Inclined Plane: (See Figure 4)

1. Weigh the weight pan and record its weight. w_p = 11.5 gwt

2. Weigh the cart and record its weight. w_c = 397.8 gwt

3. Place the cart on the inclined plane. Attach a string, run it over the pulley, and attach the weight pan. Place 500 gwt of additional weight in the cart. (A knob-top weight of mass 500 g) The total weight of the cart and the added weight is equal to the output force F_{out}. Calculate F_{out}. Copy the data of steps 1, 2, and 3 to the data sheet.

F_{out} = 500 gwt + w_c = 500 gwt + 397.8 gwt = 897.8 gwt

4. Set the angle of inclination θ of the plane to 10°. Determine the amount of weight w_i that must be added to the weight pan to cause the pan to descend at a constant velocity, after it is given a slight downward pull. You may have to observe the pan move several times at a slow velocity. The weight of the pan plus the weight of its contents constitutes the effective input force F_{in}.

F_{in} = w_p + w_i = 11.5 gwt + 200 gwt = 211.5 gwt

5. Choose a definite starting point for the cart, not too far above the bottom of the plane, and a definite ending point for the cart, not too far from the upper end of the plane. Measure the distance S_{in} that the cart moves along the plane from the definite starting point to the definite ending point. Measure the change in height of the cart as it moves from the definite starting point to the definite ending point. This change in height constitutes the output distance S_{out}. S_{in} can be measured with the help of the scale on the side of the inclined plane or with a centimeter scale. S_{out} should be measured with the centimeter scale. See Figure 4.

S_{in} = 25. cm S_{out} = 4. cm

6. Calculate the input work from equation 2a and the output work from equation 2b.

200
+ 11.5
211.5

W_{in} = F_{in} x S_{in} = 211.5 gwt x 25. cm = 5287.5 gwt·cm

W_{out} = F_{out} x S_{out} = 897.8 gwt x 4 cm = 3591.2 gwt·cm

7. Calculate the AMA (actual mechanical advantage) from equation (4) and the IMA (ideal mechanical advantage) from equation (5).

$$\text{AMA} = \frac{F_{out}}{F_{in}} = \frac{897.8}{211.5} = 4.24$$

$$\text{IMA} = \frac{S_{in}}{S_{out}} = \frac{25}{4} = 6.25$$

8. Calculate the percent efficiency, using equation (1b).

$$\text{Percent Efficiency} = \frac{W_{out}}{W_{in}} \times 100 = 4.24 = 424 \%$$

Transfer the results of steps 4 through 8 to the data table.

9. Repeat steps 4 through 8 for three additional angles up to 45°.