Investigating Newton's Second Law Simulation

- Go to https://phet.colorado.edu/. Go to Search and type in "Forces in 1 Dimension"
- Click on Forces in 1 Dimension. Click the Play button on the Simulation Graphic

Investigating the Relationship Between Acceleration and Net Force with a Constant Mass

1. Click on the "Choose Object" Textbook (10.0 kg).
2. Click Graph Applied Force and Click Graph Acceleration.
3. Have the "Show F_{Total}, Show $F_{Friction}$, Show $F_{Appiled}$ boxes checked.
4. In the white box to the left, put in 20.00 N for the Applied Force. Click on Go and record the Total Force (in green) and the Acceleration (in black) in the table below.
5. Clear your screen by Clicking Clear, Click Yes for Clearing the Graphs.
6. In the white box to the left, put in 30.00 N for the Applied Force. Click on Go and record the Total Force (in green) and the Acceleration (in black) in the table below.
7. Repeat with all the Applied Forces Shown in the Table.

Applied Force	Acceleration (m/s²)	Net Force (N)
20.00 N		
30.00 N		
40.00 N		
50.00 N		
60.00 N		
70.00 N		

8. Graph your data from the table on the graph below.
9. Draw a best-line fit for your data.
10. Determine the slope of your best line fit and record it here: _____
11. What does the slope represent? _____
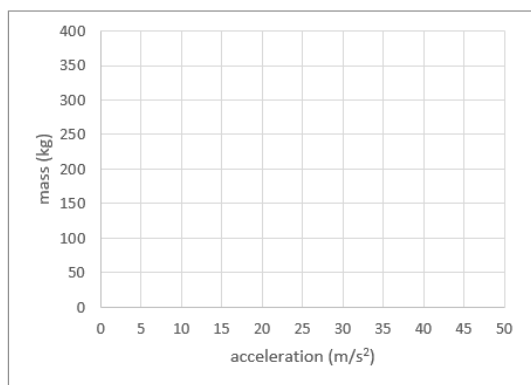12. What is the relationship between acceleration and net force? _____
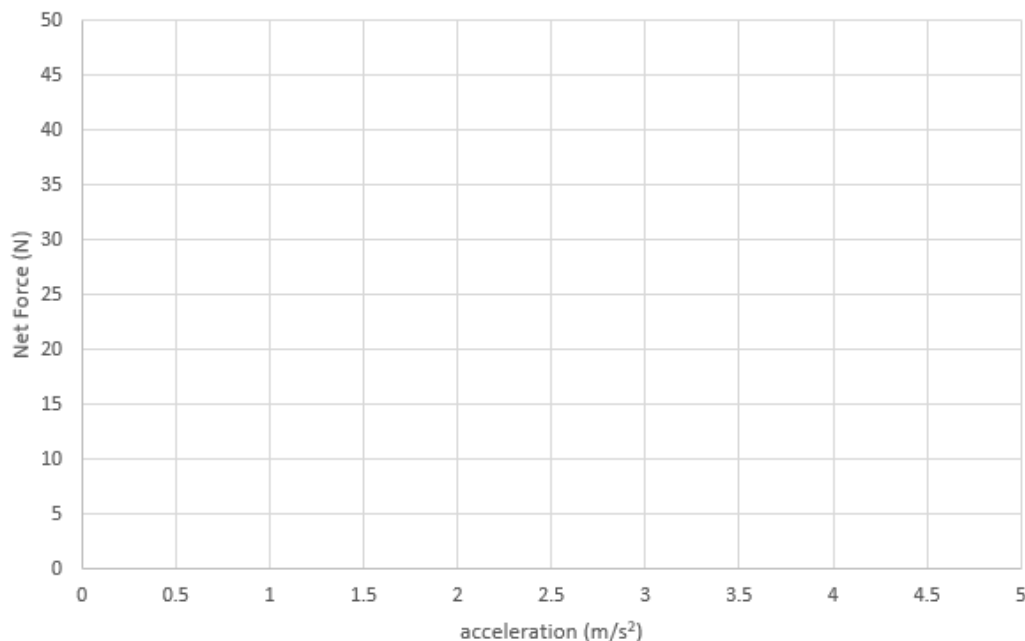
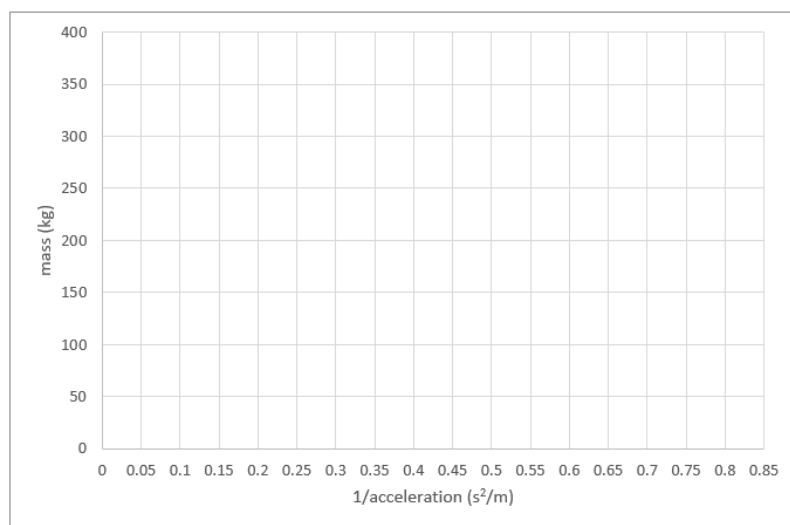## Investigating the Relationship Between Acceleration and Mass with a Constant Net Force

1. Click on the "Choose Object" Textbook (10.0 kg).
2. Click Graph Applied Force and Click Graph Acceleration.
3. Have the "Show F_{Total}, Show $F_{Friction}$, Show $F_{Appiled}$ boxes checked.
4. We want the Total Force (Net Force in Green) to be **500.0 N**. To do this with the Textbook, we find the Friction Force (in Red) is 24.5 N. So we will want to put in 500.0 N + 24.5 N = 524.5 N. Put in 524.5 N into the white Applied Force Box and Click Go. Record the Mass and the Acceleration in the table below.
5. Repeat with all the different objects. You will have to determine the Friction Force (in Red) so to find out what Applied Force you need to put in in order to have a Net Force (Total Force in Green) of **500 N**.

Object	Acceleration (m/s²)	Mass (kg)
Textbook		
Sleepy Dog		
File Cabinet		
Crate		
Refrigerator		

6. Graph your data from the table on Graph A below.
7. Is your data linear in Graph A?
8. What is the relationship between acceleration and mass? _____
9. If we want to make this graph linear, what would you need to do to the acceleration to make a linear graph? Try to graph this new data below in Graph B.
10. What is the slope of the data in Graph B? _____ What does this slope represent? _____

Graph A

Graph B