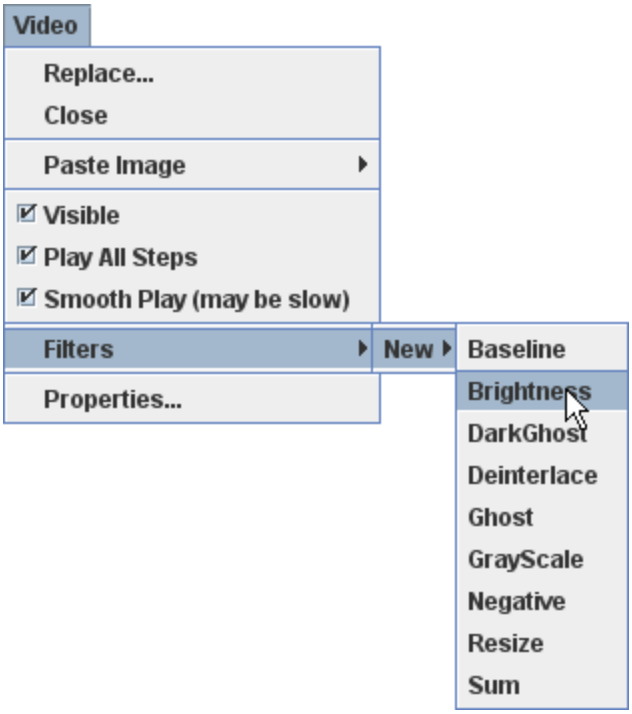
Video Recording of Observations

1. Place a **meter stick** in the video frame for calibration purposes.
2. Throw a ball at an angle.
3. Record a video of the ball's trajectory. Do not track the ball's motion. You want the video to remain in the same frame as the ball goes up and down.
    a. Start recording before the ball thrown up.
    b. Stop recording after the ball reaches the ground or when it is caught.
4. Upload video to **Google Drive or email to yourself** and download the video to the laptop.

Analyzing Observations

1. Open your video file in **Tracker** software (https://physlets.org/tracker/).
    a. Click the **Open** button  on top and select the downloaded video.
    b. If you need to **Rotate** your video, go to the top menu bar and select **Video / Filters / New / Rotate**. Select the desired rotation and close the window.

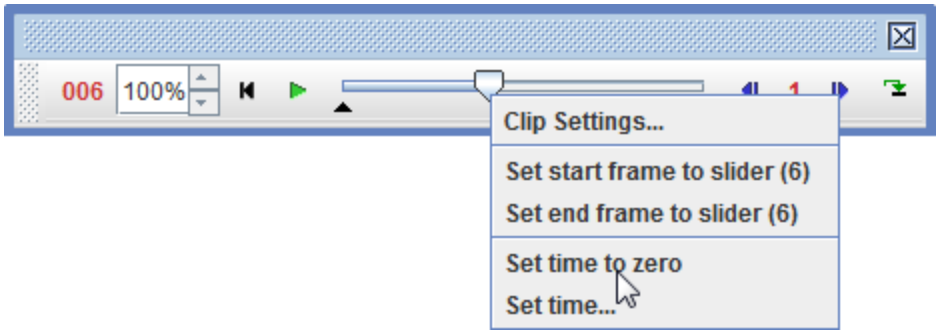


    c. Click **Help** and select **Getting Started** as a reference to these instructions.

2. Identify the frames ("video clip") you wish to analyze.
    a. At the button video player, use **play** button or **scan slider** to watch the video.
    b. For fine control use the following keyboard keys:
    Use **PageUp** to step forward 1 frame at a time

Use **PageDown** to step backward 1 frame at a time
Hold down **Shift** key with these keys to step by 5 steps rather than 1.

c. Set **Start Frame** by **Right-Click** when marker is at the desired frame. Make sure to also **Set time to zero** at this start frame.



d. Set **End Frame** by **Right-Click** when marker is at the desired frame.
e. Set **Step Size** to 5 by clicking the number **1** between the left and right step arrows.

f. Use **HOME** to go back to the start frame

3. Calibrate the video scale.

a. Click on the **Calibration** button  and select the calibration stick.
b. Move the **calibration stick** to the ruler in the frame.

c. Drag the ends of **calibration stick** to the length of the ruler.
d. Set the value to the length of the known ruler.

4. Set the reference frame origin and angle.

a. Click the **Axes** button  to show the coordinate axes.
b. Drag the **origin** to the initial position of the object of interest.
c. If necessary adjust the angles of the axes.

5. Track objects of interest manually with the mouse.

a. Click the **Create** button  on top and choose **Point Mass**
b. Select a point on the object which you can follow from the start to end frame.
c. Mark the position of the object on every step frame by holding down **shift key** and click the mouse as video automatically steps through the video clip.

6. Save the data by choosing the **File/Export/Data File.**

a. Import into a Google Sheets.
b. Copy and Paste the data into desmos.com

Quadratic Modeling Name_____

1. Sketch the vertical position **y** vs. the time **t** graph from the plot.

2. Write out the equation of best fit from desmos using $z_1 \sim ax_1^2 + bx_1 + c$?

3. Think about each parameter

Parameters	Value	Sense (Reasonable)?
a - (acceleration due to gravity)/2		
b - initial vertical speed		
c - initial vertical position		

4. Compare your data to the fitted equation.

	From Data	From Fit	Comparable (Y/N)?
Time the ball reaches **maximum height**.			
Maximum height the ball reaches.			
Time the ball reaches the ground.			