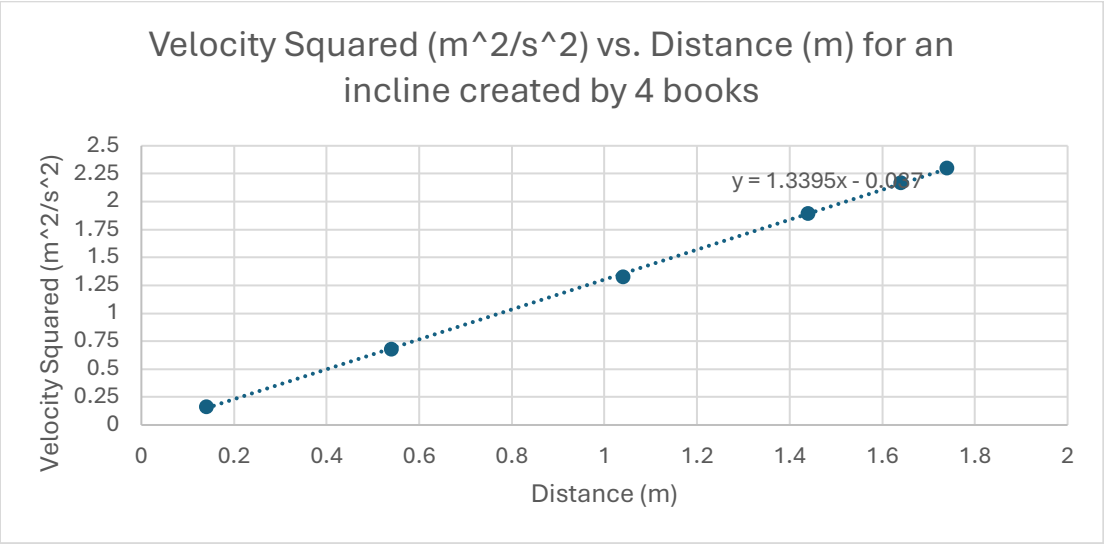
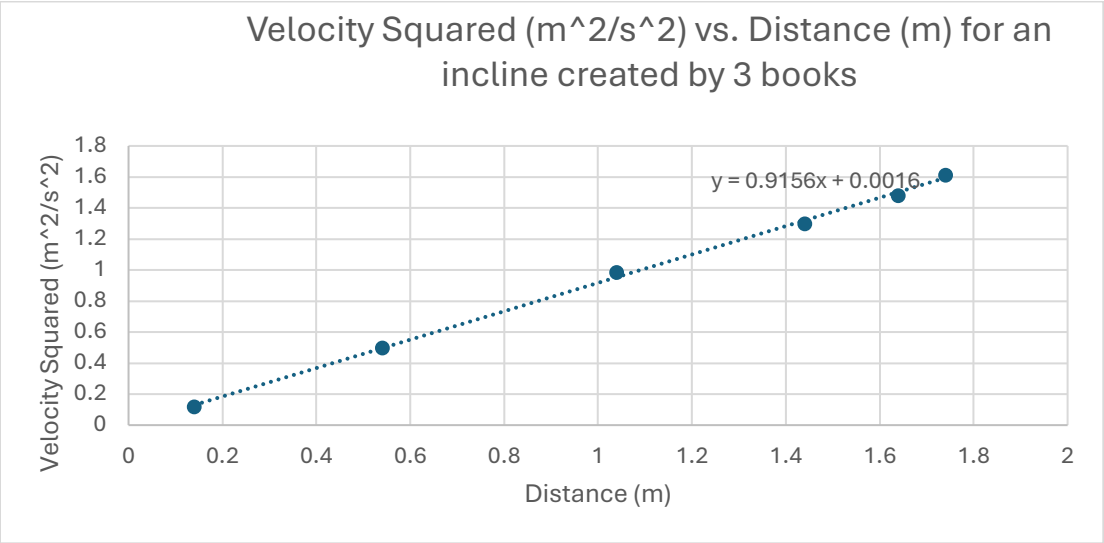
Analysis:

The purpose of this lab is to measure gravity using a ramp and a n number of books to generate an incline for a cart to go down. Somewhere along the inclined plane, there is a velocity sensor that measures the velocity of cart as it passes through the device. The displacement, which is from the bolt on the cart to the velocity sensor, is measured with the ruler on the side of the ramp. Six different displacements were measured for each incline: one with 3 books, and one with 4 books. Additionally, 3 trials were done for each displacement to obtain an accurate velocity by averaging the velocity of the trials. From here, square the velocity, put it as the y axis, and the x axis would be the displacement. The velocity was squared to generate the no t equation: $v_f^2 = v_0^2+2a\Delta x$, which can be rewritten as $v_f^2 = 2a\Delta x$ because v_0 is 0 m/s, and this equation is in the form of y = mx with 2 times acceleration being the slope.

Here are the two graphs that represents the different inclination:





Experimental acceleration for an inclination created by 4 books with the height of 0.150m:

$v_f^2=2a\Delta x$ which is the same as y = mx, and 2a is equivalent to m.

- ⇨ $2a = 1.3395\ m/s^2$
- ⇨ $a = 0.670\ m/s^2$

Experimental acceleration for an inclination created by 3 books with the height of 0.116m:

$v_f^2=2a\Delta x$ which is the same as y = mx, and 2a is equivalent to m.

- ⇨ $2a = 0.9156\ m/s^2$
- ⇨ $a = 0.458\ m/s^2$

Conclusion:

Both the graphs have non-zero y-intercepts because the data obtained is not perfect and the accuracy of the data will be measured by percent error. First, one has to calculate the expected acceleration using the equation g = sin (θ). Sin (θ) is the quotient between the height of the books and the length of the ramp which is the hypotenuse. Then, one calculates the percent error by subtracting the expected acceleration from the experimental acceleration, divide the difference by the expected acceleration, and times the quotient by 100 to obtain a percentage. Hence, the percent error of the acceleration for the incline created by 4 books is:

- ⇨ $g \sin(\theta) = 9.8 * (0.150/2.27) = 0.648\ m/s^2$
- ⇨ $(0.670-0.648)/0.648 * 100 = 3.34\%$

Percent error of the acceleration for the incline created by 3 books is:

- ⇨ $g \sin(\theta) = 9.8 * (0.116/2.27) = 0.501\ m/s^2$
- ⇨ $(0.458-0.501)/0.501 = -8.58\%$

The percent errors were small for both inclines, so the experiment was done with no glaring errors. Nevertheless, there were mistakes that were not accounted for while doing this experiment. The most obvious mistake is the measurement of books as it was done with a wooden ruler, so it might have been skewed when measuring which resulted in a higher height calculated. However, this would have made a small different in the calculation process. An error that explains the positive percent error for the incline created by 4 books would be that the individual might have push the cart which added on to its acceleration, resulting in a larger velocity measured, which leads to the experimental acceleration being greater than the expected acceleration. For the incline created by 3 books, friction might have caused a significant change in the acceleration of the cart. This is because the slope is less steep than the slope for 4 books, friction generated by the ramp would have had a larger effect for this incline. Henceforth, the cart moves slower, velocity measured is less, so the resulting acceleration has a negative percent error when compared to the expected acceleration.