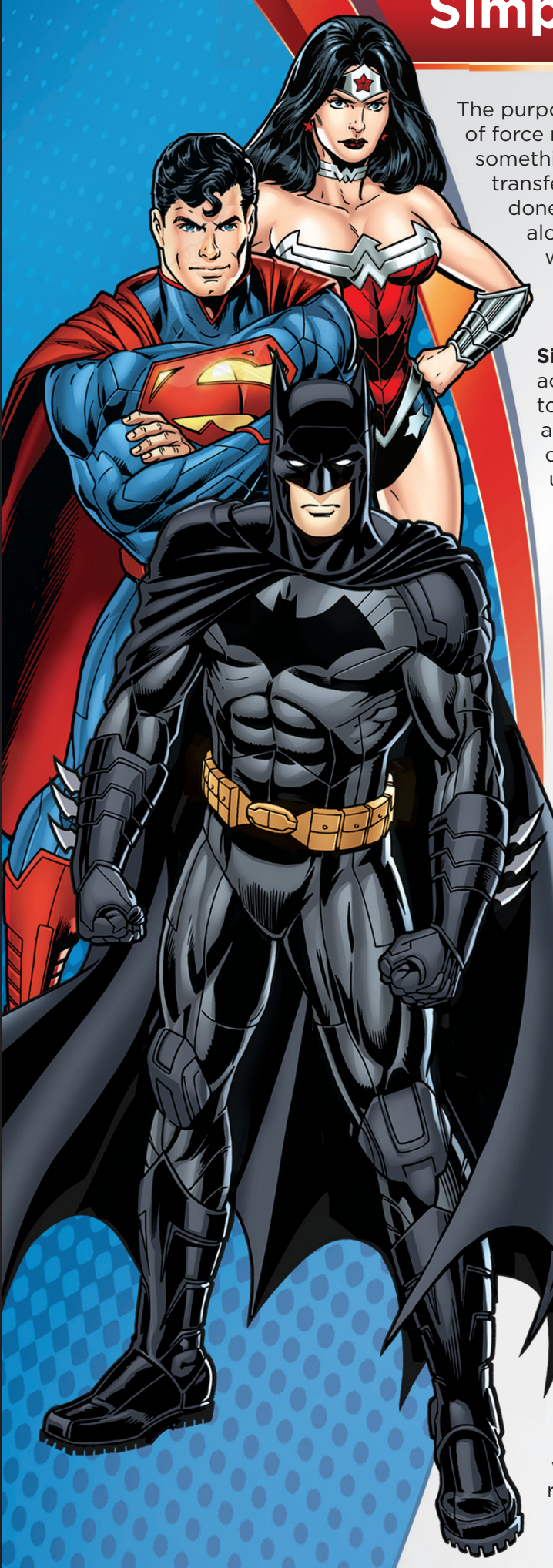
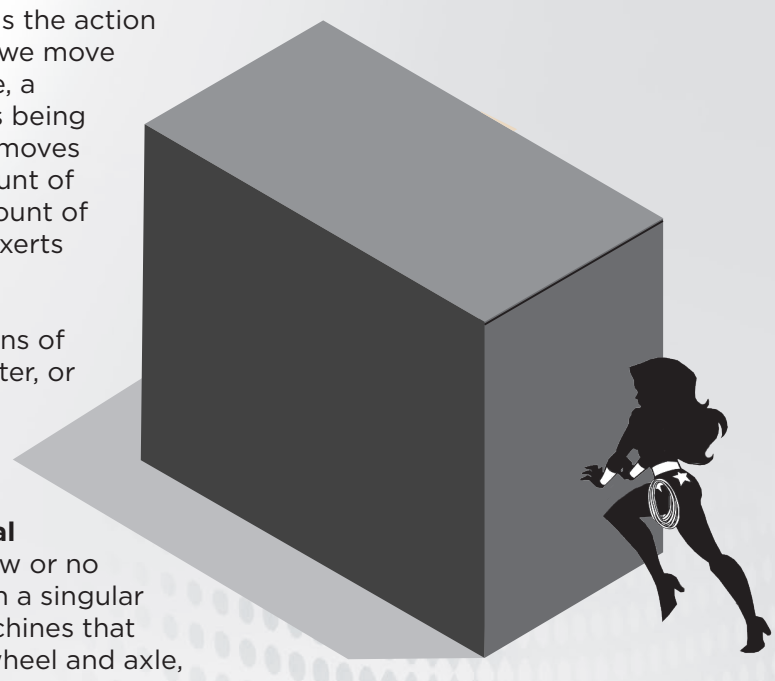
Newspapers In Education and the Washington State Fair present

Simple Machines are Super Machines



The purpose of machines is to do work. **Work** is the action of force moving across a distance. Whenever we move something, or something is moved by a force, a transfer of energy is happening and work is being done. For instance, when a roller coaster moves along a track, it is doing work. The amount of work that it does is the combined amount of kinetic and potential energy that it exerts (or the total amount of energy).

