

Mechanical Advantage and Pulleys

Pulley systems are an important part of many machines. In this Investigation, you will be testing factors that might influence the actual mechanical advantage of pulley systems.

A single fixed pulley, like the one in Figure 1(a), has an ideal mechanical advantage of 1 since the effort force (120 N) is equal to the load force (120 N). However, in the single movable pulley (Figure 1(b)), half of the load is supported by the rope attached to the ceiling. The other half is supported by the free end of the rope, where the effort force is applied. Therefore, the effort force needed to move the load is only one-half the load force, or 60 N. The mechanical advantage of this pulley is 2. A simple way to determine the ideal mechanical advantage to a pulley system is to count the number of lengths of rope between pulleys that support the load. In Figure 1(a), only one segment of rope supports the load. Therefore, the mechanical advantage is 1. In Figure 1(b), two segments of rope support the load, so the mechanical advantage is 2.

SKILLS MENU

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| <input type="checkbox"/> Questioning | <input type="checkbox"/> Performing |
| <input type="checkbox"/> Hypothesizing | <input type="checkbox"/> Observing |
| <input type="checkbox"/> Predicting | <input type="checkbox"/> Analyzing |
| <input type="checkbox"/> Planning | <input type="checkbox"/> Evaluating |
| <input type="checkbox"/> Controlling Variables | <input type="checkbox"/> Communicating |

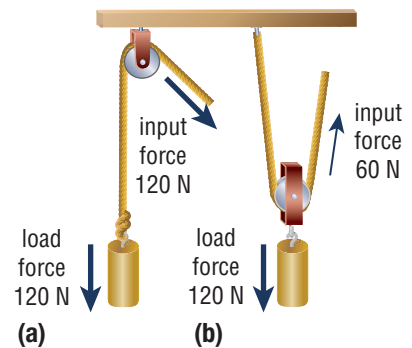


Figure 1

Testable Question

How does the number of pulleys used in a pulley system affect mechanical advantage?

Hypothesis/Prediction

Make and record a hypothesis for the testable question. Your hypothesis should include a prediction and reasons for your prediction.

Experimental Design

Mechanical advantage is the dependent variable you will be studying in this investigation. The independent variable you will be testing is the number of pulleys in a system.

Equipment and Materials

- spring scale
- single pulley
- double pulley
- triple pulley
- standard mass or washers
- metre stick
- string



spring scale



single pulley



double pulley



triple pulley



standard mass/
washers



metre stick



string