Name:_____

Investigating Frictional Forces

Brief Introduction

Friction plays a major role in almost every physical situation you have encountered in the class thus far, but you have for the most part ignored it. In this investigation, you will be developing qualitative and quantitative understanding of frictional forces, so you can incorporate frictional forces into your models. You will be using force sensors, as well as motion detectors to collect data.

Pre-Lab Modeling

Since you are going to be looking at frictional forces today, you will be starting with *complete* models of two situations that involve friction.

Situation 1
A person pushes, with a force of 750 N on a heavy sofa, but the sofa does not move.

Situation 2
A person pushes, with a force of 800 N on a heavy sofa, and the sofa moves constantly with a speed of 0.5 m/s.

Pre-lab Considerations

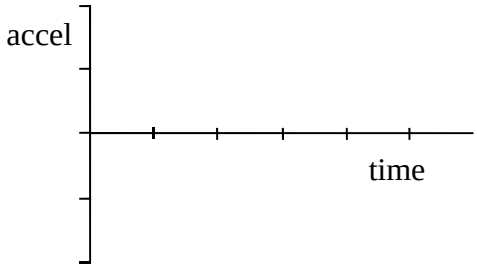
Prior to collecting data and exploring, it is useful to organize your thoughts ahead of time. You already have extensive experience with friction. Draw on that experience and make a list of the factors that you think/suspect effect the force of friction.

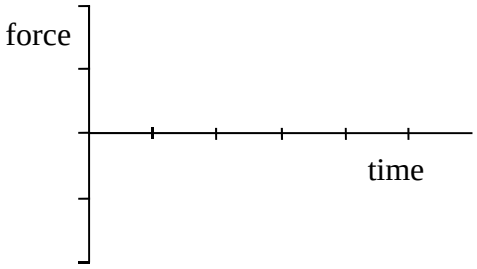
During this lab you will have the following equipment: force probes, motion detectors, four friction blocks with different surfaces, cart masses, and tracks with pulleys and hanging masses. With this equipment, devise a way to test each of the factors that you listed above. Briefly describe each way to test your factors below.

Factor being tested:

Description of experiment:

Data Collected



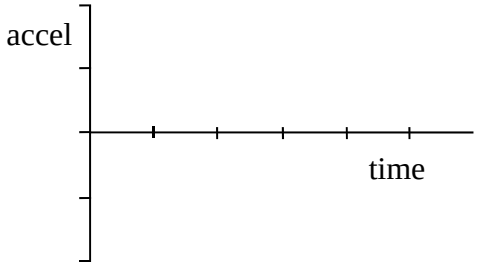


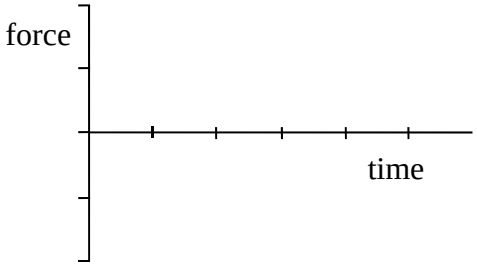
Conclusion:

Factor being tested:

Description of experiment:

Data Collected



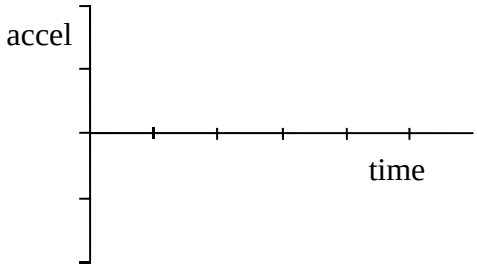


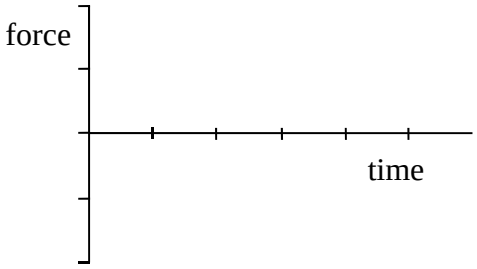
Conclusion:

