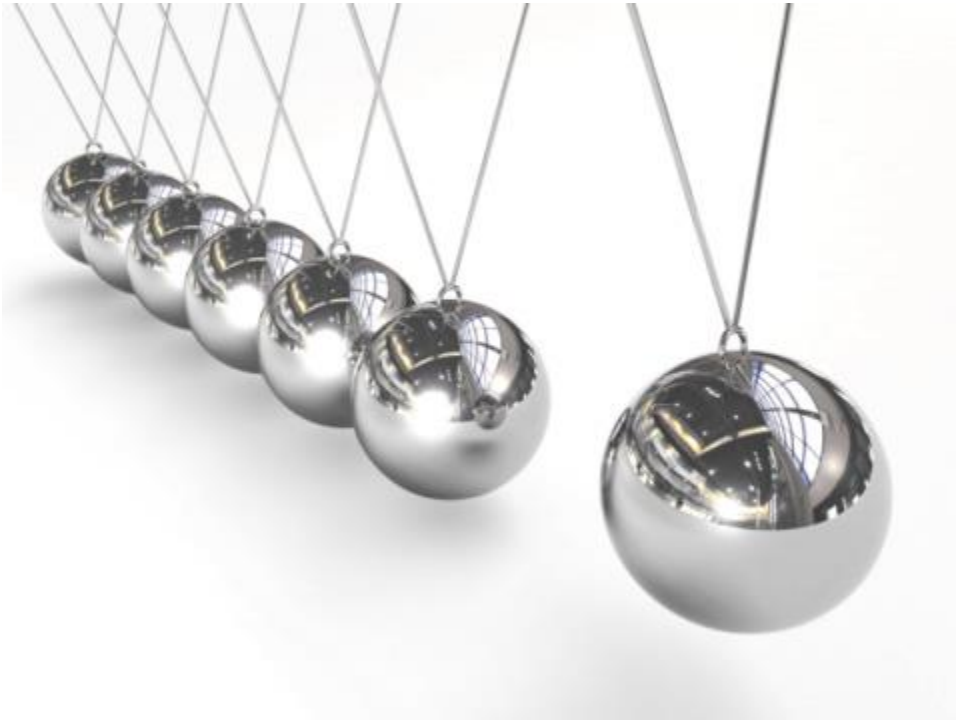
Grade 5 Science
Unit 3

Putting it in Motion



PART 1:

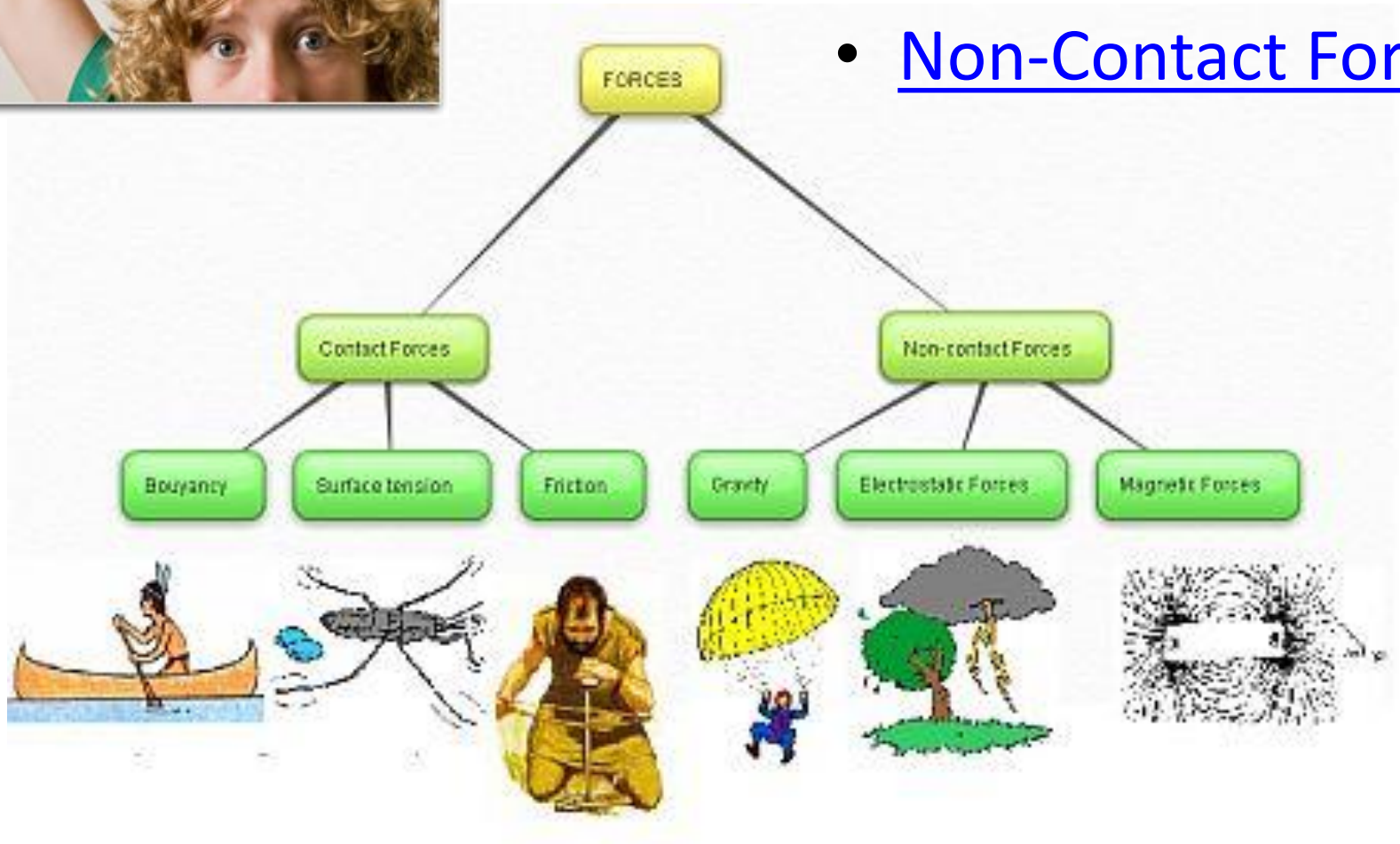
Force and Motion

Motion: The movement of something from one place to another.

