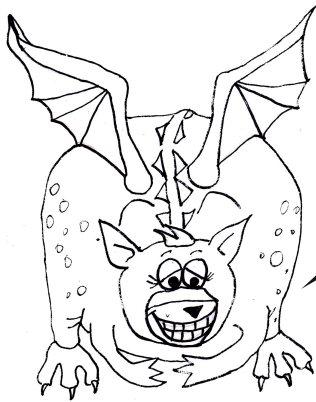


Monster Sciences

ENGINEERING

Pulleys make things lighter to lift.



WINCH

What you will need:

- 1 cup of rice in a ziplock bag
- String
- Tape
- Pencil
- Cardboard tube (eg toilet roll)
- Water bottle
- Marker

What you will do:

1. Tie the string around the bag so it is nice and tight.
2. Put the bag on the floor in front of you. Measure the string from the bag up to your chin when you are standing up straight and cut it off.
3. Tape the end of the string to the pencil.
4. Use the marker to draw a line along one side of the pencil.
5. Hold the pencil in front of you with the line on top. Now wind up the string, carefully counting how many times the line on the pencil comes back to the top. Write that number down
6. Now take the string off the pencil and tape it to the cardboard roll. Draw a line on it, then roll it up, carefully counting again. Write it down.
7. Now it's the water bottle's turn. You know what to do!

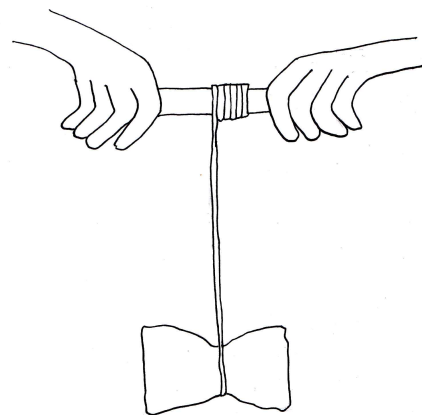
What should happen:

Simple machines are tools that help us to move things using less energy. You have made 3 types of winch, also sometimes called a windlass.

The larger the diameter of the winch (in other words the wider the roll), the fewer turns it takes to lift the load. However each turn is heavier because it is lifting the load further. To reduce the effort a winch needs either a gear or a handle, which acts as a lever. Then the winch becomes a complex machine!

Monster Challenges:

- Use your winch to pull the load up an inclined plane. What do you discover?
- Scientists argue about what kind of simple machine a winch is. Some think it's a pulley, others think it's a wheel and axle and still others think it's a lever. What do you think? Why?



TEACHING NOTES:

Monster Sciences Experiment: Engineering EN09

Key Concepts:

Suitable for Ages: 6 -12+

- Simple Machine - Winch

Resources:

- Experiment description Engineering EG09 - one copy per student.
- 1 cup of rice in a ziplock bag, tape, marker, pencil, cardboard roll (eg toilet roll), water bottle (or similar), string
- Investigation record IR - one copy per student.

Lesson Notes:

Before the lesson, ask a fast finisher to measure out a cup of rice into each ziplock bag - enough for your class to work in pair or groups of 3. Encourage your students to investigate - if they would like to try other items from the class room as winches that would be great!

As a class discuss the experiment prior to undertaking it, and students should complete the sections of their Investigation Report IR01 from "Title to "Hypothesis".

At the end of the lesson gather the students together again and hold a whole class discussion about their results. Students can then complete their Investigation Record.

What should happen in this experiment, and why?

Students should be able to see that larger winches are quicker to lift objects but they may need some help to understand that each rotation of the larger winch lifts a heavier load. Perhaps as part of your group discussion you could demonstrate a large winch turning slowly and show the students how far the load is lifted in one rotation.

Follow up questions:

- Where do we see winches?
- Can winches pull loads along, as well as up?