

In Time You Will See The Moving Plot

Purpose: To do a better job of describing motion.

Procedure:

Set up a ticker tape timer with about 3 meters of ticker tape. (The exact procedure will depend on the type of timer.)

Fasten the ticker tape to a pull back car with masking tape.

Wind up the pull back car, start the timer and let the car pull the tape through the timer.

Data:

Your tape should look something like the diagram below.

Where the dots separate enough to tell them apart draw a line perpendicular to the long edge of the tape through the first dot and then



every 6th dot to the end of the tape like in the diagram below.

Measure the distance between the lines with a ruler and record the information on the tape using a notation like $\Delta x_1 = 2.4$ cm.



Transfer your data to a computer spreadsheet and complete the data/results table similar to that below.

Moving Plot Spreadsheet Formulas

Δt	Time	Δx	Distance	Average Velocity	Instantaneous Velocity	Δ velocity	acceleration
seconds	seconds	cm	cm	cm/s	cm/s	cm/s	cm/s ²
0.1	0.1	3.2	3.2	=D3/B3	=C3/A3		
0.1	=B3+A4	4.4	=D3+C4	=D4/B4	=C4/A4	=F4-F3	=G4/A4
0.1	=B4+A5	5.3	=D4+C5	=D5/B5	=C5/A5	=F5-F4	=G5/A5
0.1	=B5+A6	6.2	=D5+C6	=D6/B6	=C6/A6	=F6-F5	=G6/A6
0.1	=B6+A7	6.9	=D6+C7	=D7/B7	=C7/A7	=F7-F6	=G7/A7
0.1	=B7+A8	7.9	=D7+C8	=D8/B8	=C8/A8	=F8-F7	=G8/A8
0.1	=B8+A9	8.6	=D8+C9	=D9/B9	=C9/A9	=F9-F8	=G9/A9
0.1	=B9+A10	9.3	=D9+C10	=D10/B10	=C10/A10	=F10-F9	=G10/A10
0.1	=B10+A11	9.9	=D10+C11	=D11/B11	=C11/A11	=F11-F10	=G11/A11
0.1	=B11+A12	10.6	=D11+C12	=D12/B12	=C12/A12	=F12-F11	=G12/A12
0.1	=B12+A13	10.9	=D12+C13	=D13/B13	=C13/A13	=F13-F12	=G13/A13
0.1	=B13+A14	11.4	=D13+C14	=D14/B14	=C14/A14	=F14-F13	=G14/A14
0.1	=B14+A15	11.7	=D14+C15	=D15/B15	=C15/A15	=F15-F14	=G15/A15
0.1	=B15+A16	11.7	=D15+C16	=D16/B16	=C16/A16	=F16-F15	=G16/A16
0.1	=B16+A17	12.1	=D16+C17	=D17/B17	=C17/A17	=F17-F16	=G17/A17
0.1	=B17+A18	14.3	=D17+C18	=D18/B18	=C18/A18	=F18-F17	=G18/A18
0.1	=B18+A19	12.2	=D18+C19	=D19/B19	=C19/A19	=F19-F18	=G19/A19
0.1	=B19+A20	12.1	=D19+C20	=D20/B20	=C20/A20	=F20-F19	=G20/A20
0.1	=B20+A21	11.9	=D20+C21	=D21/B21	=C21/A21	=F21-F20	=G21/A21
0.1	=B21+A22	11.4	=D21+C22	=D22/B22	=C22/A22	=F22-F21	=G22/A22
0.1	=B22+A23	10.1	=D22+C23	=D23/B23	=C23/A23	=F23-F22	=G23/A23

Moving Plot Summary

On EACH graph (yes, every one of the five graphs – change in displacement vs time, displacement vs time, average velocity vs time, instantaneous velocity vs time and acceleration vs time) put an X where the displacement is the greatest, a ○ where the instantaneous velocity is the greatest and a □ where the acceleration is the greatest.

Things I expect to see in the summary for In Time You Will See The Moving Plot

1. Definition of velocity in terms of slope, in both in words and formula
2. Description of the difference between average velocity and instantaneous velocity
3. Definition of acceleration in terms of slope, both in words and formula
4. Description of jerk and why we didn't calculate jerk
5. Size and source of errors – there are two – Hint: Use a measuring tape to measure your total distance and compare it to the calculated total.
6. Improvements – measuring zero velocity and measuring negative velocity.