

Big Pulley Station:

Background info:!

- A machine is a device that does **work**. Machines do not increase the amount of work done, but they do make work easier.!
- Machines make work easier by changing **force** or **distance**, or by changing the direction of the force.!
- A **pulley** is a simple machine.!

! Try out both **fixed** and **movable** pulleys, asking students which feel easier to lift the water bottles.!

! The fixed (class 1) pulley has a mechanical advantage of 1 since the force is the same on both sides of the pulley.!

! The free (class 2) pulley has a mechanical advantage of 2, meaning the force required to lift a load is split between the rope on either side of the pulley. In other words, this pulley can deal with double the force as the fixed pulley.!



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Small Pulleys Station

Give students each their own pulley and string if possible, asking them to use the pulleys to pick up small things around them and lift them. Let them play around with them for awhile before trying to get them to make a compound pulley.!

A **compound pulley** is a system of pulleys. It lets people still pull down and take advantage of being able to change the direction of the force (fixed pulley) while halving the effort required (free pulley). !

Let students play around with this for awhile, and if they get comfortable lifting objects, then ask them what happens when you add more pulleys? Help them get started if need be.!



Gears Station

Background Information:

Gears are used in many machines, although they are often hidden from view in a protective case filled with grease or oil. !

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Gears do three main jobs: !

1. They change the direction of motion.!
2. They increase or decrease the speed of the applied motion. !
3. They magnify or reduce the force that you apply. !
 - a. Think of an egg beater for each of these! Use that as an example.!

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See if students can see each of these jobs in the pre-built apparatus, going through them one-by-one. Focus in on parts, and remove them to pass around if need be. There are some extra parts in the box, but not many. !

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Consider allowing students to take apart the preconstructed apparatus to make little gear cranks, ensuring that you're able to quickly put it back together for the next group (if desired). Have the instructions handy, and let students play and build their own gear devices freely.