

## Pulleys

## Primary Audience:

**Description:** Participants will experiment with pulleys, uncover their utility, and show that they can increase their strength with a pulley.

## Keywords:

## Concepts:

- Pulleys decrease the effort needed to do a job.

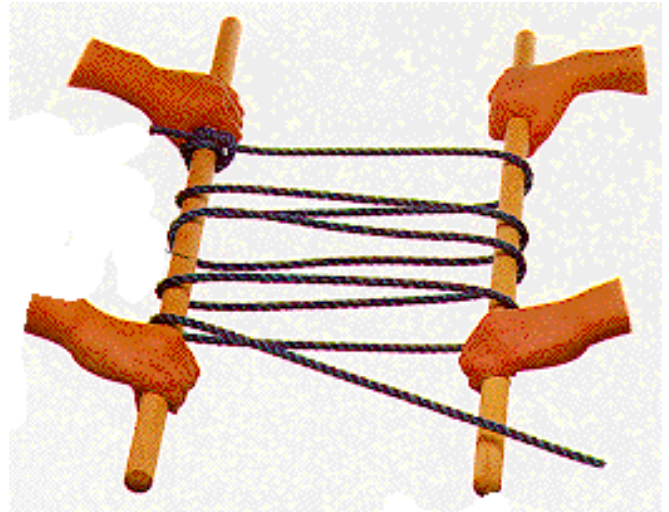
## Materials:

- For Demonstration:
  - Dowel
  - Rope
- Per Group:
  - Rope
  - Jug of Water or Sand
  - Dowel
  - Tape

## Instructions:

*(Invite two participants to hold broom handles about two feet apart. Tell the group that you want someone to pull the two people together. They may only use the length of rope. WARNING they may not lasso each other. Have different people try moving the two participants together. Share results.)*

*(Secret: Tie one end of the rope around one handle and then loop it over the other handle and back 5 or 6 times. Now, one small weak person can easily pull them together.)*



Can anyone tell me why looping the rope around the two dowels worked, but only looping it once was still very hard? (Pulleys decrease the effort needed to do a job.)

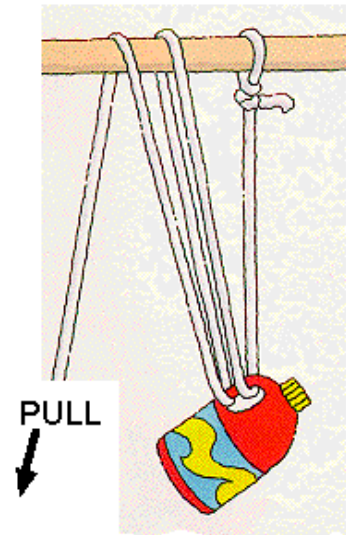
Let's explore this concept even further by making our own pulleys. First, tape the ends of the broom handle down between two desktops.

Carefully and gently try several ways to lift the jug using the rope and broom handle.

Now, tie the rope to the broom handle, loop the rope through the jug handle, and lift by the free end of the rope with the weight in the middle (movable pulley).

Loop the rope over the broom handle and pull down on the free end.

Now loop the rope through the jug handle another time and then up and over the broom handle. You will have two loops over the broom and the original knot.



**Possible Interactive Questions:**

- Why was it easier to pull the participants with multiple loops rather than one?
- What methods or types of pulleys worked well during this activity? Why?

**What's Going On?**

Just like the previous activity, the more times the rope is looped through the jug and over the broom handle, the less effort needed.

**Further Exploration:**

1. Find small jugs for the participants to pull up with strings and use spring scales to measure the force needed.

**Relevant Ohio Science Content Standards:**

- Physical Sciences K-2 A: Discover that many objects are made of parts that have different characteristics. Describe these characteristics and recognize ways an object may change.
  - K.1: Demonstrate that objects are made of parts (e.g., toys, chairs).
  - 1.6: Investigate a variety of ways to make things move and what causes them to change speed, direction and/or stop.
- Science and Technology K-2: Explain that to construct something requires planning, communication, problem solving and tools.
  - 1.8: Investigate that when parts are put together they can do things that they could not do by themselves (e.g. blocks, gears, and wheels).