Force: a push or pull on an object resulting from the object's interaction with another object.

Contact vs Non-Contact Forces

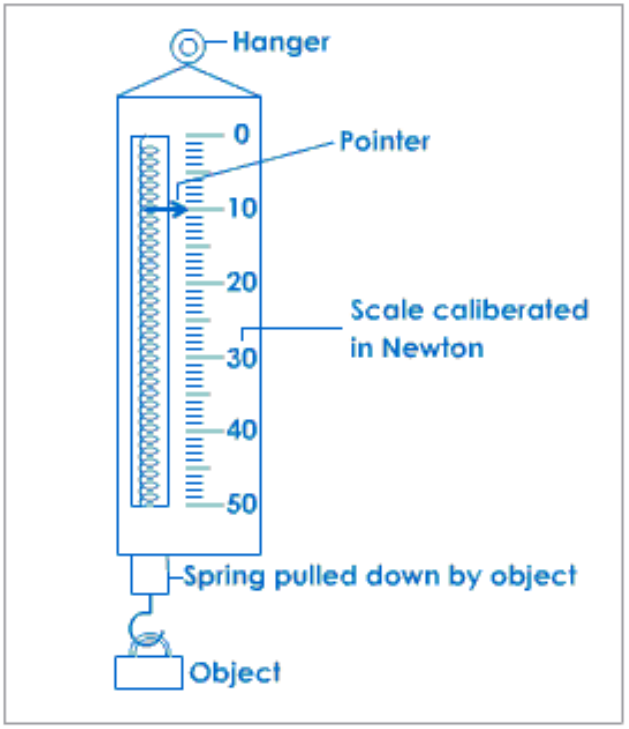
- Contact Forces
- Non-Contact Forces



How do we Measure Force?

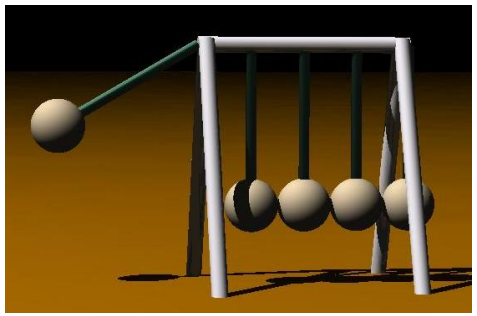
The **newton** is a unit of force, usually abbreviated *N*. 1 newton is the force required to cause a mass of 1 kg to accelerate at a rate of 1 m/s2 (in the absence of other forces)

A **spring scale** is a measuring tool with a spring fixed at one end with a hook to attach an object at the other.



Different Kinds of Motion

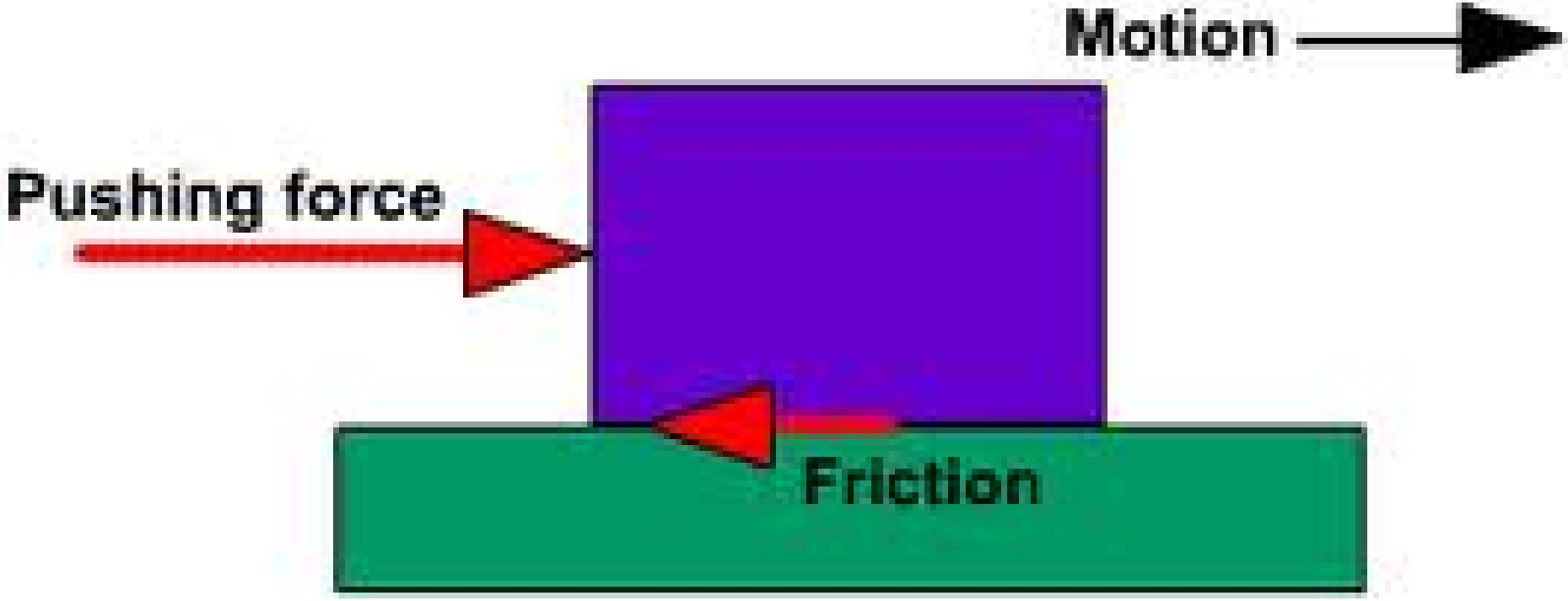
- ***Linear Motion*** (a movement in a straight line between two points)
- ***Rotational Motion*** (a movement along a curved path or in a circle)
- ***Reciprocating Motion*** (a movement that goes up and down in a straight line)
- ***Oscillating Motion*** (a movement that goes backwards and forwards in a straight line)



