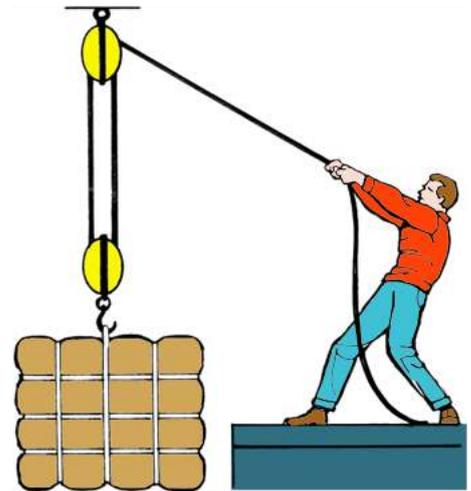


## Build a Pulley System

### Materials

- › 2x Small Cardboard Boxes
- › 2x Pencils
- › Sewing Spool
- › String
- › Paperclip

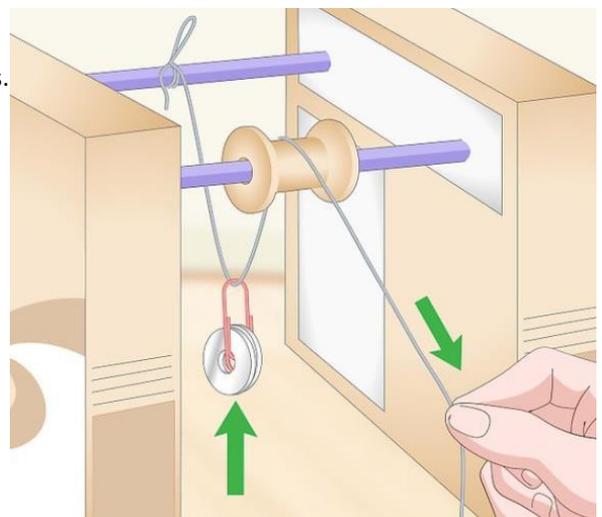


### Activity Overview

- › In this activity we will learn what a pulley is and how they use mechanical advantage to lift heavy objects.
- › Use the Activity Plan below to build your own compound pulley system.

### Activity Plan

- › Use two boxes of the same size, such as cereal boxes, and place them on a flat surface.
- › Slide the sewing spool onto the middle of one of your pencils. If you don't have a sewing spool, try wrapping Blu Tack around the pencil as an alternative.
- › Make two pairs of holes approx. 5-6 cm apart for the pencils to go into.
- › Tie one end of the string to the middle of the other pencil.
- › Slide the paperclip onto the string so it's between the two pencils.
- › Attach a load to the paperclip and test out your pulley system!

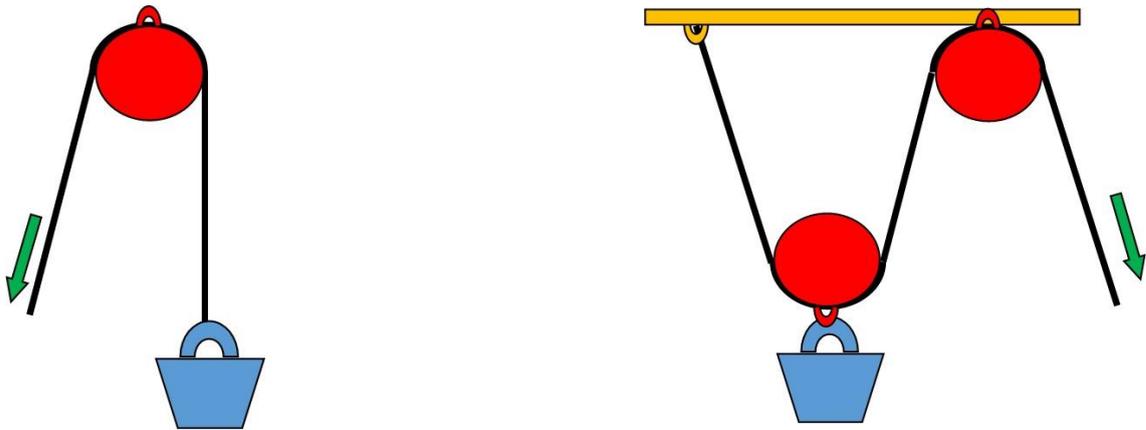


### Reflective Questions

- › How could your pulley be designed differently to further reduce the weight of the object?
- › Why would Babcock need to use pulleys?

## What is a Pulley System?

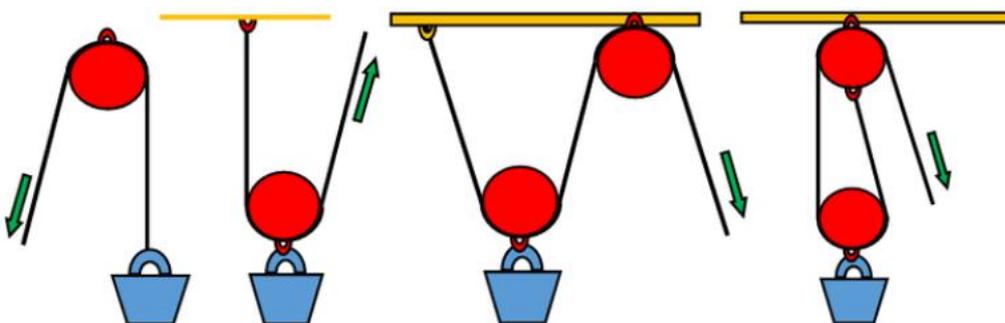
Sometimes lifting heavy objects can be difficult when only using human force. This can be helped by using a 'simple machine' known as a pulley. A pulley system is a collection of one or more wheels which are used with a rope or chain to make it easier to lift things. A basic pulley consists of a wheel on a fixed axle, with a groove along the wheel's edge to guide a rope or chain. The amount of force required to lift the object is equal to the load. For example, if our load weighs 100kg then we will have to apply 100N (Newtons) of force to lift the load.



The amount of effort that is required to lift the object can be greatly reduced by adding two or more wheels together. As more pulleys are added, you increase your **mechanical advantage**. This means it becomes increasingly easier to lift the same load. The only difference is that you need a longer piece of rope/chain to lift the same load.

**Mechanical advantage** is the measurement of how much force is required when using a pulley system. The bigger the mechanical advantage, the less force is required, but the greater the distance you have to use that force. So for a two wheeled compound pulley, you only have to apply 50N of effort to lift a 100kg load. The fixed axle is helping to lift the load by giving us the other 50N of effort required. An example can be seen in the two-wheeled pulley system above. If you look at the wheel connected to the load, one side is being lifted by the person/machine using force (green arrow), and the other side is being lifted by the yellow hook.

## Types of Pulley



From left to right:

- Fixed Pulley
- Moveable Pulley
- Compound Pulley
- Block and Tackle