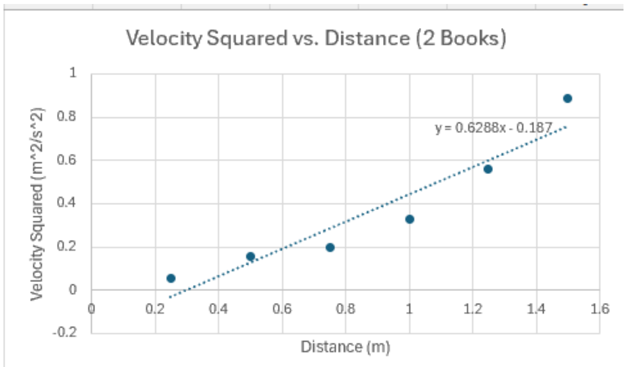
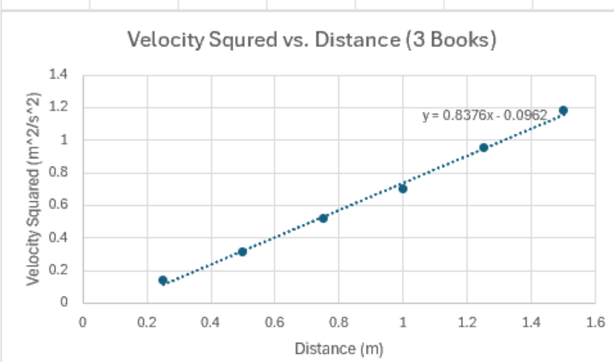
Lab 1 Report:

Analysis:

velocity		distance	velocity squared		height=10.4cm	
-0.942		1.5	0.887364		length=223.5cm	
-0.572		1	0.327184			
-0.396		0.5	0.156816			
-0.747		1.25	0.558009			
-0.443		0.75	0.196249			
-0.232		0.25	0.053824			
-1.089		1.5	1.185921		height=14.4cm	
-0.84		1	0.7056		length=223.5cm	
-0.561		0.5	0.314721			
-0.977		1.25	0.954529			
-0.72		0.75	0.5184			
-0.376		0.25	0.141376			

We started by collecting the data with a height of 2 books and 3 books respectively. This gives data for velocity and distance which can then be fitted into the equation $V^2 = V_0^2 + 2a\Delta x$.





We chose to graph velocity-squared against distance because it would create a linear graph and thus the acceleration could be calculated. The y-intercepts of these equations can be ignored because they are close to 0 and we are only looking for an approximation of gravity. The y-value corresponds to V^2 and the x-value corresponds to Δx because there is no initial velocity in the experiment so V_0^2 is 0. Therefore, the slope of the line is 2a. So, dividing these slopes by 2 will give us the acceleration. The acceleration when there are two books is 0.6288 ÷ 2 = 0.3144, and the acceleration when there are three books is 0.8376 ÷ 2 = 0.4188.

Conclusion:

The equation $a = g \bullet \sin(\theta)$ can be used to find an experimental value for the gravitational constant. Rearranging this equation gives us that $a \div \sin(\theta) = g$. $\sin(\theta)$ is the height of the ramp divided by the length of the track, which comes out to 0.0465 and 0.0644 for the two-book trials and the three-book trials. The values for acceleration were determined in the previous section, so plugging in these values into the equation gives us g = 6.76 from the two-book trials and g = 6.50 from the three-book trials. The percent error for the two-book trials is 45.0% and the percent error for the three-book trials is 50.1%.

There are many sources of error that could have reduced the gravitational constant compared to what was expected. One is friction, which would have reduced the velocity of the cart. Also, there was dust on the track that could have slowed down the cart. Another issue could be incorrectly placing the cart and/or the sensor. If they were accidentally placed too close together compared to what was recorded the cart would have had less time to accelerate so it would have a lower velocity. A lower velocity would have resulted in lower values for g because it would have decreased the velocity-squared values which would lower the slope of the line which is proportional to the acceleration.