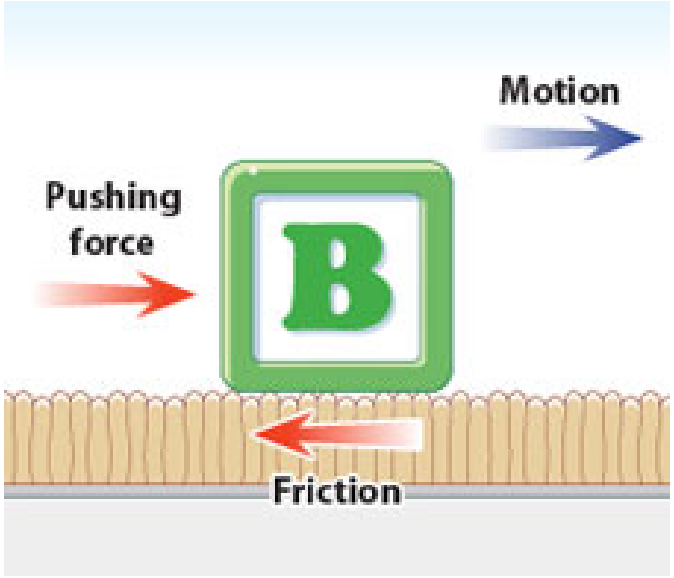
Motion – Did you know?

You can't feel motion at all if you stay exactly the same. You can only feel motion if there are changes in speed or direction.

PART 2:
Friction



Friction



Friction is a **force** between two surfaces that are sliding, or trying to slide, across each other. For example, when you try to push a book along the floor friction makes this difficult.

Friction always works in the direction opposite from the direction the object is moving, or trying to move. Friction always **slows** a moving object down.

More or less friction

The amount of friction depends on the materials from which the two surfaces are made. The rougher the surface, the more friction is produced.

For example, you would have to push a book harder to get it moving on a carpet than you would on a wooden floor. This is because there is more friction between the carpet and the book than there is between the wood and the book.

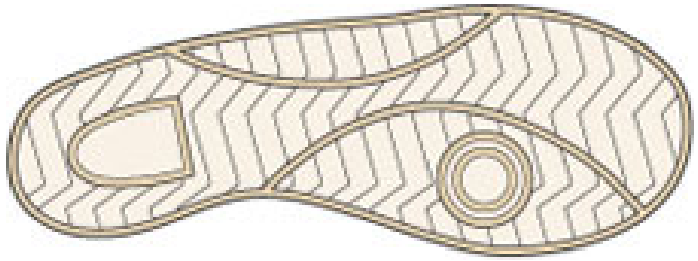
Heat

Friction also produces **heat**. If you rub your hands together quickly, you will feel them get warmer.

Friction: Wanted or Unwanted?

Friction can be a useful force because it prevents our shoes slipping on the pavement when we walk and stops car tyres skidding on the road.

When you walk, friction is caused between the tread on shoes and the ground. This friction acts to grip the ground and prevent sliding.



Ice causes very little friction, which is why it is easy to slip over on an icy day. However this is a good thing for ice skating and sledging.

Reducing friction

Sometimes we want to reduce friction. For example, we use oil to reduce the friction between the moving parts inside a car engine. The oil holds the surfaces apart, and can flow between them. The reduced friction means there is less wear on the car's moving parts, and less heat produced.

Overcoming Unwanted Friction

What Devices Can Help You Overcome Friction?

- rollers
- wheels
- axles
- grease, lube, etc…
- water
- smoother surfaces
    - hardwood or tile vs carpet
    - ice vs gravel or pavement
    - sliders vs grippers (in curling)

Friction and Air Resistance

Air resistance is a type of friction between air and another material. When an aeroplane flies through the air, for example, air particles hit the aeroplane, making it more difficult for it to move through the air.

