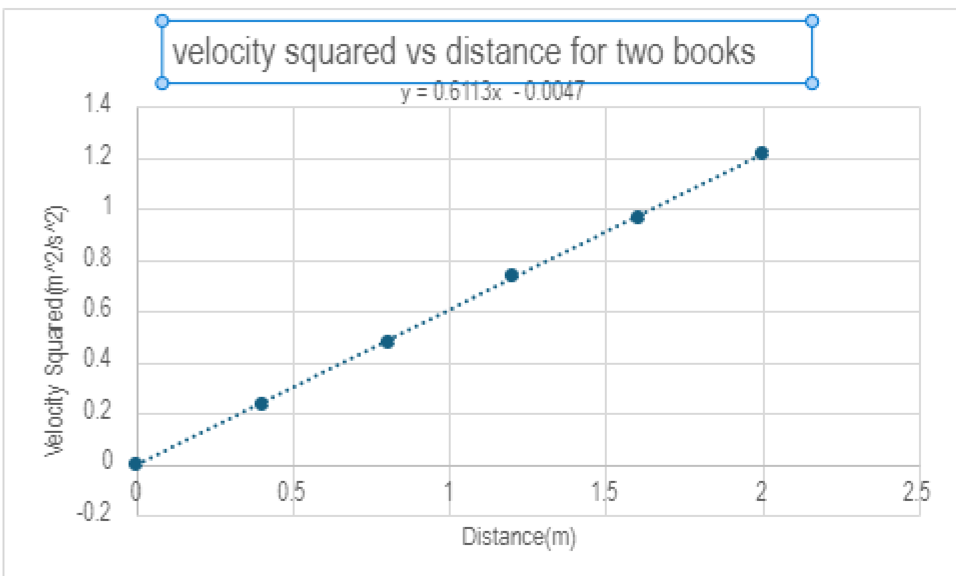
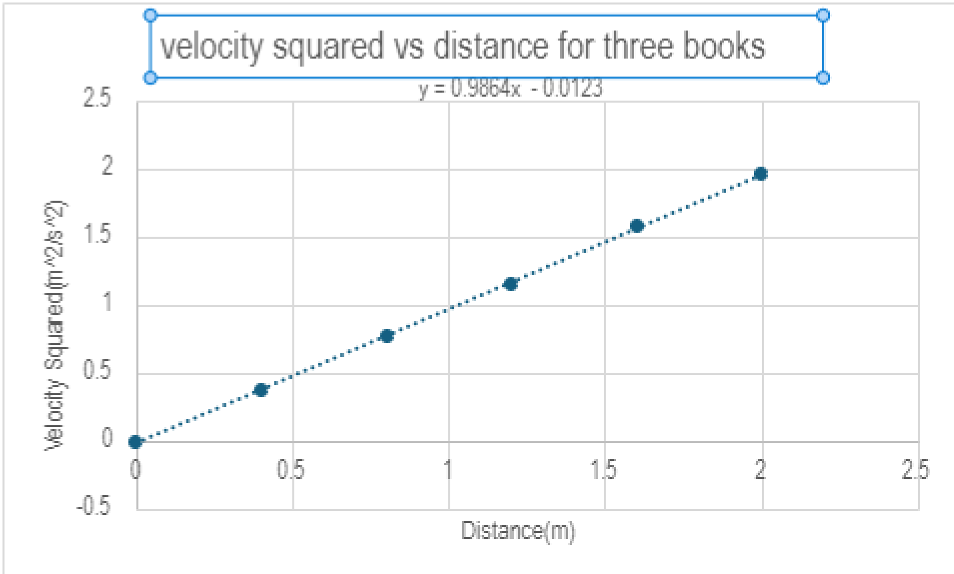
Analysis:

We made a graph of velocity squared vs distance to then be able to calculate the acceleration using one of our big four equations, $v^2 = v_0^2 + 2a\Delta x$. Because the cart starts from rest, $v_0^2=0$ and the equation becomes $v^2 = 2a\Delta x$. We will now rearrange the equation to solve for acceleration, giving us $a = (v^2/2\Delta x)$. We see that the slope of the line on our graphs is $v^2/\Delta x$, so the acceleration will be equal to half of the slope of the line. For two books the slope of the line is .6113, meaning that the experimental acceleration will be .6113/2=.3057 m/s^2. Meanwhile, the slope of the line for three books is .9864, giving us an experimental acceleration of .9864/2= .4932 m/s^2.





Conclusion:

Now we will take a look at the expected acceleration for each of these cases, given by the formula a=g*sin(θ). When we have two books, we form a right triangle with the hypotenuse of length of 190cm, and the side opposite θ is 7.72cm. This means that sin(θ)=7.72/190, so the expected acceleration is a=9.8* 7.72/190=. 3982 m/s^2. For the case with three books, we use the same method to find sin(θ)=11.67/190, giving us an expected acceleration of a=9.8* 11.67/190= 0.6019m/s^2. We will now move to calculate the percent error for both cases, which will be -23.2% and –18.1% for the case with two books and three books respectively. Because of the significant difference in the expected and experimental measurements for the cart's acceleration, it would be reasonable to look at the potential sources of error that could explain the difference. One of the most significant potential sources of error is our assumption that there is no friction between the cart and the ramp. This source of error is directional, and it will significantly decrease the measured acceleration by creating an opposing force. Another potential source of directional error that will decrease the acceleration is the influence of air resistance on the cart’s motion, however considering the relatively low speed of the cart this is a much smaller influence.