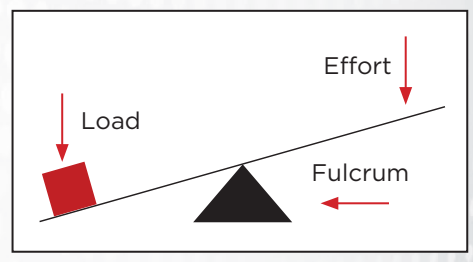


When Wonder Woman moves, she is transferring energy. Whenever energy is transferred we also call it "doing work". This may happen through lifting, pulling, or pushing. Power is the work done in a unit of time. In other words, power is a measure of how quickly work can be done. If you take the work (force x distance) of Wonder Woman doing the work and divide it by the time it takes for her to do the work, you will get the power.

Simple machines are the simplest means of accomplishing something faster or better, or to make work easier. Often this is by allowing us to pull or push something over a longer distance so that we can use less force to do the same amount of work. This is also called **mechanical advantage**. Simple machines have few or no moving parts, and tend to do work in a singular movement. There are six simple machines that you should know about: the lever, wheel and axle, inclined plane, wedge, pulley, and screw. These simple machines can be found in all kinds of places, including at the Washington State Fair.

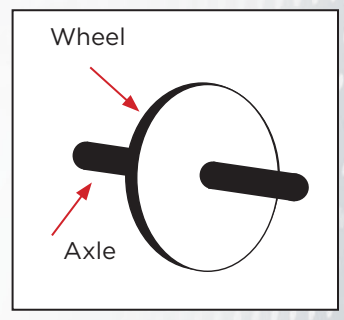
In fact, simple machines are so common that they even imitate parts of our own bodies. For instance, in many ways your arm resembles a **lever**. A lever is a simple machine that consists of a bar and a fulcrum.

Whenever you pick up anything heavy, your elbow acts as the fulcrum of the lever, and your arm bone acts as the lever itself. A lever decreases the amount of force needed to lift a **load**, or the resistance or weight acted on by the machine. There are actually three different types of levers, which are classified based on where the fulcrum is located in relation to the weight. Places where you might find levers include brooms, seesaws, nutcracker, and pliers.



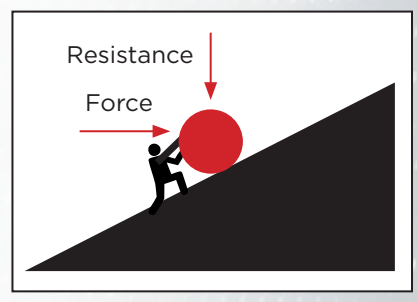
LEVER

A **wheel and axle** is made up of two circles — a wheel that spins around a rod known as an axle. The force applied to the wheel multiplies when it spins around the axle. How do you think the size of the wheel relates to the effort needed to turn it? Think of your own experience with wheels. Places where you might find wheels and axels include door knobs, steering wheels and bicycle wheels.



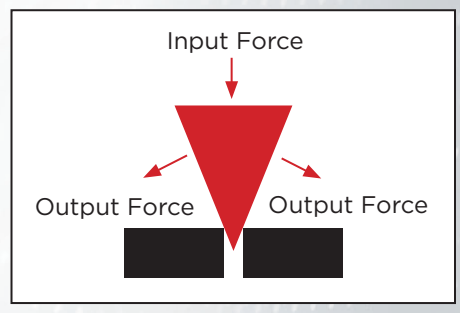
WHEEL AND AXLE

An **inclined plane** is a smooth, slanted surface. Inclined planes allow us to move objects up or down with much less effort than it takes to lift them. The longer the inclined plane is, the less effort it will take to move an object up or down, but the longer it will take to do the work. Places where you might find inclined planes include ramps, escalators and stairs.