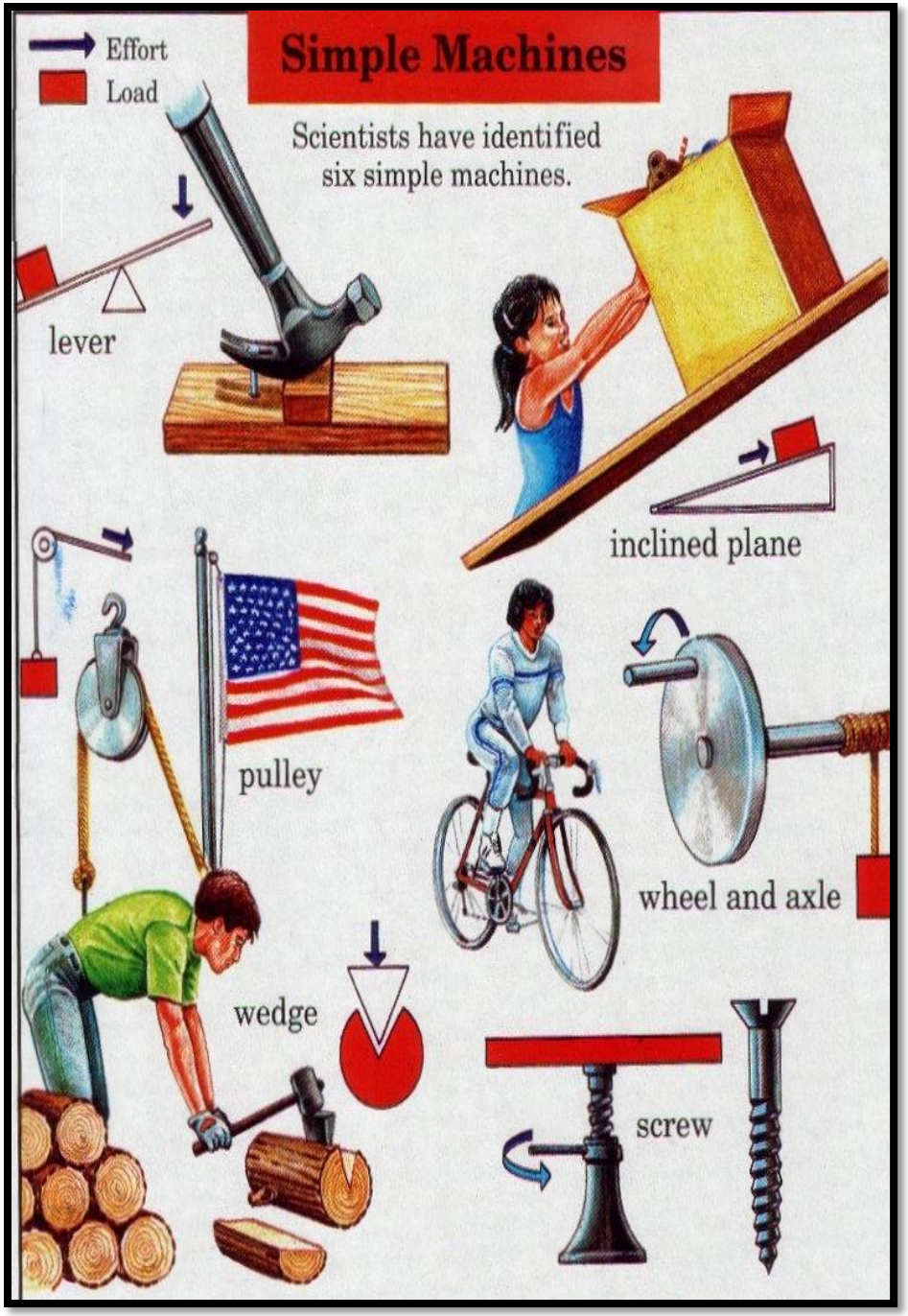
Some shapes, known as **streamlined** shapes, cause less air resistance than others. Aeroplanes and cars are streamlined, so that they move through the air as easily as possible.

