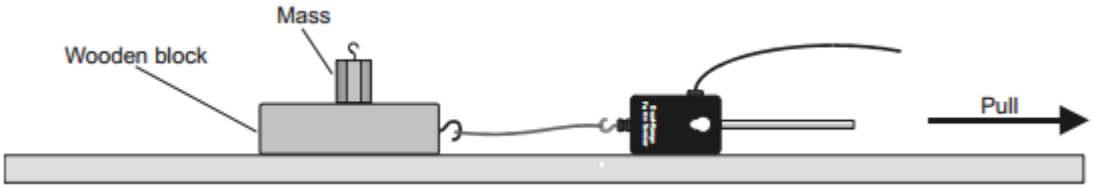
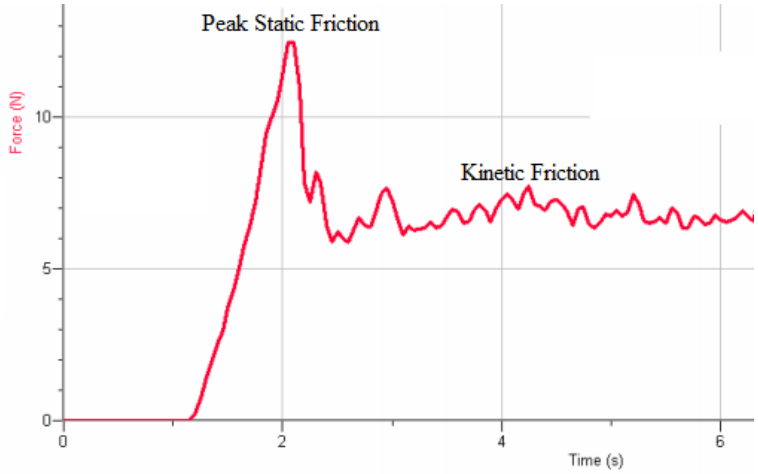
Normal Force vs. Frictional Forces Laboratory

Question: What is the relationship between the normal force on an object and the force of friction? Is the relationship between these two values proportional?

Procedure: Students will change the amount of mass on a block of wood and thereby changing the normal force on the block. The students will then measure the peak static friction and kinetic friction forces.

- Measure the mass of your block. (1 g = 0.001 kg) (1 g = 0.0098 N)
- Plug the Dual-Range Force Sensor into CH1 on the LabQuest
- Attach a strong to the block and to the Force Sensor
- With the string having slack in it (not tight or pulled), Zero the Force Sensor by clicking on the red CH1: Force on the home screen and pressing Zero.
- Press Play (Collect) and pull the block with a constant slight force until the block is moving at a constant speed.
- You should get a graph (shown below).
- Highlight the Peak Static Friction with your finger and click Analyze, Statistics, and Force. The "Max" will show you the Peak Static Frictional Force. Enter this data into your table.
- Highlight the constant force section that shows the Kinetic Friction and click Analyze, Statistics, and Force. The "Mean" will show you the average Kinetic Frictional Force. Enter this data into your table.
- Change the amount of mass on the block and repeat the steps above five more times.





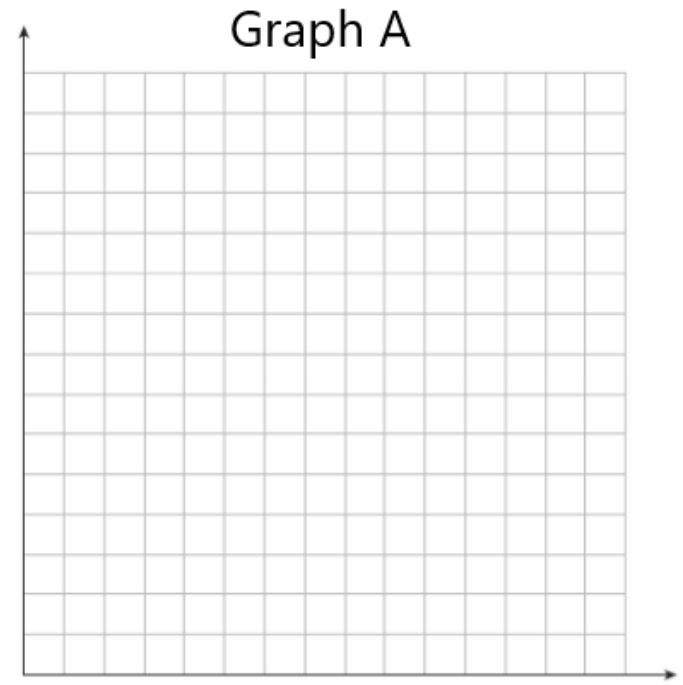
Data Table:

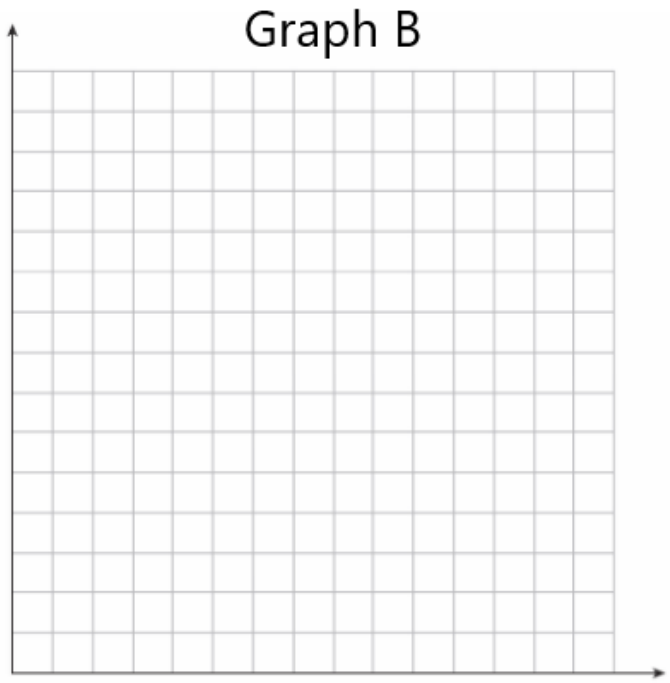
Total Mass (kg)	Normal Force (N)	Peak Static Friction (N)

Total Mass (kg)	Normal Force (N)	Peak Kinetic Friction (N)

Analyzing the Data:

Graph your Normal Force and Peak Static Friction into Graph A. Graph your Normal Force and Average Kinetic Friction into Graph B. Label your axes in the graphs and show your scales for the horizontal and vertical axes.





Post-Lab Questions

1. In Graph A, what was your independent variable?_____
2. In Graph A, what was your dependent variable? _____
3. What is the relationship between the Normal Force and the Peak Static Friction?_____
4. What is the relationship between the Normal Force and the Average Kinetic Friction?_____
5. According to your Graph A, what is the coefficient of static friction of the block and the table?_____
6. According to your Graph B, what is the coefficient of kinetic friction of the block and the table?_____
7. What are the units of the coefficient of friction? _____