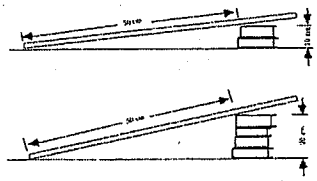

Name: _____ Class: _____

Inclined Planes

An inclined plane is a slanted surface used to raise objects. The sloping floor of a theater, a road over a mountain, and a ramp into a building are examples of inclined planes. In this activity you will investigate an inclined plane and then extend this concept to investigate the relationship between the height of the slope and the force of the effort required to pull and object up the inclined plane. You will also investigate the difference between a high sloping inclined plane and a low sloping inclined plane.

Hypothesis: How do you think the height of the inclined plane will affect the mechanical advantage and efficiency, if at all? Explain in detail.

_____

_____

Purpose: To calculate the work input, work output, efficiency, and mechanical advantage of an 2 inclined planes and compare.
Materials: board, stack of books, spring scale, string
Procedure:

1. Stack the books and prop one end of the board on the books to make a ramp. Your first inclined plane should be short in height. Measure the height and length of the inclined plane in **meters.**
2. Hang a textbook from the spring scale and determine its weight in Newtons.
3. Slowly pull the textbook up the inclined plane and determine the effort force.
4. Make a drawing of the inclined plane and textbook being pulled up. Label the F_E, F_R, d_E, and d_R
5. Now do the exact same thing for a ramp that is "taller".
6. Calculate work input, work output, mechanical advantage, and efficiency for both.

Data for ramp 1:

Height of plane= _____ Length of plane: _____

Weight of textbook= _____ Force need to pull up the book= _____

Drawing of ramp (label F_E, F_R, d_E, and d_R)

Calculations for ramp 1: Be sure to show all of your work.

Work input Work output

Efficiency

Ideal Mechanical Advantage Actual Mechanical Advantage

Data for ramp 2:

Height of plane= _____ Length of plane: _____

Weight of textbook= _____ Force need to pull up the book= _____

Drawing of ramp (label F_E, F_R, d_E, and d_R)

Calculation for ramp 2: Be sure to show all of your work.

Work input Work output

Efficiency

Ideal Mechanical Advantage Actual Mechanical Advantage

Conclusions:

1. Does it take more or less force to pull the textbook up the inclined plane as opposed to lifting it? Explain why. _____

   _____

   _____

2. Does your effort have to travel more or less distance using the inclined plane? _____

3. So using an inclined plane you gain _____ and sacrifice _____.

4. What causes the difference between the work needed to pull the block up the inclined plane (work input) and the work needed to lift it to the same height (work output)? _____

   _____

   _____

6. Compare the mechanical advantages and efficiencies for both inclined planes. What accounts for the difference? _____

   _____

   _____

   _____

   _____

7. Which ramp would be better suited when moving an extremely heavy object? Why?

   _____

   _____

   _____