What a Drag!

Name: _____ Date: _____ Period: _____

Getting Started:

1. Discuss and record what you know about friction with your lab partner.

2. Identify a situation in which friction works against you. Then identify one in which friction works for you. What would happen if there were no friction at all?

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Inquiry 1.1

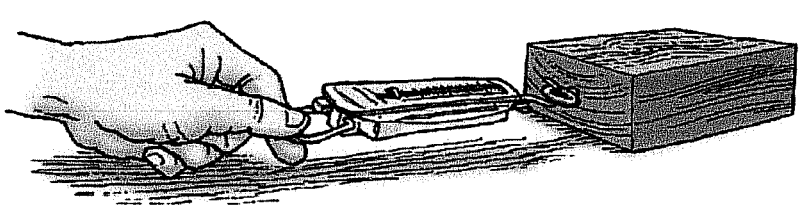
Pulling a Block Across Different Surfaces

Procedure:

1. Lay the spring scales on the tabletop. Does the pointer register zero? If not, adjust it to read zero.

2. In this inquiry, you will investigate the force of friction on a block as you pull it across each of the following surfaces: the plain tabletop, waxed paper, a paper towel, fine sandpaper and coarse sandpaper.

3. Attach the hook on the spring scale to the round screw hook on the wooden block, as shown below.



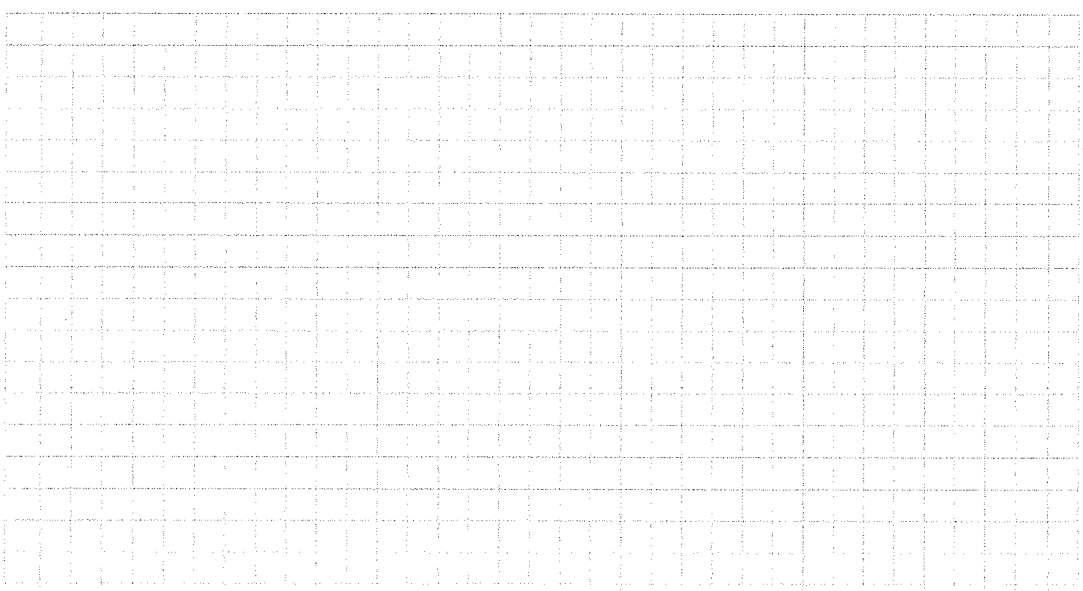
4. Pull the block across each of the five surfaces and collect force data for each surface. Be sure to pull the block across the entire length of the surface. Record your data in the table below. Calculate the average force for each surface.

Surface	Weight	1st Attempt in N	2nd Attempt in N	3rd Attempt in N	Average Force
Plain Table Top Surface					
Wax Paper					
Fine Sandpaper					
Rough Sandpaper					
Paper Towel					

5. How can you graphically represent the average force data for each surface? What kind of graph should you use? Construct a graph below.

   1.

   2.



