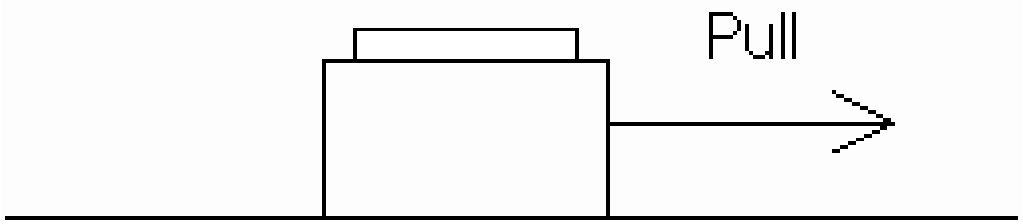
Name _____ Date _____ Per____
Unit 5: Lab Friction Lab

FRICTION

In this activity you will examine how static and kinetic frictional forces vary as the normal force between an object and a surface is changed. You will apply a horizontal force to a block of wood loaded with weights in order to pull the block at constant velocity across a horizontal plane. With your results you will estimate the coefficients of static and kinetic friction for the surfaces involved.

Prediction:
Complete the following Free Body Diagram:

$\Delta V = 0$



1) According to a force diagram explain why:
   a. The magnitude of the force of the pull will equal the magnitude of the force of kinetic friction.

   b. The magnitude of the weight will equal the magnitude of the normal force.

2) How do you expect both the static and kinetic forces on the block to change with increasing block mass? Explain and if possible, write your answer mathematically, including as much information as you can.

Purpose: Measure the kinetic friction and static friction for wood blocks on wood surfaces.

Materials: Wooden block, wooden plank, spring scale, various masses.

Part I Coefficient of static / kinetic friction

Procedure:

1) Weigh the block using a three beam balance scale
   Measure the maximum static friction force by using the Newton scale. Note the maximum reading just before the block starts to move. Do this for at five different masses listed below.
2) Measure the kinetic friction force in Newtons by pulling the block over the plank at a steady, moderate speed. Be sure to hold the spring scale horizontally.
   Do this for at five different masses listed below.
3) Complete the table of the total weight (combined weight of block and mass) vs. the Pull Force.

Data:

Weight of wooden block _____kg

Added Mass (kg)	Total Weight (N) = (added mass + block)(gravity)	Maximum Pull Force prior to motion (static) (N)	Pull Force during constant velocity (kinetic) (N)
0.100			
0.300			
0.400			
0.700			
1.000			

Analysis:

1) On a separate sheet of paper create a graph of

FRICTION FORCE vs NORMAL FORCE

Using two separate graphs, plot the static and kinetic friction force (y-axis) as a function of normal force (x- axis) and plot the points from the data table, drawing a line of best fit. Make sure to Title the graph and label the axis, both "x" and "y".

Use the equation $F_f = \mu_f F_n$ and calculate both μ_s & μ_k. Show your work for each.

Our measured coefficient of friction μ_s _____ μ_k _____

2) Why is it important to hold the spring scale horizontal?

3) Try pulling the Newton scale at different speeds. What do you find?

4) Using 400g mass on your block, measure the friction force for an additional two surfaces, lab table and floor. Summarize your results below:

Wood board = _____
Lab Table = _____
Lab Floor = _____

5) Turn your block sideways and repeat with 400g mass on all three surfaces (wooden plank, lab desk, and floor). What did you find?

Wood board = _____
Lab Table = _____
Lab Floor = _____

6) Based on your result the previous question, do wide tires give better traction? Explain.