# <u>Lab</u>: Inclined plane

Name_____

An inclined plane is a slanted surface used to make work easier.  The **ideal mechanical advantage (IMA)** of an inclined plane is calculated by dividing the length by height.  Because of a large amount of friction the **actual mechanical advantage** is a better indicator of the way work is made easier.  **(AMA)** is found by dividing resistance force by effort force.

**Problem**       **How much can an inclined plane make work easier?**

<u>**Materials:**</u> Meter Stick, Ring stand, Spring Scale, Wood Block
<u>**Procedure:**</u>
1. Find the weight of the **resistance** by hanging the block from the spring scale.  Record in Newtons. (This number will be the same for all heights of the ramp).
2. Measure the length of the Meter stick. Record in cm. (This number will be the same for all heights of the ramp).
3. Raise ring stand to 8cm above the table top. Use your meter stick to measure the height and adjust your ring stand, then rest your meter stick on it.
4. Attach the spring scale to the block and pull up the ramp.  Read the force needed to pull the block and record as the EFFORT force in Newtons.  Make sure to pull smooth.
5. **Repeat at 15 cm, 30 cm, and 40 cm of height**.

<u>**Data:**</u>

| Ramp Height (cm) | Ramp Length (cm) | Resistance Force (N) (weight of block hanging from spring scale) | Effort Force (N) (weight of block pulled up the ramp) |
|---|---|---|---|
| 8 cm | | | |
| 15 cm | | | |
| 30 cm | | | |
| 40 cm | | | |

<u>**Graph:**</u>
- Make a graph that shows a comparison of **IMA** to **AMA**.  On the x-axis place ramp length and resista.  On the y-axis place ramp height and effort force.  **Use different colors for each.**

**Conclusion**:

1. Calculate the IMA at each height.

$$IMA = \frac{l}{h}$$

    8 cm_____           30 cm _____

    15 cm_____         40 cm _____

2. Calculate the AMA at each height.

$$AMA = \frac{F_r}{F_e}$$

    8 cm_____           30 cm _____

    15 cm_____         40 cm _____

3. How does the IMA compare to the AMA?

4. Why?

5. Describe the shape of the lines on your graph?

6. What is the general trend of Mechanical Advantage compared to the height of ramp?

7. To what form of energy is the lost energy changed?

8. What can be done to overcome friction?

9. What is the AMA (actual mechanical advantage) and IMA (ideal mechanical advantage) of the inclined plane shown below? Show your work.

2.5 N

10.0 N

10.0 m

2.0 m