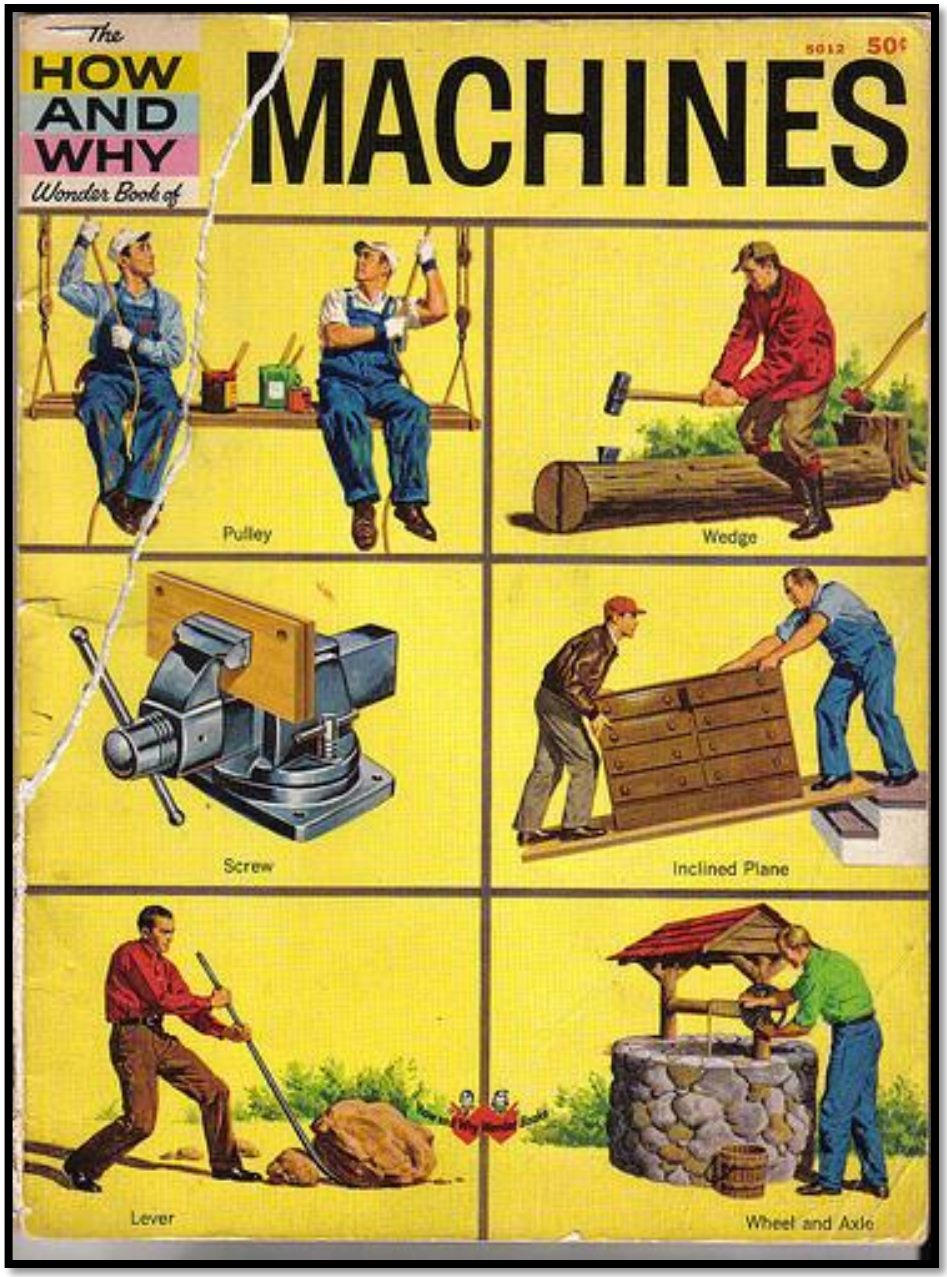
Streamlining

PART 2: Simple Machines

Simple machines: tools that make work easier. They have few or no moving parts. These machines use energy to work.

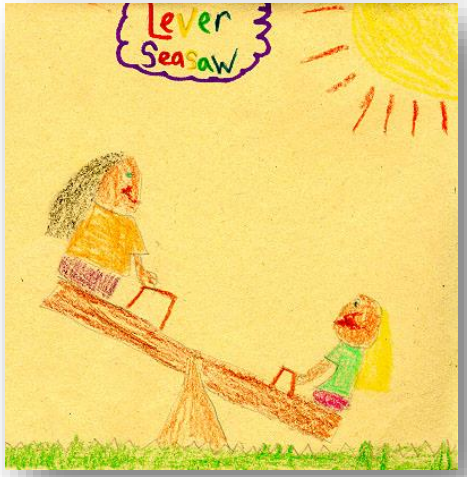
TYPES OF SIMPLE MACHINES:


Effort
Load
Simple Machines
Scientists have identified six simple machines.
lever
inclined plane
pulley
wheel and axle
wedge
screw


The
HOW AND WHY
Wonder Book of
MACHINES
5012 50¢
Pulley
Wedge
Screw
Inclined Plane
Lever
Wheel and Axle

1. Lever:

A lever is a board or bar that rests on a turning point (**fulcrum**). An object that a lever moves is called the **load**. The closer the object is to the fulcrum, the easier it is to move.



These girls are using this simple machine to have fun on the playground. They are using the seesaw to make the work of lifting each other easier.

Here's an example of a lever used to move a rock.
What is the load? Where is the fulcrum?
Using a lever makes moving the rock easier.

<u>Examples of Levers</u>:

- Hammer (when used to pull a nail out)
- Bottle Opener
- Crow Bar

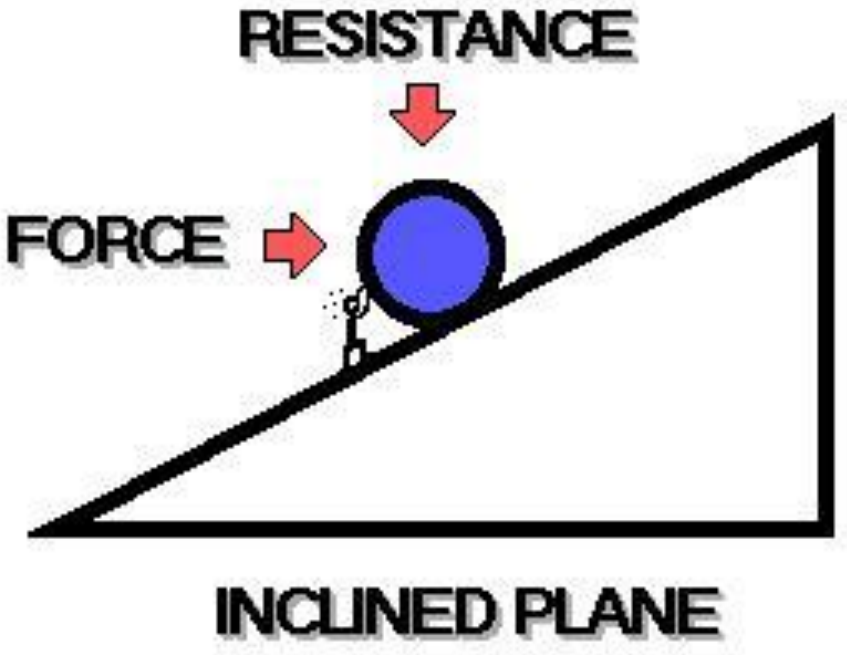

Load
Fulcrum
Force

2. Inclined Plane:

An inclined plane is a flat surface that is higher on one end. You can use this machine to move an object to a lower or higher place. Inclined planes make the work of moving things easier. You would need less energy and force to move objects with an inclined plane.

