

Group 1

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Investigation 1A

Using a force sensor and cart velocity sensors, confirm that the impulse-momentum theorem holds true. Perform this experiment twice with differing initial momentums.

Trial 1:

	Initial	Final
Velocity (m/s)	0.379	-0.363
Mass (kg)	0.29975	
Momentum (Mass x Δ Velocity, kg * m/s)	-0.2224	
Impulse (calculated with Vernier, N*s)	-0.245	

Trial 2:

$$Ft = m\Delta v$$

	Initial	Final
Velocity (m/s)	0.872	-0.813
Mass (kg)	0.42584	
Momentum (Mass x Δ Velocity, kg * m/s)	-0.7175	
Impulse (calculated with Vernier, N * s)	-0.750	

Investigation 2D

Perform an elastic collision with two carts and see if momentum is conserved and if energy is conserved. Perform this experiment two times with different cart masses and/or velocities.

$$m_{\text{green}} v_{\text{green-initial}} + m_{\text{yellow}} v_{\text{yellow-initial}} = m_{\text{green}} v_{\text{green-final}} + m_{\text{yellow}} v_{\text{yellow-final}}$$

$$\frac{1}{2} m_{\text{green}} v_{\text{green-initial}}^2 + \frac{1}{2} m_{\text{yellow}} v_{\text{yellow-initial}}^2 = \frac{1}{2} m_{\text{green}} v_{\text{green-final}}^2 + \frac{1}{2} m_{\text{yellow}} v_{\text{yellow-final}}^2$$

Trial 1:

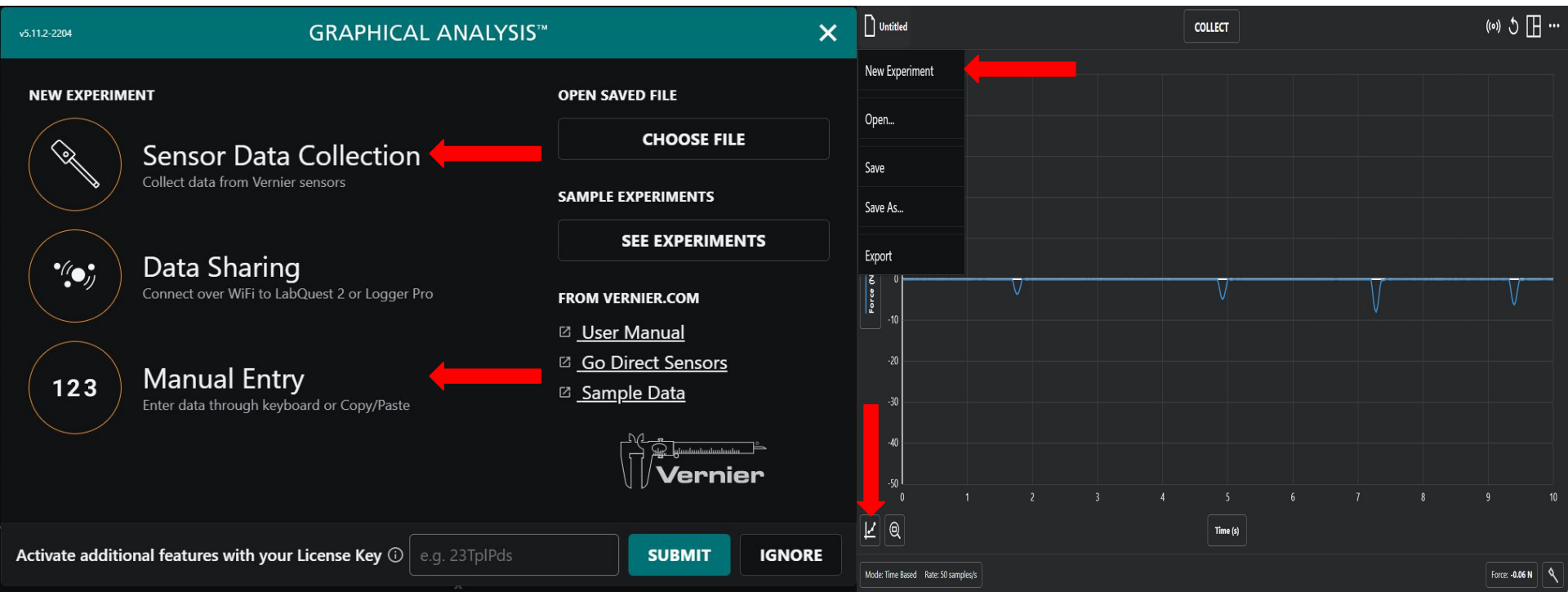
	Initial	Final
Green cart velocity (m/s)	0.261	-0.277
Green cart mass (kg)	0.29972	
Yellow cart velocity (m/s)	-0.265	0.245
Yellow cart mass (kg)	0.29882	
Total momentum (Ns)	-0.001	-0.01
Total Kinetic Energy (J)	0.0207	0.0205

Trial 2:

	Initial	Final
Green cart velocity (m/s)	0.911	-0.137
Green cart mass (kg)	0.29972	
Yellow cart velocity (m/s)	-0.150	0.890
Yellow cart mass (kg)	0.29882	
Total momentum (Ns)	0.228	0.224
Total Kinetic Energy (J)	0.1277	0.1212

Manual Input + Modifying Graph Appearance

In order to modify the graph appearance, there is a button that looks like this, .



The screenshot displays the 'GRAPHICAL ANALYSIS™' software interface. On the left, the 'NEW EXPERIMENT' menu is open, showing options: 'Sensor Data Collection' (with a red arrow pointing to it), 'Data Sharing', and 'Manual Entry' (with a red arrow pointing to it). Below the menu is the Vernier logo. On the right, a graph titled 'Untitled' shows a blue line representing force over time. A red arrow points to the 'Graph Appearance' icon (a square with a line graph) in the bottom-left corner of the graph area. The graph shows a blue line with several downward-pointing spikes, indicating force measurements over time. The y-axis is labeled 'Force' and ranges from 0 to -50. The x-axis is labeled 'Time (s)' and ranges from 0 to 10. A 'COLLECT' button is visible in the top right of the graph area. At the bottom, there is a license key input field with the text 'e.g. 23TpIPds', a 'SUBMIT' button, and an 'IGNORE' button. The status bar at the bottom right shows 'Mode: Time Based Rate: 50 samples/s' and 'Force: -0.06 N'.