# Incline Plane Lab

Physical Science Physics                                    Name_____

## Purpose
To study the mechanical advantage of different inclined planes, to determine the efficiency of each plane.

## Materials
- Meter stick
- 500g weight
- String
- **Correct** spring scale
- masking tape
- books (or something) to prop inclined plane
- board or aluminum track

## Procedure

** Find the **correct** spring scale to use throughout the lab.
- A different colored spring scale has a different range
- Do **NOT over stretch** the spring!!

** You may have to change spring scales

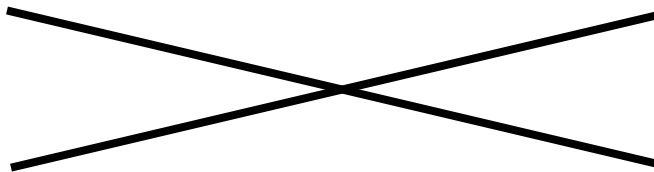**Part one-** lift the weight by hand
*Find the* **work** *it takes to lift a weight a height of 30 centimeters.*

1.    Using the spring scale, measure the force it takes to lift a weight by hand.

| Givens | Work | Answer |
|---|---|---|

2.    Calculate the **work** done if the weight is lifted 30 centimeters. (Convert distance to meters!)
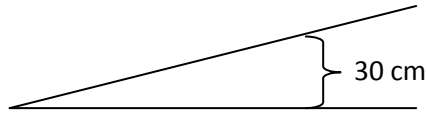
| Givens | Work | Answer |
|---|---|---|

**Part 2 –** Lifting the weight using inclined planes
*Find the work it takes to lift a weight to a height of 30 centimeters using a shallow ramp and a steeper ramp.*

SHALLOW RAMP                30 cm

1.      Make a shallow ramp using the board and some books. <u>Find the point on the board that is 30 centimeter from the bottom of the ground (see diagram above)</u>. Mark the correct height with a small piece of masking tape.

2.      Measure the length of the inclined plane to the tape mark. <u>Convert to meters</u>.

        Length in meters = _____

3.      Place the weight at the bottom of the ramp. Using the spring scale, pull the weight up the ramp to the 30 centimeter height. Pull the weight smoothly and evenly. Estimate the force it takes to pull the weight up the ramp.

        Force needed to pull weight up the ramp = _____

4.      Calculate the **work input** of this inclined plane.

        Givens                          Work                          Answer

5.      The <u>output force ($F_{out}$)</u> is the weight of the weight. What is the **actual mechanical advantage** of this inclined plane?

        Givens                          Work                          Answer

6.      The <u>work output</u> is the work it takes to lift the <u>weight by hand</u>. What is the **efficiency** of this inclined plane?

        Givens                          Work                          Answer

STEEPER RAMP

1.      Make a steeper inclined plane using the board and some books. Find the point on the board that is 30 centimeter from the bottom of the ground. Mark the correct height with a small piece of masking tape.

2.      Measure the length of the inclined plane to the tape mark. Convert to meters.

        Length in meters = _____

3.      Place the weight at the bottom of the ramp. Using the spring scale, pull the weight up the ramp to the 30 centimeter height. Pull the weight smoothly and evenly. Estimate the force it takes to pull the weight up the ramp.

        Force needed to pull weight up the ramp = _____

4.      Calculate the **work input** of this inclined plane.

        Givens                          Work                            Answer

5.      The resistance (output) force ($F_r$) is the weight of the weight. What is the **actual mechanical advantage** of this inclined plane?

        Givens                          Work                            Answer

6.      The work output is the work it takes to lift the weight by hand. What is the **efficiency** of this inclined plane?

        Givens                          Work                            Answer

# Incline Plane Lab

QUESTIONS

1.      What took **less work**? Lifting the weight by hand, lifting the weight using the shallow ramp, or lifting the weight using the steeper ramp?

2.      Which of the above took **less force**?

3.      Which ramp took **more force** to use? Why?

4.      Which ramp was more **efficient**? Why?

5.      Why would you ever use the ramp that was **less efficient** to do the lifting?

6.      What could you do to increase the **actual mechanical advantage** of these inclined planes?

7.      How does an inclined plane make **work** easier?