

Name: \_\_\_\_\_

## Tracker Lab

Due Date: \_\_\_\_\_

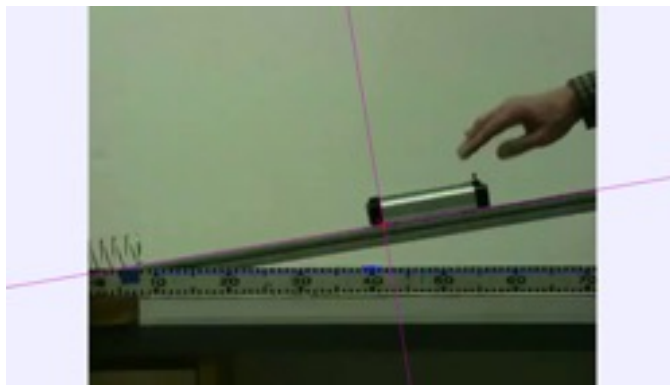
The purpose of this lab is to familiarize yourself with Tracker software at home.

This is free, virus free, ad free, educational software. It is available for Mac, Windows and Linux. There is also a beta version available online. Because it's beta, its functionality isn't guaranteed. You can download it from <https://physlets.org/tracker/> or from the Physics 112 weebly page under the heading Supplementary Resource. Download and install the version for your computer (or try the online beta version). During the installation, an option comes up to install videos as well – DO THIS (we'll be using one for this activity).

From the Tracker download page, watch the videos Tracker quick start and Getting Started with Tracker (under the heading Tracker Video Tutorials).

### The actual lab:

1. Start the Tracker software.
2. From the menu select Video→Import.
3. From the Tracker/Videos folder, select "bouncing\_cart.mov".
4. Using the slider under the video, slide it to the right until you see the frame in which the hand is just removed from the cart. Right click on the slider and select "Set start frame to . . ."
5. Adjust the slider until the frame just before the cart touches the spring for the first time. Right click on the slider and select "Set end frame to . . ."
6. Hit the "rewind" button, it should now take you to the initial frame that you set.
7. Click the "Axes" button below the menu (you can hover over the buttons for their names). Hold the "Shift" button and click on the center of the axes and drag them down to the lowest point on the cart at the track. Set the angle from the horizontal to  $9.4^\circ$ . The axes should be parallel and perpendicular to the track. Adjust the axes so the one perpendicular to the hill is parallel to the black/silver line on the cart as shown.



You may need to make some fine adjustments by moving the origin of the axes or adjusting the angle slightly.

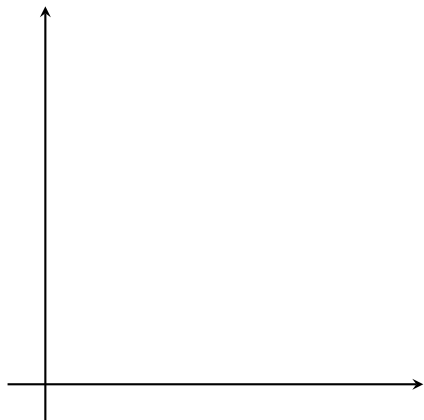
8. Create a "calibration stick". Holding the shift key click on the 10 cm line on the ruler in the video and then again on the 70 cm line. This will create a calibration stick. Click on the "measurement" above the stick and set the value to 0.6 m.
9. Create a point mass. Hold the shift key down and click on the origin of the graph. The video moves forward one frame. Click on the same spot on the cart and repeat this until the last frame of the video. As you do this, a position-time graph will be shown on your screen.

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**Tracker Lab**

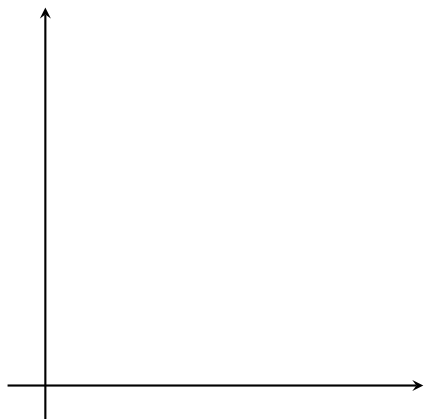
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10. **Sketch the graph below (numbers not required)** and label the axes. What does this tell you about the cart?



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11. Click on the x(m) on the y-axis of the graph and change it to **vx:velocity x-component**.
12. **Sketch the v-t graph below (numbers not required)** and label the axes. Does it look like what you expected? Why or why not?



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13. On the graph, right click and select "Analyze". You may need to select the Analyze button at the top of the page. Make sure the Fit Name is "Line" which fits a linear equation  $v = A * t + B$  (think  $y = mx + b$ ). You may also need to click the "Auto Fit" check box. Find "parameter" and "value" on the screen and it gives values for A and B.
14. **What do A and B represent on this graph? State their values with appropriate units.**
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15. **What is the acceleration of the cart?**
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