PHYSICS 12

NAME(S): _____

Direct Measurement Video Problem: Student on Rocket-Powered Cart

This video (I://handout/sloan/video_student_riding_rocket) shows a student accelerating across the stage on a cart powered by a releasing compressed carbon dioxide from a fire extinguisher. The video was filmed at ***30 frames per second***. Use the slider at the bottom of the video to watch the video.

1. Which physical quantities could you measure from this video?

2. Assume that this cart is an example of constant acceleration. Which equation of motion for constant acceleration would help you find the acceleration of the cart and rider (based on the variables list in #1)? Rearrange this equation to isolate *a*.

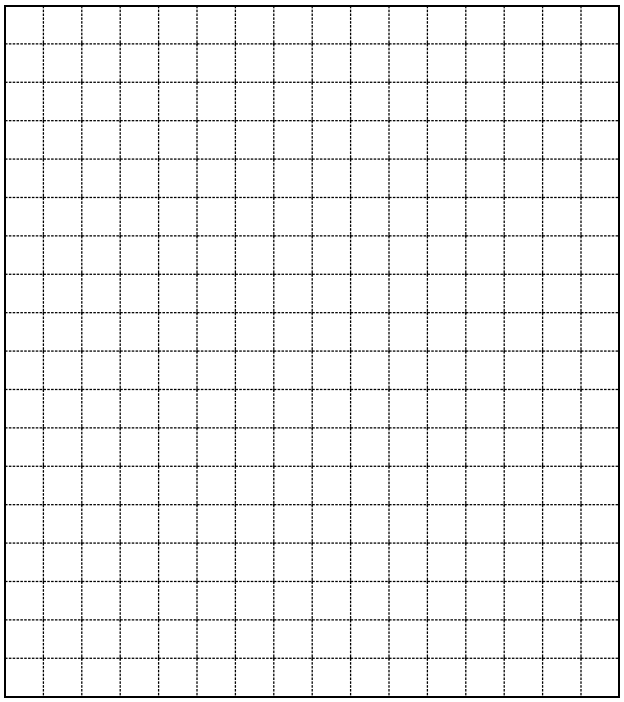
3. Determine the time it takes the cart to move the length of the ruler using the number of frames at 30 frames per second. What could be an error value for the frame you start at? How does this affect the time? (use ± to represent the value)

4. What distance has the cart traveled during the time interval you found above? (Include possible error value.)

5. Calculate the minimum and maximum accelerations of the cart from the time it begins to move until it has traveled the length of the ruler using the data from #3 & 4 and the equation from #2.

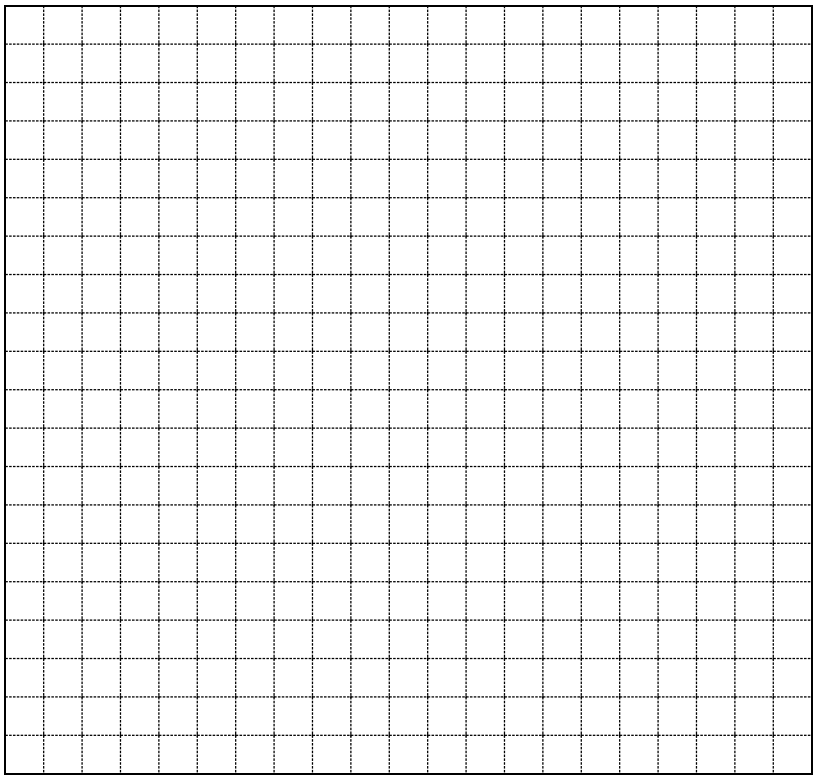
6. Make a chart of the data points you are using including the frame #. Plot a d vs t graph for each 0.5 s interval.

Frame #	15	30	45	60	75	90	105
Time (s)							
Dist. (m)							



7. From the data in the d vs t chart that you recorded determine the velocities for each interval using $v=\Delta d/\Delta t$. Make a v vs t chart for each 0.5 s interval and then plot on the graph. Find the slope of the graph.

Time (s)							
Vel. (m/s)							



8. How does the slope of the v vs t graph compare with the value obtained for acc. using the equation? If there are discrepancies discuss why they may occur.