Tools and Equipment, Part I Activity – Inclined Plane Worksheet

Instructions/Questions

A. Measure the length and height of Inclined Plane A (1st station):

Length: 30 (cm)
Height: 20 (cm)

1. What is the mechanical advantage based on these measurements? 1.5
2. What was the required force to raise the object?
   Without the inclined plane: (Output force) ________ (g)
   With the inclined plane: (Input force) ________ (g)
3. What is the mechanical advantage based on these measurements? __________

B. Measure the length and height of Inclined Plane B (2nd station):

Length: 60 (cm)
Height: 20 (cm)

1. What is the mechanical advantage based on these measurements? 3
2. What was the required force to raise the object?
   Without the inclined plane: (Output force) ________ (g)
   With the inclined plane: (Input force) ________ (g)
3. What is the mechanical advantage based on these measurements? __________
C. Measure the length and height of Inclined Plane C (3rd station):
   - Length: \(90\) (cm)
   - Height: \(20\) (cm)

1. What is the mechanical advantage based on these measurements? \(4.5\)
2. What was the required force to raise the object?
   - Without the inclined plane: (Output force) ________ (g)
   - With the inclined plane: (Input force) ________ (g)
3. What is the mechanical advantage based on these measurements? ____________

D. Measure the length and height of Inclined Plane D (4th station):
   - Length: \(120\) (cm)
   - Height: \(20\) (cm)

1. What is the mechanical advantage based on these measurements? \(6\)
2. What was the required force to raise the object?
   - Without the inclined plane: (Output force) ________ (g)
   - With the inclined plane: (Input force) ________ (g)
3. What is the mechanical advantage based on these measurements? ____________

**Results**

1. Did you obtain different mechanical advantages for the different methods of measuring? If so, was the difference large?
   - Answers may vary.

2. Which inclined plane had the greatest mechanical advantage?
   - The longest inclined plane, Plane D, had the greatest mechanical advantage.
# Conclusions

1. Does calculating mechanical advantage just with the dimensions of the inclined plane really work? That is, does the calculation describe what really happens? Write a short paragraph explaining your answer.

   **Answers may vary.**

2. If you are the engineer designing a ramp for a construction site to move a wheelbarrow a height of 100 feet, which inclined plane would you use? Why?

   **Answers may vary. Students may answer: the ramp with the greatest mechanical advantage. Whichever ramp they choose, their explanation of why they chose the ramps should be well thought out and explained.**

3. What are some possible sources of error in this experiment?

   - The needle on the spring scale was not steady and we had to estimate a number.
   - Friction between the rotating axle and the cart increased the amount of force required to draw the cart up the plane
   - Our measured distances may be off by a few millimeters, give or take.