Pull(ey)ing The Science Out (Or Pulleys)
2nd or 3rd Grade

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Benchmarks:

SLC 10: Explain the operation of a simple mechanical device.

Purpose:

The purpose of this lesson is for students to learn that different amounts of pulleys pulling something up affects how easy or hard it is to pull the object up.

Materials:

- Wood blocks – 1 for each group
- Pulleys with clamps – 1 for each group
- Pulleys (don't need to be clamped) – 1 for each group
- String cut to ~ 72 cm and 1.44 m lengths
- Plastic cups – 1 for each group
- Paperclips
- Tape
- Rulers

Initial Demonstration:

Set Up: Demonstrator should clamp a pulley to a table-top or board where the whole class will be able to see. Attach one end of the string to the plastic cup, thread the string through the pulley, and attach the other end of the string to one of the wood blocks.

Demonstrator should have a student come up and put paperclips into the cup until the block starts moving up. Student and class should help count the number of paperclips put into the cup.

Target Observations:

- The block went up
- The cup went down
- It took *x number* of paperclips to get the block to go up.
- The pulley moved

Target Model:

-Pulleys help people lift things straight up if paperclips are put on the other end of the string.

Procedure:

Demonstrator should show the students two different pulley setups, one with one pulley, and the other with two pulleys. Demonstrator should ask students if they think

that both setups will need the same amount of paperclips to pull the block up. Regardless of what they say (yea or nay), ask them to prove it by doing some experiments. Break the class up into groups of 4-5 students per group. Give each group a Data Sheet from below and the one-pulley setup to start with. When the students have finished taking data for the one pulley the *Leader* (see below) should bring the sheet up to the demonstrator for inspection, then have their one-pulley setup replaced with the two-pulley setup. To motivate the students it may be helpful to challenge them to "prove you (the demonstrator) wrong" by showing that the two different systems need different amounts of paperclips.

It may help to break the groups up into the following roles: a *Leader* will bring the completed first half of the Data Sheet to the demonstrator, as well as make sure the group is running smoothly; a *Writer* will write down any data and observations that the group collects; the rest of the students can be *Experimenters*, who will be the first students in the group to carry out the experiment. Every group member should be given a chance to carry out the experiment, but this division may help the groups work a little smoother if they are having problems.

Discussion:

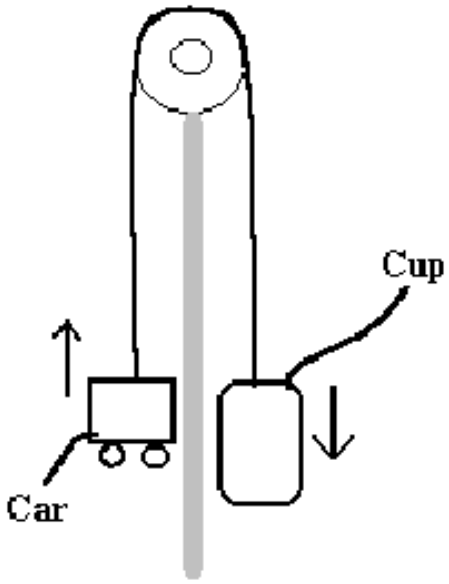
What did the groups find? Did they prove you, or themselves, wrong? How? Which pulley took the fewest number of paperclips? Does the class agree? Why do they think this is so? How should we change our description of pulleys with what we now know? What are some examples of pulleys around us? Why would we want to use them?

Target Revised Model:

-Pulleys help people lift things straight up if paperclips are put on the other end of the string, *but using two pulleys together make something easier to lift than using one pulley.*

Pulleys!!

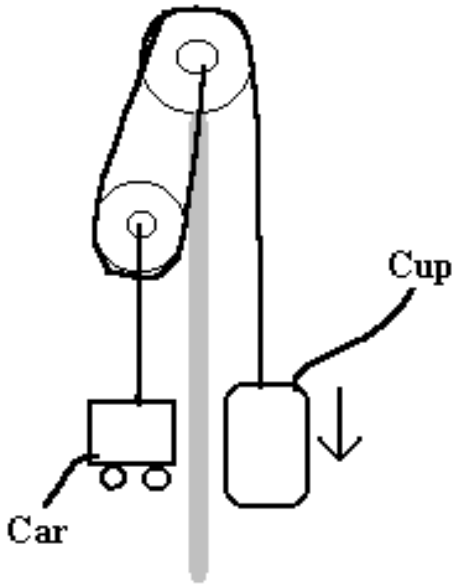
Part 1: Measure the number of paperclips for your 1-Pulley system and write it in.



	Trial 1	Trial 2	Trial 3
# of paper clips	_____	_____	_____

STOP: Show sheet to teacher before going on.

Part 2: Measure the number of paperclips for your 2-Pulley system and write it in.



	Trial 1	Trial 2	Trial 3
# of paper clips	_____	_____	_____