



Curiosity Guide #402

Pulleys

Accompanies Curious Crew, Season 4, Episode 2 (#402)

Spool Pulleys

Investigation #3

Description

Work smarter, not harder!

Materials

- Wooden dowel, 18 inches long and slender enough to slide through the hole in the spool
- Wooden spool
- 2 chairs
- Tape
- String or slender rope, 15 feet in length
- Plastic gallon-size milk jug with cap
- Water

Procedure

1. Fill the plastic jug half full of water and put on the cap.
2. Slide the wooden dowel through the spool and center the spool.
3. Lay the dowel across the backs of two straight chairs.
4. Tape the dowel in place if necessary.
5. Tie one end of the string on the handle of the jug.
6. Set the jug underneath the spool on the floor.
7. Stretch the string over the top of the spool and dangle the loose end on the floor.

Trial 1

1. Pick up the jug to get a sense of its weight. Set the jug down.
2. Hoist the jug by pulling down on the string.
3. What do you notice?

Trial 2

1. This time, loop the loose end of the string through the jug handle a second time and back over the spool.
2. Hoist the jug again. What do you notice?
3. What would happen if you looped the string again?

My Results

Explanation

When you first hoist the jug, using the string, the lifting force is like when you lifted the jug without the string. The spool is acting like a pulley, changing the direction of the force from lifting up to pulling down. The only advantage is that you get to pull down instead of up.

Adding a second loop to the jug means that there are now two rope loops supporting the jug, so the force to move the jug is cut in half. Did you notice that lifting the jug was easier with two rope loops?

You may also notice that you must pull the rope farther than before to move it. With each additional loop you add, it is easier to hoist the jug, but you will pull that much more string. Trading force for distance is a mechanical advantage.

Think about this: Pulleys are one of the six simple machines that people use to make work easier. Pulleys are usually some kind of wheel with a groove in it for a rope or cable to travel in. Attaching one end of the rope to a load, threading the rope through a pulley, and pulling on the other end makes hoisting objects possible. The first pulleys were used 3500 years ago and were made to hoist water. In time, people began to combine pulleys and get a better mechanical advantage. Can you think of places where we use pulleys?

**Parents and Educators: use #CuriousCrew
#CuriosityGuide to share what your Curious
Crew learned!**



Curious Crew is a production of Michigan State University.

Learn more at WKAR.org.

© MSU Board of Trustees. All rights reserved.