6. A. Which surface required the greatest force to pull the wooden block across it?

   B. Which surface required the least force?

   C. Did the weight of your wooden block change as the surfaces changed?

   D. Review the variables for this lesson. Which variables did not change as you tested each surface?

Inquiry 1.2

Changing the Load

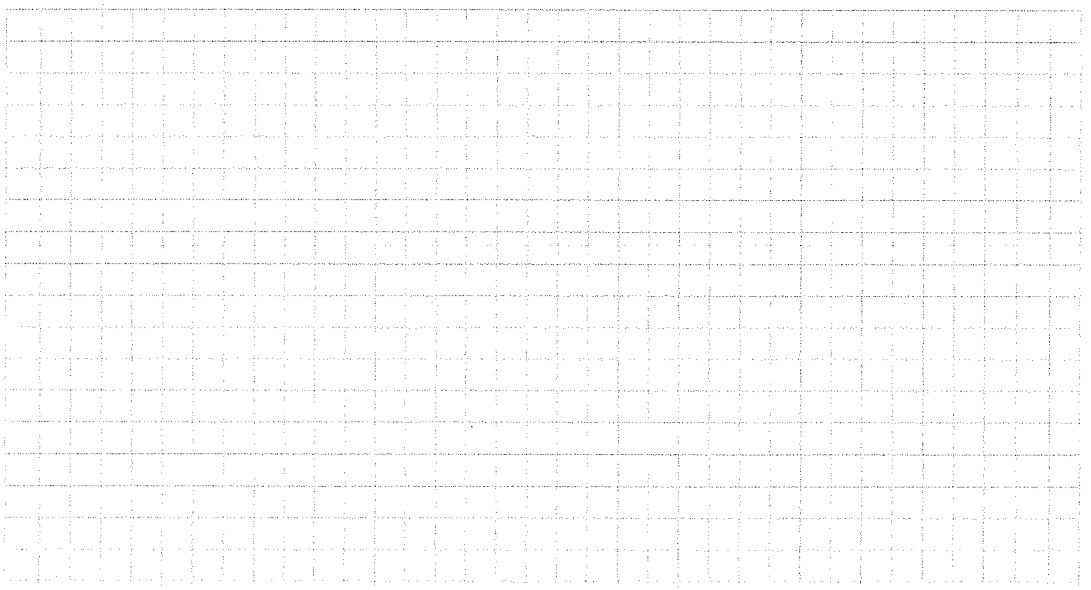
Procedure:

1. Think about and discuss with your lab partner the following question: What will happen to the effort force needed to pull the block? Write you prediction in the space below.

2. This inquiry activity requires that you and your lab partner add a mass to your wooden block. Change the weight of the load by stacking more weight on top of your block. Weigh your block with the mass on top. Then pull your block over each of the five surfaces. Record your information in the table below.

Surface	Weight	1st Attempt in N	2nd Attempt in N	3rd Attempt in N	Average
Plain Table Top					
Wax Paper					
Fine Sandpaper					
Rough Sandpaper					
Paper Towel					

3. Graph your data below.



4. Compare your data and graph with your first set of data and graph. Discuss with your partner the relationship between the load and the frictional force.

5. Think about the variables in this investigation. What did you keep constant as you changed the weight of the blocks?

Inquiry 1.3

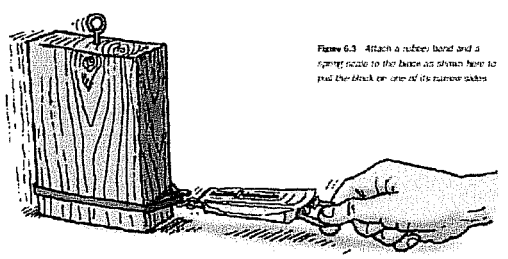
Changing the Surface Area

Procedure:

1. Look at your block. You can turn the block on its wide side and pull on it, or stand it on one of its narrow sides and pull on it. When the block is on its wide side, the area in contact with the surface is greater than when it is on its narrow side. You pulled the block across the surfaces on its wide side in trials. Predict what will happen to the force of friction if you pull the block on a narrow side across the surface.

2. Construct a data table below to record the description of each surface area of the block (wide or narrow) and the measurement of the force needed to pull the block at a steady rate across the surface (plain table top, waxed paper, fine sandpaper, rough sandpaper and paper towels)

3. Put a rubber band around the block so that it is below the center (about one-fourth of the way to the top of the block as measured from the table). Attach the spring scale hook to the rubber band and pull the block so that it moves smoothly across the table, as shown below. Measure the frictional force as the block slides at a constant speed along the surface. Do this for each side of the block.



4. How did your prediction compare with the results?

5. Think about the variables. Which variables did you keep constant this time?

Reflecting on What You've Done:

A. Summarize in a paragraph what you have learned about the force of friction. In your summary, include factors that affect frictional force and explain how you measure it.

B. In this lesson, you measured sliding friction. Why does the force on the spring scale measure the force of friction while the block moves at a steady speed?

C. Suppose you used ice as a surface for the block to slide on. What results would you get in this lab? Consider results for all three variables – surface type, weight of the block, and surface area.