

## Forces

# How Archimedes won at 'Tug of War'

## Demonstrating how pulleys work

### You will need....

- ✓ 2 pieces of broom handles (or bars from retort stands)
- ✓ 1 rope
- ✓ 3 students

### Background:

This demonstration is based on a crude version of Archimedes's compound pulley - a forerunner of 'the block and tackle' which is used for lifting heavy loads.

### Follow these steps:

1. Take three students, two against one.
2. Ask who would win a 'Tug of War' contest
3. Arrange the rope as shown.
4. Two students try to hold the handles steady and the third student pulls the rope.

### So what happened?

The third student has no problem pulling the rope and bringing the handles together.

The pulley exchanges a small movement with large effort for large movement with less effort involved.

### What next?

1. Discuss the principle of machines leading to an understanding of efficiency as:

$$\frac{\text{mechanical advantage}}{\text{velocity ratio}}$$

