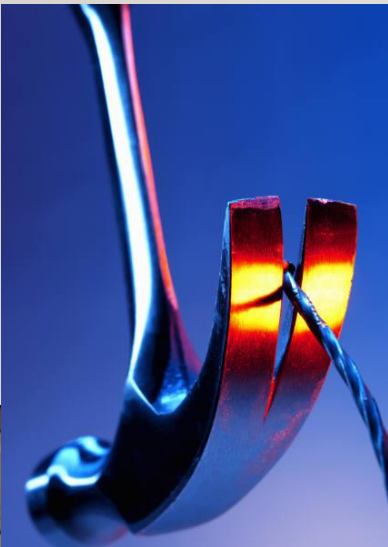
WHEEL AND AXLE

- Makes it easy to move things by rolling them, and reducing friction
- **Examples:** car, bicycle, office chair, wheel barrow, shopping cart, hand truck, roller skates



LEVER

- Makes lifting weight easier by using a fulcrum to redirect force over a longer distance
- **Examples:** see-saw, dump truck, broom, crane arm, hammer claw, crow bar, fishing pole, screwdriver, bottle opener

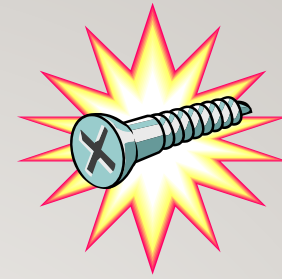


INCLINED PLANE

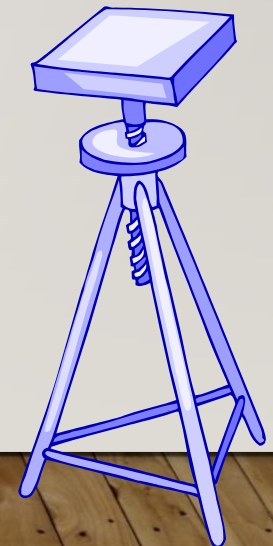
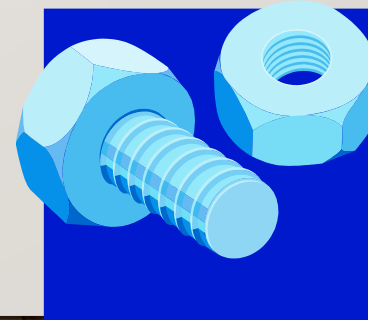
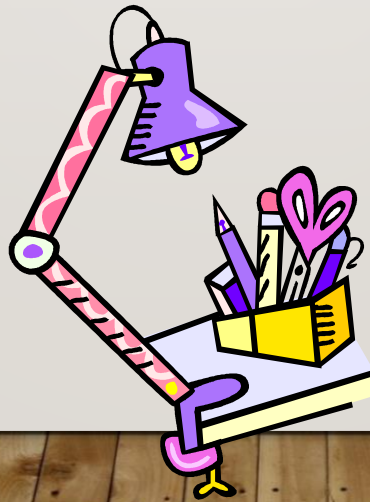
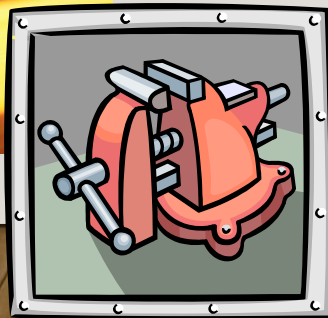
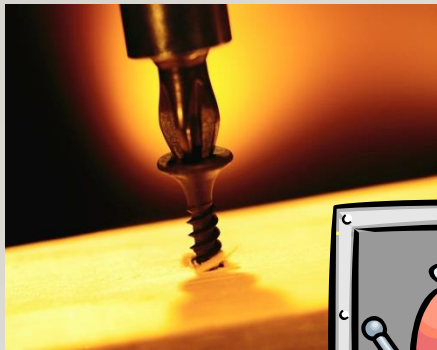
- Makes it easier to move objects upward, but you have to go further horizontally
- **Examples:** highway or sidewalk ramp, stairs, inclined conveyor belts, switchback roads or trails



