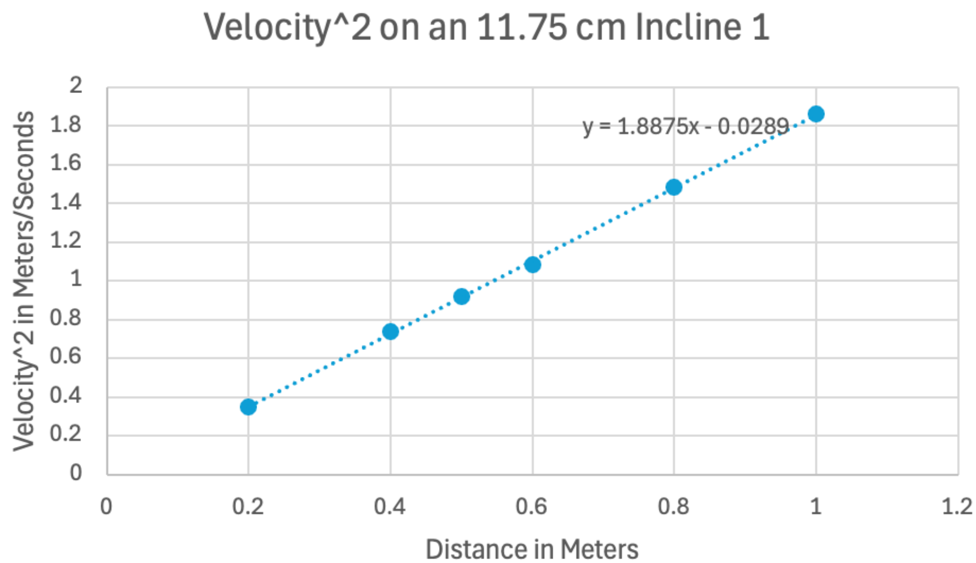
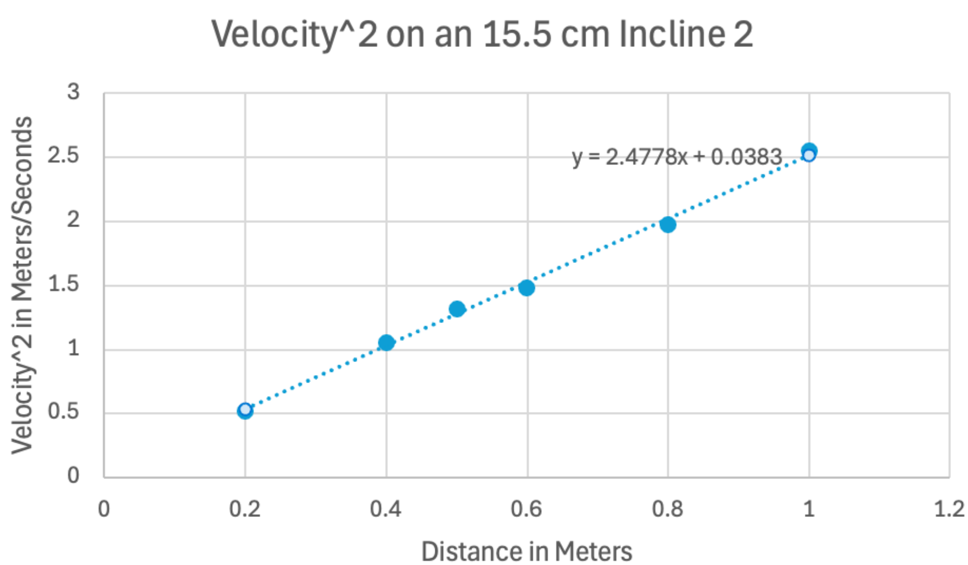
Analysis:





Once all of the data was collected for the velocity portions, I noticed that the graph wasn't linear when graphed out on Excel. So, in order to make it linear and not exponential, I looked at the 4 Kinematic Equations and squared the velocity because of the equation, v^2=v0^2+2aΔx.

Based on this equation, we know that v^2 is the dependent variable and the displacement is the independent variable. I made v^2 the y-value and Δx the x-value, the cart used was at rest in the beginning so the initial velocity would be 0. Once graphed, I went and got the line of best fit.

On the first incline with 11.75cm, I got y = 1.8875Δx – 0.0289. On the second incline with 15.5 cm, I got y = 2.4778Δx + 0.0383. If we relate this back to the 4 Kinematic Equations, we can use v^2 = 2aΔx because v0^2 is equal to 0. Since v^2 is equal to y, and y = mx+b, 2a is the slope of both lines. To find acceleration, you can just divide the slope by 2, so 1.8875/2 = 0.94375 m/s^2 for 11.75 cm ramp, and 2.4778/2 = 1.2389 m/s^2 for 15.5 cm ramp.

Conclusion

Based on the knowledge of acceleration we gathered from the analysis, we know that gravity has a higher force on an object that falls on a steeper ramp. So I thought it was reasonable to see that when the cart rolled on Incline 2, the ramp with 15.5 cm, it had a higher acceleration of 1.2389 m/s^2 than Incline 1. Incline 1 had a ramp of 11.75 cm, and when the cart rolled down the ramp, gravity didn't have a greater force on the object because it wasn't as steep. So, it only had an acceleration of 0.94375 m/s^2.

The expected value of acceleration is a = gsin(θ). For Incline 1, 11.75 cm, we have to find sin of theta. Since sin is opposite over hypotenuse, the hypotenuse is equal to 1.17589 m and the height is 0.1175 m. Knowing this, we can plug it back into the original formula as a = 9.8 (0.1175/1.17589) = 0.9793 m/s^2. For the percentage error, if you substitute in ((0.9793 – 0. 94375) / 0. 94375) * 100 = 3.767% error for Incline 1's 11.75 cm ramp. For the 15.5 cm ramp on Incline 2, the hypotenuse is 1.18022 m and the height is 0.155 m. Plugging into the same formula, 9.8 (0.155/1.18022) = 1.287 m/s^2. For the percentage error, substituting ((1.287 – 1.2389) / 1.2389) * 100 = 3.88% error for the 15.5 cm ramp.

Some of the sources of error that could be present in the experiment are friction and air resistance. Especially because both equations had an acceleration lower than expected. The friction portion could have caused the cart to move slower and have lower acceleration, particularly in Incline 1 where the slope is not very steep. The friction could have worked with air resistance as the friction against the wheels and the ramp along with a force pushing against the cart could have also contributed more in Incline 2, where the slope was steeper but the air resistance was more present.