SIMPLE MACHINES

(Making work easier...phew!)
Simple Machines Foldable

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<td>What are machines</td>
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<th>Screw</th>
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<th>Wheel and Axle</th>
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- Use the directions to complete your foldable.
- Then flip to the back to finish your notes.
What are MACHINES?

• Most people think of complex, technical, or electronic gadgets with motors..., but machines can be much SIMPLER.

• A machine is any device that lets you do WORK in an EASIER or BETTER way.

• Basically:
  Simple machines make work EASIER.
How do machines do work?

• Machines make work easier by changing 3 things about the FORCE you exert to do work:
  - **AMOUNT OF FORCE** you exert
  - **DISTANCE** over which you exert force
  - **DIRECTION** in which you exert force
What are SIMPLE MACHINES?

- There are only 6 basic simple machines that make work easier:
  - Inclined Plane
  - Wedge
  - Screw
  - Lever
  - Wheel & Axle
  - Pulley
WORK & SIMPLE MACHINES

• Simple machines **DON'T** change the amount of **WORK** done!

  (They change the size, distance or direction of your **FORCE**)  

**WORK IN** = **WORK OUT**

(*usually machines lose a bit of work due to **FRICTION**...*)
INCLINED PLANE

• An inclined plane is a flat, sloped surface. It connects a lower level to a higher level.
• You use less force over a longer distance to raise a load to a higher level.
INCLINED PLANE: Examples

- Ramps (Boat ramps, wheelchair ramps)
- Ladders/Stairs
A lever is a bar that pivots or rotates on a point (called a fulcrum). Levers may change the size, distance or direction of the force.
LEVERS: Examples & Uses

• First Class Levers:
  – Scissors, See-saws, Pliers

• Second Class Levers:
  – Staplers, Nutcrackers, Wheelbarrows

• Third Class Levers
  – Shovels, baseball bats, tweezers
PULLEY

• A pulley is a grooved wheel with a rope, used to raise/lower/move a load.
• Pulley systems change the direction and/or decrease the input force so you can move heavier loads.
PULLEY: Examples & Uses

- Cranes
- Raising a flag on a pole
- Window Blinds
- Raising a sail on a boat
- Clothesline
WEDGE

• A wedge has slanting slides that meet at an edge - it splits material apart.
• It changes force in one direction into a splitting force that acts at right angles to the blade.
WEDGE: Examples & Uses

- Ax, Knife, etc.
- Zippers
- Used in all cutting machines (to split materials apart)
WHEEL & AXLE

• The wheel is locked to the central axle - when one turns, so does the other one.
• A short powerful force at the axle, will move the wheel’s edge a long distance.
• A long motion at edge of wheel, moves the axle with great force.
WHEEL & AXLE: Examples & Uses

- Screwdriver
- Windmill
- Cars/Bicycles
- Rolling Pin
- Door Knob
- Fan
• A screw has a “thread” or “groove” wrapped around a central cylinder.
• While turning, it converts a twisting force into a forward or backward force.
SCREW: Examples & Uses

• Screws can hold things together or lift materials.
• Screws
• Screw top lids for jars/bottles
• Light bulb
• Swivel stools/chairs
Simple Machine Review!

Write the name of the type of simple machine next to the picture on the back of your foldable.
COMPOUND MACHINES

- **Compound Machines** - are made of combinations of two or more simple machines.
Compound Machines

Early Uses of Compound Machines
- Lever
- Wedge
- Stone ax
- Shears
- Wheelbarrow
- Wheel and axle

Today's Compound Machines
- Bulldozer
- Pencil sharpener
- Typewriter
- Lawn mower
- Hand drill
Compound Machines:

Two or more simple machines working together.

- Wheelbarrow: Wheel & axle, levers
- Pencil Sharpener: Lever, wedges (inside)
- Crane: Lever, pulley, wheel & axle
- Bulldozer: Wedge, wheel & axle
- Clippers: Wedges, levers
- Escalator: Pulleys (inside), inclined plane

**Inclined Plane**
- Pedal

**Lever**
- Gearshift

**Wedge**
- Brakes

**Screw**
- Found in body & engine

**Pulley**
- Seatbelt

**Wheel and Axle**
- Car wheels and axles
Machines make work easier by changing 3 things about the FORCE:

• The **amount** of force

• The **distance** of the force

• The **direction** of the force
Machines make work easier by changing 3 things about the FORCE:

- The **amount** of force
  (eg. A ramp lets you lift a heavy object with **LESS** force)
Machines make work easier by changing 3 things about the FORCE:

• The **distance** of the force (eg. A baseball bat lets you move your arms a short distance, but move the end of the bat a large distance).
Machines make work easier by changing 3 things about the FORCE:

- The **direction** of the force
  (eg. The pulley on a set of window blinds lets you move the blinds UP with a DOWNWARD pull.)