SCREW

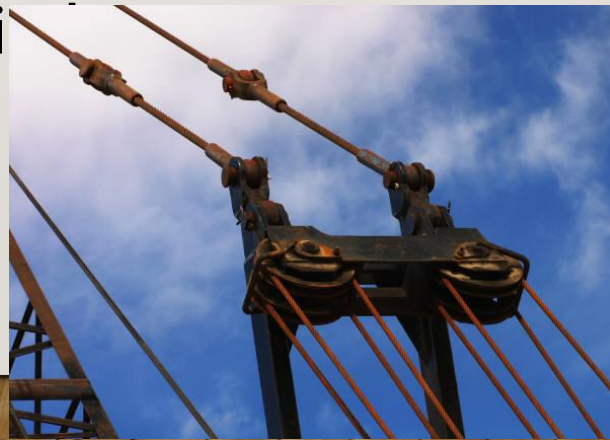
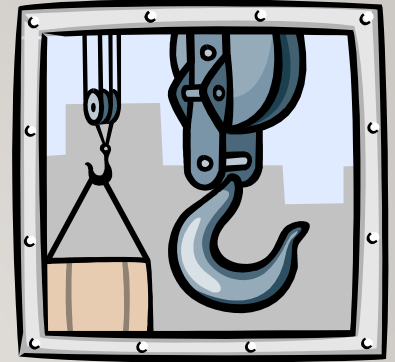


- Turns rotation into lengthwise movement
- Takes many twists to go a short distance
- Holds things together
- **Examples:** screws, bolts, clamps, jar lids, car jack, spinning stools, spiral staircases



PULLEY

- Makes lifting things with a rope easier by redirecting force and the addition of additional pulleys
- **Examples:** flag pole, elevator, sails, fishing nets, clothes lines, cranes, window shades and blinds, rock clim



WHY USE SIMPLE MACHINES?

For the **mechanical advantage**...

- Making something easier to do, but it takes a little longer to do it
- For example, going up a longer flight of stairs instead of going straight up a ladder

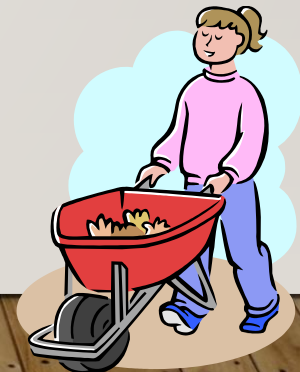
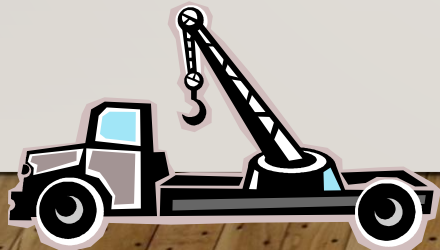


COMPLEX MACHINES

- Combining two or more simple machines to work together

- **Examples:**

- Car jack **combines** wedge and screw
- Crane or tow truck **combines** lever and pulley
- Wheel barrow **combines** wheel and axle with a lever



SUMMARY

Wedge	Pushes material apart, cuts
Wheel and Axle	Makes it easy to move things by rolling them, and reducing friction
Lever	Helps lift heavy weights using longer distances
Inclined Plane	Makes it easier to move objects upward; a longer path, but easier lifting
Screw	Turns rotation into lengthwise movement
Pulley	Makes lifting heavy weights easier by redirecting force

MECHANICAL ADVANTAGE



MECHANICAL ADVANTAGES & EFFICIENCY

- Ideal Mechanical Advantage
 - Theoretically what MA a machine has (no friction, heat, etc.)
- Actual Mechanical Advantage
 - The actual measured MA (takes into consideration losses from friction, heat, etc.)
- Efficiency
 - How close a machines actual MA is to its theoretical MA
 - $efficiency = \frac{AMA}{IMA}$

YOUR ASSIGNMENT:

- On a separate sheet of paper, complete the problems on the simple machines assignment found on my blog
 - Take your time and show work!

CLOSING

- You will be assigned a number to become a specialist in one simple machine
- You and your simple friends will be tasked with finding or creating a real-world example of this machine and sharing it with the class
- Be prepared to answer the following questions:
 - How is this an example of a _____ simple machine?
 - What factors will increase this machine's Ideal Mechanical Advantage? Decrease?
 - What factors will increase this machine's efficiency? Decrease?
 - Where might this example be used in the real world and how might it be applied?