Sliding Friction

Objectives:

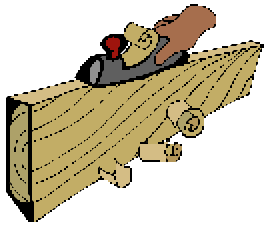
- determine the coefficient of sliding friction for wood on desk, rubber-soled shoe on dry floor, and rubber-soled shoe on wet floor
- determine the relationship between friction force and surface area

Equipment: force scale, friction block, shoe, various masses, water

Procedure:

"Wood on Desk - Wide Side"

1. Find the weight of your friction block using either the triple beam balance or your force scale.
2. Record the weight of the friction block in Data Table I.
3. Attach the force scale to the friction block and pull the scale horizontally with the desktop <u>at a steady rate</u> and record the average force reading in your data table under the column "Friction Force."
4. Add some mass. Calculate this additional weight (use g = 10 m/s/s for each of the calculations) and record your findings in the Data Table. This total amount of weight will be known as the "Normal Force." Pull the block as before to find the amount of friction force with this total weight.
5. Continue until Data Table I is completed with 5 total trials.
6. Calculate the "Friction Coefficient" by *dividing the Friction Force by the Normal Force*. This coefficient has no units since you are dividing Newtons by Newtons.
7. Find the average value of your friction coefficients and record beneath your data table.



8. Make a graph of "Friction Force vs. Normal Force." Include the origin as one of your data points. Determine the best fit equation of your line and record on the graph. Notice how close the slope is to your average Friction Coefficient.

"Rubber-soled Shoe on Dry Floor"

9. Repeat procedures 1-8 using the shoe on the dry floor for Data Table II – "Rubber-soled Shoe on Dry Floor."

Data Table I – "Wood on Desk - Wide Side"

Trial	Block Weight, N	Additional Mass, kg	Additional Weight, N	Normal Force (Total Weight) N	Friction Force, N	Friction Coefficient
1		0	0			
2						
3						
4						
5						

Average Friction Coefficient for "Wood on Desk" = _____

Data Table II – "Rubber-soled Shoe on Dry Floor"

Trial	Shoe Weight, N	Additional Mass, kg	Additional Weight, N	Normal Force (Total Weight) N	Friction Force, N	Friction Coefficient
1		0	0			
2						
3						
4						
5						

Average Friction Coefficient for "Rubber-soled Shoe on Dry Floor" = _____

10. Repeat procedures 1-8 using the shoe on a place where you have made the floor wet. Record the results in Data Table III – "Rubber-soled Shoe on Wet Floor."

Data Table III – "Rubber-soled Shoe on Wet Floor"

Trial	Shoe Weight, N	Additional Mass, kg	Additional Weight, N	Normal Force (Total Weight) N	Friction Force, N	Friction Coefficient
1		0	0			
2						
3						
4						
5						

Average Friction Coefficient for "Rubber-soled Shoe on Wet Floor" = _____

Compare the friction coefficient of rubber on a **dry floor** with rubber on a **wet floor**.

You will now repeat these procedures for finding the friction coefficient for wood on desk, but will use the "thin side" of the wood block. Since the "wide side" has approximately _____ times as much area as the "thin side," most people would expect the friction on the "wide side" to be about _____ times as large.

11. Perform these trials as before and record your results in Data Table IV - "Wood on Desk - Thin Side."

Data Table IV – "Wood on Desk – Thin Side"

Trial	Block Weight, N	Additional Mass, kg	Additional Weight, N	Normal Force (Total Weight) N	Friction Force, N	Friction Coefficient
1		0	0			
2						
3						
4						
5						

Average Friction Coefficient for "Wood on Desk – Thin Side" = _____

Questions:

1. How does the friction coefficient depend on the area of the surface in contact?

2. Why do you think this is so?

3. What factors do influence the amount of sliding friction?

4. Name some possible sources of error in this lab.

Data Table V – " on "

Trial	Block Weight, N	Additional Mass, kg	Additional Weight, N	Normal Force (Total Weight) N	Friction Force, N	Friction Coefficient
1		0	0			
2						
3						
4						
5						

Average Friction Coefficient for " on " = _____

Data Table VI – " on "

Trial	Block Weight, N	Additional Mass, kg	Additional Weight, N	Normal Force (Total Weight) N	Friction Force, N	Friction Coefficient
1		0	0			
2						
3						
4						
5						

Average Friction Coefficient for " on " = _____