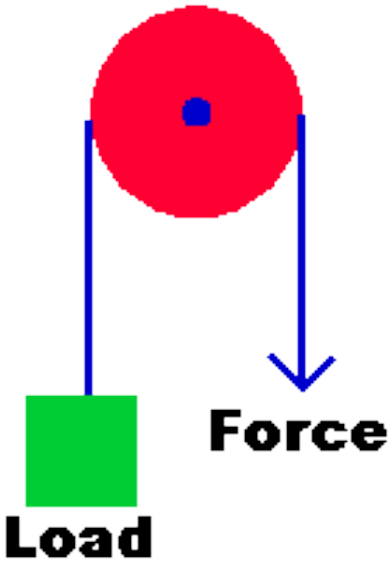
Examples of Inclined Planes:

- Ramp
- Slanted Road
- Path up a Hill
- Slide




YAMAHA

3. Pulley:

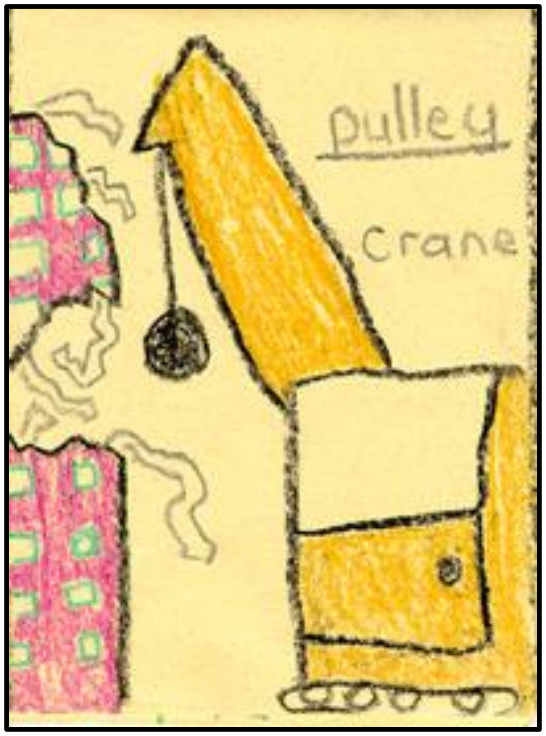


A wheel and a rope. The rope fits on the groove of the wheel. One part of the rope is attached to the load. When you pull on the other side of the pulley, the wheel turns and the load will move. Pulleys make the work of moving heavy loads a lot easier.

<u>Examples of Pulleys</u>:

- Flag Poles
- Clothes Lines
- Sailboat
- Blinds
- Crane

This crane uses a pulley to move the heavy wrecking ball. Without the use of a pulley, the wrecking ball would be very hard to move.



4. Wedge:

A wedge is an object with at least one slanting side ending in a sharp edge, which cuts material apart

Examples of Wedges:

Axe
Scissors
Chisel
Push pin
Door stop

5. Screw:

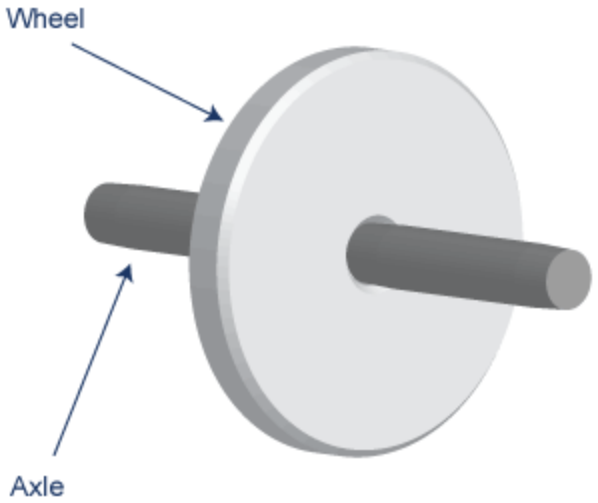
A screw is an inclined plane wrapped around a shaft or cylinder. The inclined plane allows the screw to move itself when rotated.

<u>Examples of Screws</u>:

Wood screws
Nuts & Bolts
Cork Screw
Drill
Light bulb

6. Wheel and Axle:

The axle is a rod that goes through the wheel which allows the wheel to turn. Gears are a form of wheel and axle.



<u>Examples of Wheel and Axle</u>:

Pencil sharpener

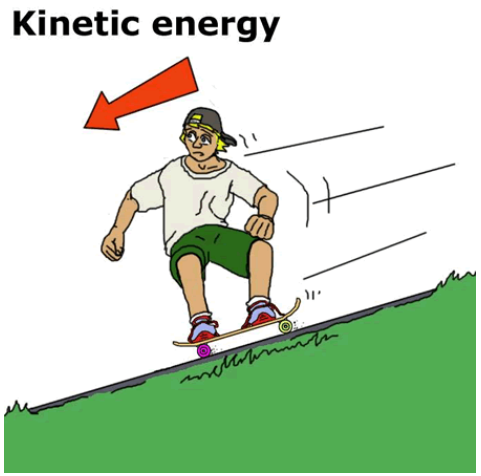
Cart

Apple peeler

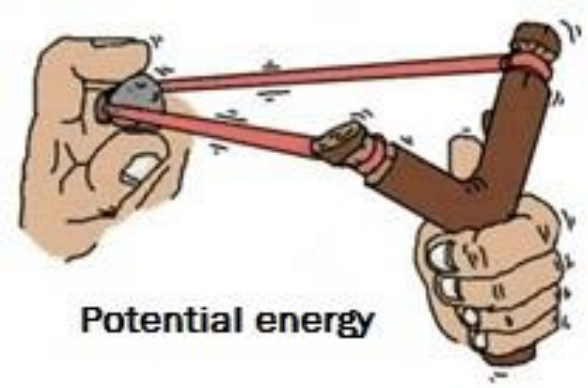
Door knob

PART 3: Energy

Energy: The ability to do work.



Kinetic Energy: The ability of a moving object to do work.
Energy of "movement".

