Fast Facts #10 Work and Energy

Name _____ Block__

Heat can be transferred through Convection, Conduction, or Radiation	
Type of Energy Transfer	**Description**
Conduction (touching)	Conduction involves objects in direct contact (touching each other). Heat energy transfer occurs between particles as they collide within a substance or between objects in contact. All materials do not **conduct** heat equally well. Poor conductors of heat are called **insulators.** The energy transfers from an area of **higher** temperature to an area of **lower** temperature. (Heat moves from the hotter area to the cooler area.) **Example**: if a plastic spoon and a metal spoon are placed into a hot liquid, the handle of the metal spoon will get hot quicker than the handle of the plastic spoon because the heat is conducted through the metal spoon better than through the plastic spoon
Convection (movement of the substance)	**Convection** is the transfer of heat in liquids or gases (fluids) by the **movement of the heated particles**. Particles with higher energy move from one location to another carrying their energy with them. Particles with the higher energy move from **warmer** to **cooler** parts of the fluid. **Example**: uneven heating can result in convection, both in air and in water. This causes currents in the atmosphere (wind) and in bodies of water on earth which are important factors in weather and climate.
Radiation (transfer through space)	**Radiation** is the transfer of energy **through space** without particles of matter colliding or moving to transfer the energy. This radiated energy warms an object when it is absorbed. **Radiant heat energy** moves from an area of higher temperature to an area of cooler temperature.

Energy is the ability to do work (force exerted over a distance).

The energy is transferred when a force causes a change in the motion of an object. An object must move for work to be done.

For work to be done, (1) a force must be applied to the object over a distance and (2) the object moves in response to the force.

Evidence of energy when work is being done

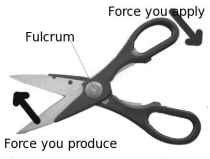
Example	Evidence that work is done
a toy car is pushed	the car moves
a fan is connected to an electric circuit	the fan moves
an object is lifted	the object moves

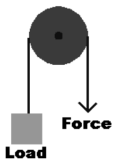
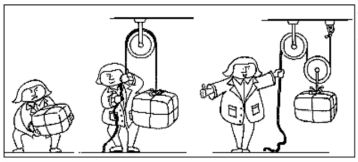
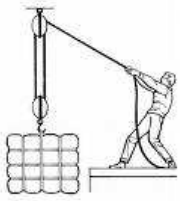
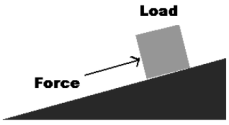
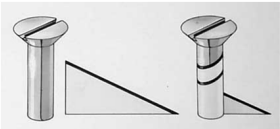
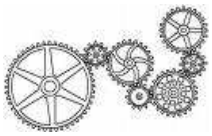
Spring Scales

A spring scale is used to measure force. Force is measured in SI units called newtons (N).

Simple Machines help reduce the amount of force required to do work.
Machines make work easier by increasing the distance of the force required to move an object.
The increase in distance the force must move reduces the amount of force required to move an object.
Simple machines can also change the direction of the force applied.

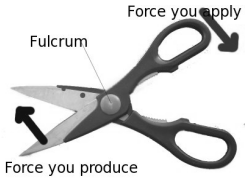
Simple Machine	Description	How the Machine Reduces the Force Needed	Examples
Lever	a rigid bar or board that is free to move around a fixed point called a fulcrum - the fulcrum can be moved to different locations along the bar	If the distance from the fulcrum to where the force is applied (effort force) is **increased**, the **amount of work** needed to move the object is **decreased**. This makes the work easier. (more distance, less force) The lever can reduce the amount of lift force needed in two ways: 1-increase the distance from the fulcrum to the point force is applied 2-by decreasing the distance from the weight to the fulcrum	**hammer**, **scissors**, **crowbars**, **pliers**, **broom**, tweezers, **wheelbarrow**, human arm, bottle opener



Simple Machine	Description	How the Machine Reduces the Force Needed	Examples
Pulley	a grooved wheel with a rope running along the groove	Pulleys can change the amount or direction of the force applied (effort force). By arranging the pulleys in a way to **increase the distance** that the effort force moves relative to the distance the weight moves, a pulley can **reduce the effort force needed**. (more distance, less force) **Movable pulleys** are used to **reduce the effort force**. (more distance, less force) A **single fixed pulley** only changes the **direction** of the force.	fixed pulleys are found on a flag pole or window blinds Movable pulleys are not attached to a structure and are found in block and tackle system or on a construction crane
	     		
Inclined Plane	a sloping surface like a ramp that reduces the amount of force required to lift an object	An inclined plane can reduce the force needed to lift a weight by: 1-increasing the length of the ramp 2-decreasing the height of the ramp The **greater the distance** of the ramp, the **less the amount of force** required to move an object up the ramp. An inclined plane makes work easier (reduces the amount of force required) by increasing the distance the object is moved. (more distance, less force) A **ramp** is a sloping surface. **Wedges** are an inclined plane (or two back-to back inclined planes) such as knives or nails. A screw is an inclined plane wrapped around a cylinder. These include bolts and jar lids	**ramp**, a **wedge** that is the edge of a knife, a **screw**, a screw on lid of a jar, the base of a screw-in light bulb
	    		
Wheels and Axle	consists of two circular objects connected by a central shaft called an axle.	When you turn the wheel, it turns the axle. The larger the wheel, the less force needed to turn it. (more distance, less force)	door knobs, steering wheels, screwdrivers, gears, and bicycle wheels
	    		

Complex machines consist of two or more simple machines. They are also called **compound machines**.

Examples include:
- -scissors are two levers and two inclined planes
- -a fishing pole consists of a lever, a wheel and axle and a pulley
- -a bicycle consists of levers (handlebars), wheel and axles (wheels, gears and pedals, and a number of screws)

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