Physics Name ________________________

Keller

Introduction to Tracker

A toy car along the hallway is slow enough to analyze with stopwatch data, but many physical phenomena happen much more quickly. To analyze these situations, video analysis software can be very useful.

1. Sign-out a laptop according to your roster number. You can also get a mouse which is often easier to use than the trackpad. Open the class website and right-click on the video link. Save this video to your desktop.

2. Click the Microsoft icon in the bottom-left, go to “All Programs”, find the “Tracker” folder, and open the Tracker program.

3. At the top, click “File”, then “Open File”, then open the cart video from your desktop. If you get an Xuggle warning, click “Xuggle” to get through it.

4. Drag the scroll at the bottom to the right until you get to the first frame where the cart has left the push and is rolling freely to the right. Write down the initial frame number, which is in the bottom-left corner of the program window. Then drag the scroll to the right until you get to the frame just before the cart is caught. Write down this final frame number.

5. At the top, click on “Clip Settings”, which is the fifth icon from the left. Type-in the start frame and end frame.

6. Click on the calibration tools icon (sixth icon from the left at the top. Select New and then Calibration Stick. Drag one end of the blue line to the left end of the meter stick laying on the table and drag the right end of the meter stick. At the top, change the calibration stick length from 100 to 1 and hit enter. Now, when you click inside the screen, the position data that is collected will have units of meters.

7. Click on the coordinate axes icon (seventh from the left at the top) and drag the origin of the axes to the center of the car when it is at the first frame.

8. Right-click inside the video and choose Zoom-To-Fit.

9. At the top, click the “Create” icon and choose “Point Mass”.

10. Hold down the shift key and the cursor inside the video window should become a small white box. Move this so that the center of the box is at the leading bumper of the car and (still holding down the shift key), left click on the mouse. This should collect data for time, x-position, and y-position in the chart on the right and also advance the video one frame forward.

11. Still holding down the shift key, continue centering the white box on the leading bumper of the car, left-clicking and collecting data until the video is done.

12. Right-click on the center of the graph and select Analyze. Check the Analyze tab and then Statistics and Curve Fits and you will receive useful information. Click Edit, then Copy, and then Image. Open a Google document, share it with akeller@longmeadow.k12.ma.us, and then paste this image into the document.

13. This image will show "x = A*t + B" where the values for A and B are to the right. Beneath the image in the Word document, rewrite this equation, putting-in the values for A and B.

14. Close the Data Tool window. Click on the little "x" which is along the y-axis of the graph and change it to "vx: velocity x-component".

15. Right-click on the graph and select Analyze. Now there will be two functions graphed along one set of axes. To remove the old (position) function, uncheck the two check boxes above "x" in the data table.

16. Also, this graph will look very noisy only because the y-axis is autoscaled. To fix this, right-click on the graph and select "Scale…". Change the vertical min to 0 and the vertical max to 10. This will clear away the noise and make the graph more representative of what happened physically.

17. Copy and paste this graph into the Google document, then close the Data Tool window.

18. Now change the y-axis to "ax: acceleration x-component". Right-click on the graph and select Analyze. Uncheck the velocity checks so that only the acceleration function is shown.

19. Change this y-axis scale from -100 to +100 to remove the noise. Copy and paste this image into the Google document.

20. In the same Google document, answer the following questions beneath the graphs:

a. What is the value of the slope of your position versus time graph, including units?

b. Suppose we define velocity as the slope of the position vs. time graph. In what way does your position versus time graph slope agree with your velocity versus time graph?

c. Suppose we define acceleration as the slope of the velocity vs. time graph. In what way does your velocity versus time graph slope agree with your acceleration versus time graph?

d. If the cart were pushed from right to left with the same speed, how would these graphs be different?

e. If the cart was pushed from left to right again, but pushed harder, how would these graphs be different?