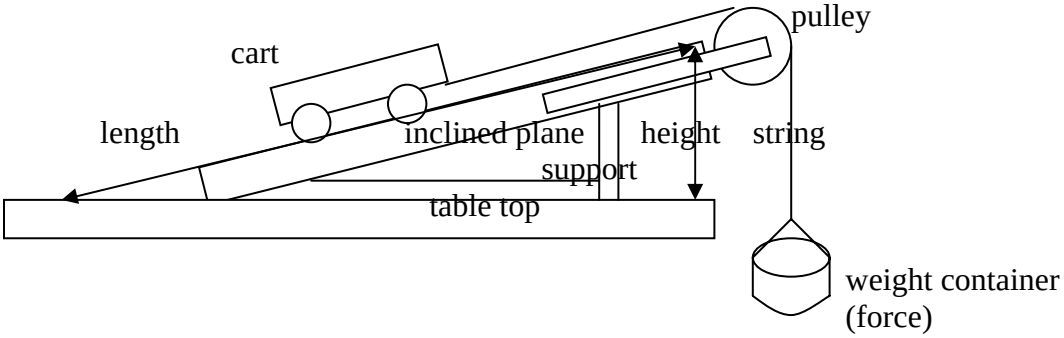
Mechanically Inclined Activity Sheet Name _____
Pd _____ Date _____

Diagram of Inclined Plane Set Up



1. Set up the apparatus as shown above. Adjust the apparatus so the weight container hangs over the edge of the tabletop. The tabletop must be level.
2. For trial 1 set the apparatus at approximately 5 degrees from the horizontal.
3. Measure the height and length of the inclined plane. These distances must be measured from the same point near the top of the plane to the same level, usually the tabletop. Enter these values in the table below.
4. Calculate the theoretical mechanical advantage, theoretical MA = length ÷ height, and enter in the table.
5. Place weights in the weight container until the cart is balanced (does not move) on the inclined plane. Gently shove the cart up and down the plane. Adjust weights until the cart moves about the same amount in both directions when given the same shove. This is to eliminate error from friction as much as possible. Determine the mass of the cart and weights using a laboratory balance. Enter this data in the table.
6. Calculate the experimental mechanical advantage, experimental MA = mass of cart and contents ÷ mass of weight container and contents. Include any hangers used to suspend the container. Enter this calculation in the table.
7. Calculate the % error. % error = ($|theoreticalMA - experimentalMA|$) ÷ average of the two values x 100%. Enter this calculation in the table.
8. Repeat the procedure for larger angles.

Trial	Length	Height	Theoretical MA	Mass of Cart	Mass of Weight	Exp. MA	% Error
1							
2							
3							
4							

Mechanically Inclined Questions & Problems Name _____
Pd ____ Date _____

Questions,

1. Define mechanical advantage.

2. Name some examples of inclined planes.

3. What factors would cause differences between the theoretical and experimental mechanical advantages?

4. What conclusion can you make concerning the relationship between steepness of incline and force required to hold an object on the incline?

5. What does a small % error indicate?

Problems,

1. What is the theoretical mechanical advantage of an inclined plane that is 6.0m long and .50m high?

2. If a simple machine has a mechanical advantage of 4.5, how much weight can a force of 2.0lb lift?

3. What is the mechanical advantage of a jack that can lift 600.N when a force of 30.N is applied?

4. A loading ramp has a mechanical advantage of 3.50. How much force is required to push a cart weighing 9000.N up the ramp?

Mechanically Inclined answers

Questions

1. Mechanical advantage is the number of times an input force is multiplied by a machine.

   As a mathematical expression, mechanical advantage = out put force ÷ input force,

   or, output force = mechanical advantage x input force.

2. loading ramps, wheel chair ramps, axes, knives, scissors blades
   Students may name additional examples.

3. Friction is usually a large source of error because the apparatus will balance over a range of weights. Measuring errors, with both rulers and balances, are usually sources of errors, especially with inexperienced experimenters.

4. The steeper the incline the larger the force required to hold the object.

5. A small error indicates good equipment, good technique and accurate measurements.

Problems

1. MA = length ÷ height
   MA = 6.0m ÷ .50m
   MA = 12

2. MA = output force ÷ input force
   4.5 = W ÷ 2.0lb
   W = 4.5 x 2.0lb
   W = 9.0lb

3. MA = output force ÷input force
   MA = 600.N ÷30.N
   MA = 20.

4. MA = output force ÷ input force
   3.50 = 9000.N ÷ F
   3.50F = 9000.N
   F = 9000.N ÷ 3.50
   F = 2570N