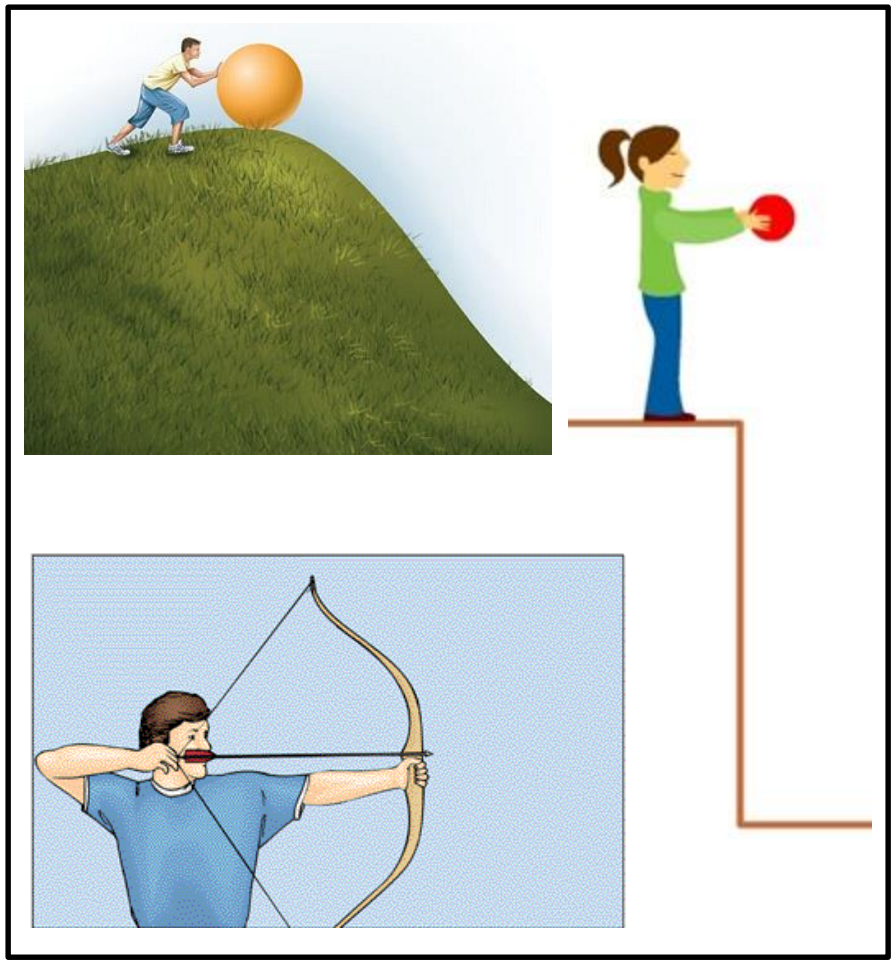


Potential Energy: The ability of a stationary object to do work.
Energy of "position"

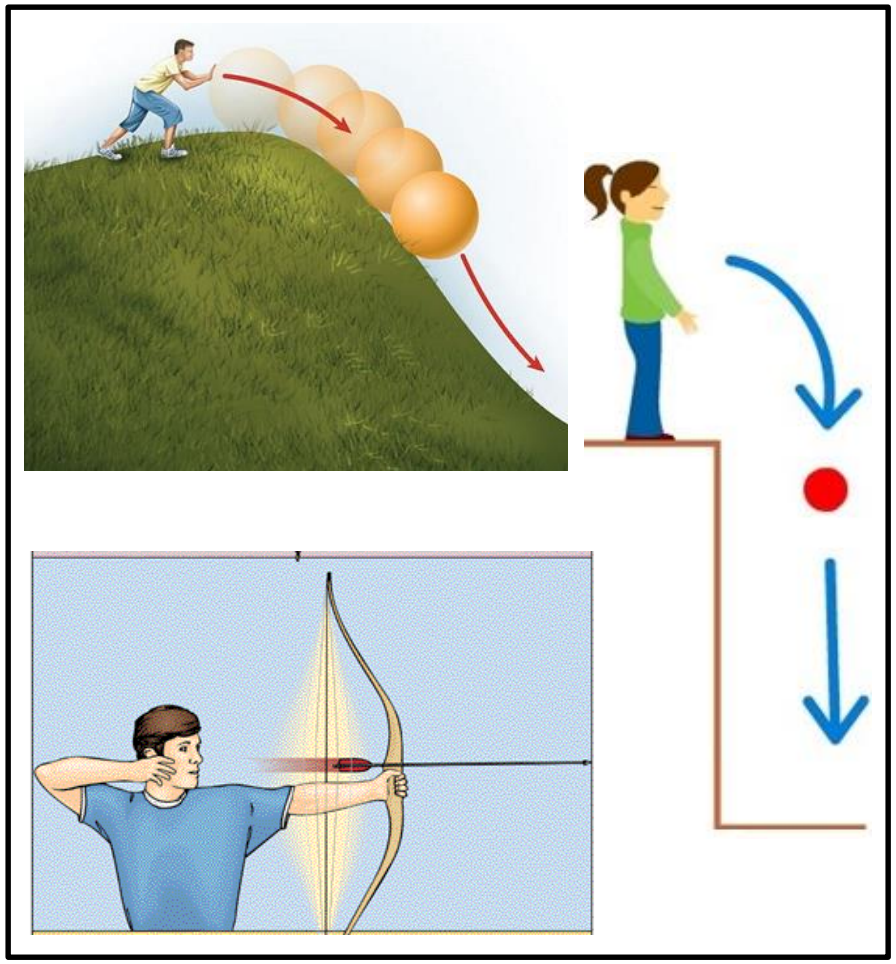
Potential energy can become Kinetic Energy.