Factor being tested:

Description of experiment:

Data Collected





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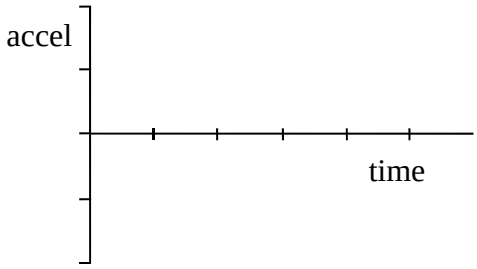
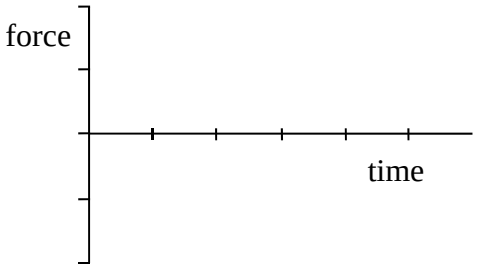




Conclusion:

Once you have finished collecting data about the factors involved in frictional forces, put your data collection equipment aside, (you will use it again later in the class) and make a whiteboard that answers the following questions part one.

1. Summarize the factors that seemed to make a difference in the force of friction, include what data you collected.

2. How did you determine the force of friction in each case?

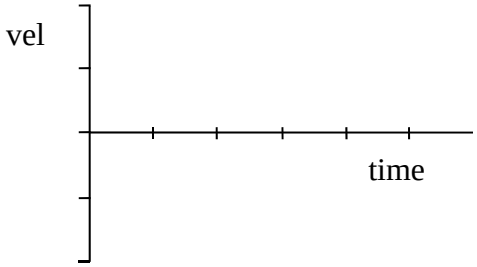
3. Make a force diagram for one of the trials above.

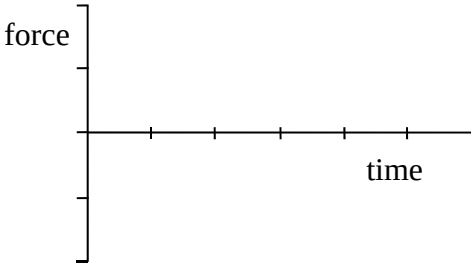
4. In the force diagram, what interaction is the force of friction the result of? Does your rule about the number of interactions in a system schema and number of forces on an object still work?

Data Collection-Part Two:

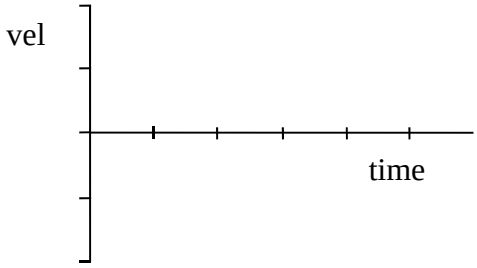
In this trial *you* will be pulling with a variable force, starting with a *very gentle* but constant tug, then slowly and constantly increasing the force you exert on the friction cart until the cart starts moving. **Once the cart starts moving, try to pull so that the cart maintains a constant velocity.** (It may take a few runs to get the constant velocity) Before you collect your data, you should predict the results on the axes provided below. Once you have made a prediction, collect your data and carefully sketch the data collected on the axes below:

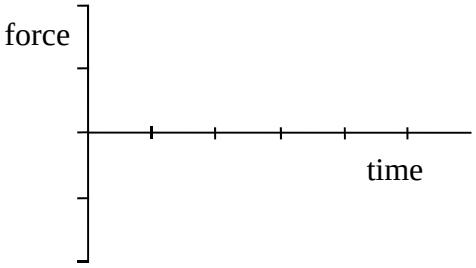
Prediction:





Data Collected:





Once you have one good run, you should print a picture of the graphs, put the data collection equipment away and make a whiteboard that answer the following questions from part two.

1. Sketch your graphs of force and velocity vs. time

2. Before the friction cart started moving, what was the force of friction? How can you tell?

3. After the cart started moving with a constant velocity, what was the force of friction? How can you tell?