
Pulleys



Pulleys not only change the direction but are also a source of mechanical advantage when used in multiples.

Related exhibits: Pulley exhibits

Time: 5 minute demo

Ages: ages 4 and up

Staffing: Floor staff or volunteer

Safety: This temporary set-up should not be left unattended. Ropes should be knotted to prevent the weight from hitting the floor if someone lets it slip.

Materials:

- 2 six-foot ladders
- 2x4 board with 3 hooks attached
- Two clamps to secure the 2x4 to the top of the ladder
- Pulleys (at least 6, for a one-, two- and three-pulley system)
- Length of rope for each set-up.
- Weight with a hook (to be moved from one pulley set-up to another)

Procedure:

1. Hook up a one-, two-, and three-pulley system on the different hooks.
2. Allow participants to lift the same item on each system.

Questions to Ask:

Which system is the easiest to lift the weight?

How much rope do you need to pull to raise the weight? Does it matter the numbers of pulleys in the system?

Science Content:

Pulleys are grooved wheels that can serve several purposes. In the Etch A Sketch®, for example, they are used to change the direction of motion. Pulleys are also useful in other applications because they provide mechanical advantage. In a single pulley system the a length of rope pulled will be equal to the height the item is raised. In other words, the force upward is the equal to force required to lift the item. In a two-pulley system, it takes half the force to lift the item as before, but the length of rope that is pulled only allows the item to be lifted half as high. The more pulleys used, the greater the advantage, but also the shorter the distance the item moves. Cranes, elevators, sailboats, and block-and-tackle operate on the mechanical advantage obtained by using pulleys together.

Other Resources:

www.howstuffworks.com/pulley.htm

The Way Things Work, by David Macaulay. Houghton Mifflin Company, Boston, 1988.