# TO MEASURE THE COEFFICIENT OF FRICTION

I.

## Introduction:

When a block rests on an inclined plane as shown, its weight acts vertically downward. Since the block cannot move in that direction, the weight of the block is resolved into two component forces. One component acts parallel to the plane and tends to slide the block down the plane. The other component acts at right angles to the plane (and is called the normal force). The normal force produces friction, which tends to make the block stick to the surface. Refer to the diagram and formula at the bottom of this page.

## Procedure:

Place the plane in the position shown. The slope should be gentle enough so that the wood block, placed on the plane, will not slide down the plane. Now increase the angle very gradually until an angle is reached at which the block will slide SLOWLY down the plane AT CONSTANT SPEED after it has been given a gentle push. Record this angle by measuring either the angle or the values of H and X.
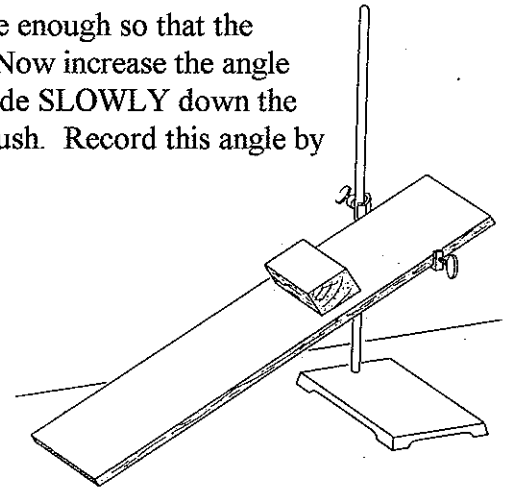
## Data:

Mass of the block of wood _____ (A)
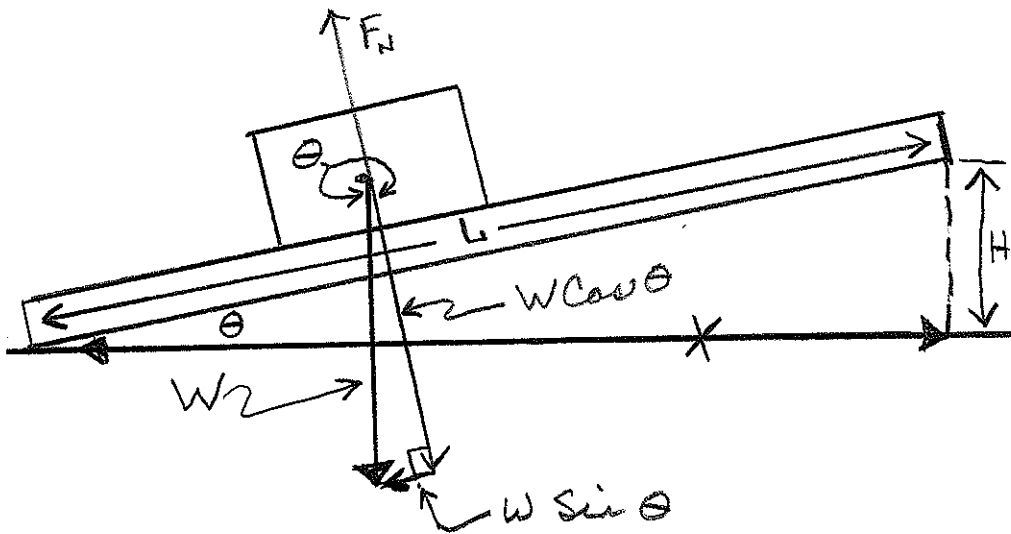Weight of the block of wood _____ (B)
Angle measures:

   H = _____
   L = _____
   X = _____

## Conclusion: The coefficient of sliding friction was found to be ... by the inclined plane method.



$$F_{FRICT} = \text{Parallel Component of } W$$

$$\mu F_N = W \sin \theta$$

$$\mu W \cos \theta = W \sin \theta$$

$$\mu = \frac{\sin \theta}{\cos \theta}$$

$$\mu = \tan \theta$$

$$\mu = \frac{H}{X}$$

## Procedure:

Set the board (formerly used as an incline) flat on the desk with the block of wood on top as indicated in the diagram.
Add masses to the hanger until the block of wood slides slowly at constant speed when it has been given a gentle tap.  Record the total weight (including the hanger) which is pulling on the block.
Add 500 grams to the block and repeat.
Add another 500 grams to the block and repeat.
Add another 500 grams to the block and repeat.

## DATA:

| Trial # | Total Weight of block and added masses (newtons)  [A] | Total Weight of hanger and added masses (newtons)  [B] | Coefficient =[B]/[A] |
|---------|------------------------------------------------------|-------------------------------------------------------|----------------------|
| 1 | | | |
| 2 | | | |
| 3 | | | |
| 4 | | | |
| | | Average= | |
| | | | |
| Reminder: 1 gram => .0098 newtons | | | |

## Conclusion:
The coefficent of friction was found to be _____ by direct measurement of the frictional force. (Use the AVERAGE of the 4 values you calculated in the last column).

## Percent Difference:
Calculate the percent difference between the values you got in part I and part II of this experiment using the relationship:

% difference = 100 % * (value 1 - value 2) / (average of value 1 and value 2)