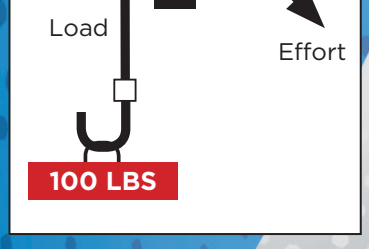


INCLINED PLANE

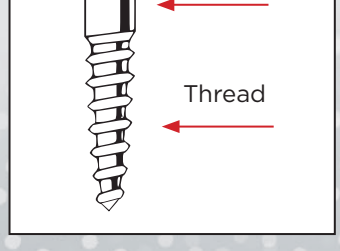
A **wedge** is basically an inclined plane that moves in order to do work, often to split or separate objects. A wedge can be used to force two surfaces apart or to lift a load slightly, by splitting the input force onto both sides of the wedge. A zipper contains a wedge that splits apart the teeth of the zipper. An axe is a wedge that splits apart pieces of wood. Places where you might find wedges include chisels, axes and door stops.



WEDGE



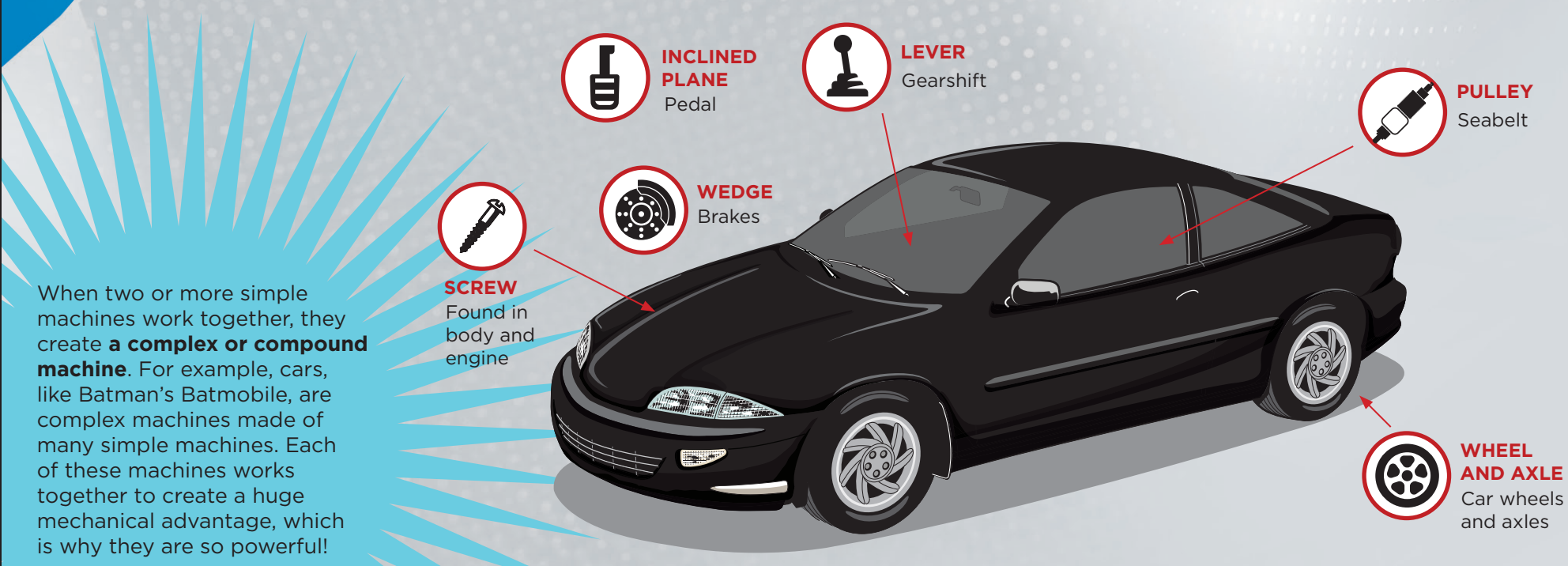
PULLEY



SCREW

A **pulley** is made up of a chain, belt, or rope wrapped around a wheel. A movable pulley decreases the amount of force needed to do work by redirecting the effort. A single fixed pulley changes the direction of the force and allows a worker to add his or her own weight to the effort. If a second pulley is added, the amount of force needed to lift the object decreases. Pulley systems often move things upward such as curtains on a stage. Places where you might find pulleys include elevators, flag poles and cranes.

You might recognize the simple machine known as the **screw**. Screws twist into surfaces easily but are difficult to remove. The thread of a screw is actually an inclined plane wrapped around a pole. Just like an inclined plane, the longer the thread of the screw, the easier the work. Places where you might find screws include bottle tops, light bulbs and swivel chairs.



When two or more simple machines work together, they create **a complex or compound machine**. For example, cars, like Batman's Batmobile, are complex machines made of many simple machines. Each of these machines works together to create a huge mechanical advantage, which is why they are so powerful!

Can you determine which simple machine is being used in each example?

How many more simple machines do you think you can you find at the fair?

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