Read pp. 14-17. Give examples of potential and kinetic energy:

POTENTIAL ENERGY:

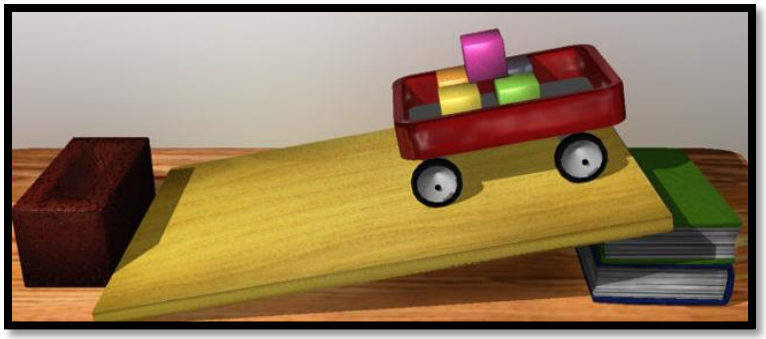


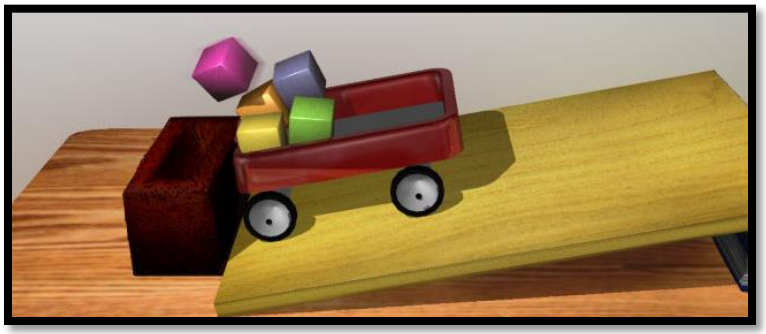
KINETIC ENERGY:

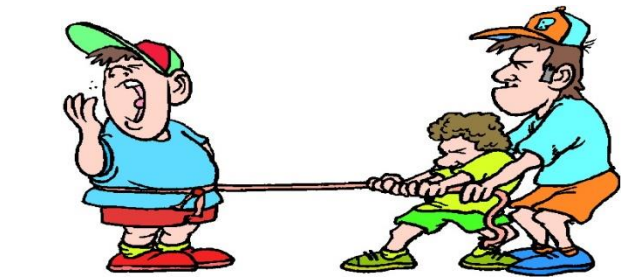


Energy of <u>Position</u>: "Stored Energy"

Energy of <u>Movement</u>



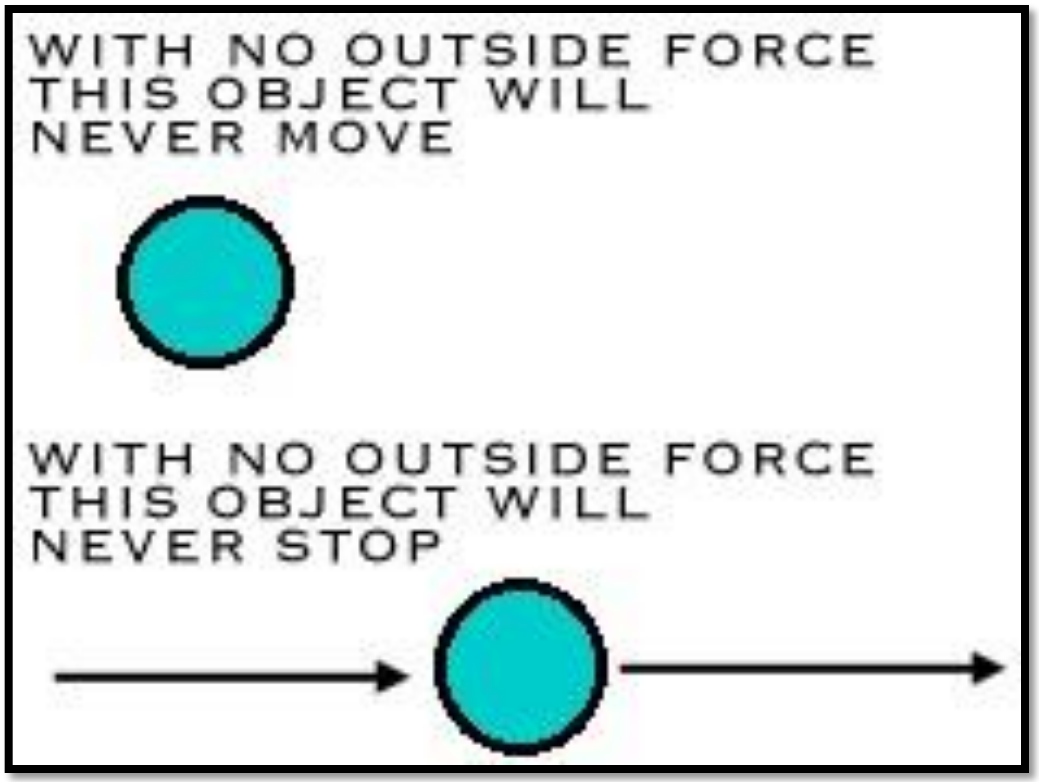




Newton's First Law of Motion

Newton's first law is often called the law of inertia

Newton's First Law of Motion states—An object at rest will remain at rest, or an object in motion will remain in motion in a straight line at constant speed, unless an external force is applied to it and changes its state motion



INERTIA

Your truck has brakes...the massive hunk of stone doesn't.

INERTIA

YOU LOSE