Inclined Plane Lab

Name: ____________________ Period: __________

1) **Question:** How does an inclined plane use less effort force?

2) **Research:** An inclined plane is a sloping, slanted surface used to raise objects.

3) **Hypothesis:** CIRCLE: Using an inclined plane __increases/decreases__ the effort force used to raise an object. If the distance of an inclined plane is increased, then the effort force required to move the weight will __increase/decrease__.

4) **Experiment:** Use the procedures at your lab station and complete the data table below.

**Data Table 1: Calculating mechanical advantage**

<table>
<thead>
<tr>
<th>Method</th>
<th>Distance traveled (cm)</th>
<th>Height raised (cm)</th>
<th>Weight of object (N)</th>
<th>Effort Force (N)</th>
<th>Mechanical Advantage by Distance</th>
<th>Mechanical Advantage by Force</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lifting to table</td>
<td>Both are the same for each trial.</td>
<td></td>
<td></td>
<td></td>
<td>Distance traveled ÷ Height raised</td>
<td>Weight of object ÷ Effort Force</td>
</tr>
<tr>
<td>short inclined plane</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>long inclined plane</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

5) **Results:** Based on your data table results, answer the following questions:

   a) How does the amount of effort force used to lift the object to the table compare to the effort force to pull the object up one of the inclined planes?

   b) How does the amount of effort force used on the short inclined plane compare to the amount of effort used on the long inclined plane?
c) How do your mechanical advantage by distance values compare to your mechanical advantage by force values?

____________________________________________________________________________

d) What does it mean to have a mechanical advantage of 1?

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e) Having a mechanical advantage of 2 means that your effort force was multiplied by 2 in order to accomplish the work. Using the inclined plane, what is the trade-off for this multiplication of force (what increases as a result of the force being multiplied)?

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6) **Conclusion:** Does your data support your hypothesis?

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7) **Reflection:** We have long inclined planes (ramps) at the back doors to our school. Explain what using the ramps does to the effort force you would need to move a big box of books from the ground to the door. Explain the trade-off involved.

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Inclined Plane Lab Procedure Steps:

1) Make sure your spring scale reads “0” N. If it does not read 0, adjust it until it does.

2) Using a meter stick, measure the height from the ground to the top of the table in cm. This is the height that you have to raise the object. Record this value in your table in each space under “Height Raised (cm).”

3) Measure the weight of the object by putting it on a silver lift tray, hooking the spring scale to that tray, and lifting it off the ground/table. Record this value in your table in each space under “Weight of Object (N).”

4) Measure the amount of force required to lift the object up to the height of the table (again using the silver tray) without using an inclined plane. Record this value in your table in the row “Lifting to table” under the heading “Effort force (N).”

5) Use a meter stick and measure the height from the ground to the top of the table in cm (or use the previously measured value if you already know it). Record this value in your table in the row “Lifting to table” under the heading “Distance traveled (cm).”

The following directions will be completed for EACH of the inclined planes, one at a time:

6) Using a meter stick, measure the length of the inclined plane in cm. Record this in your table in the appropriate row under the heading “Distance traveled (cm).”

7) Place the back wheels of your car at the bottom of the inclined plane & slowly and steadily pull the car up the inclined plane with the use of the spring scale. Read the effort force in Newtons as you do this. Record the value in your table in the appropriate row under the column “Effort force (N).”

8) Calculate the mechanical advantage by distance and by force by performing the operation indicated on the column heading.