PhyzSpringboard: UM_2

Little Dudes 2 - Velocity

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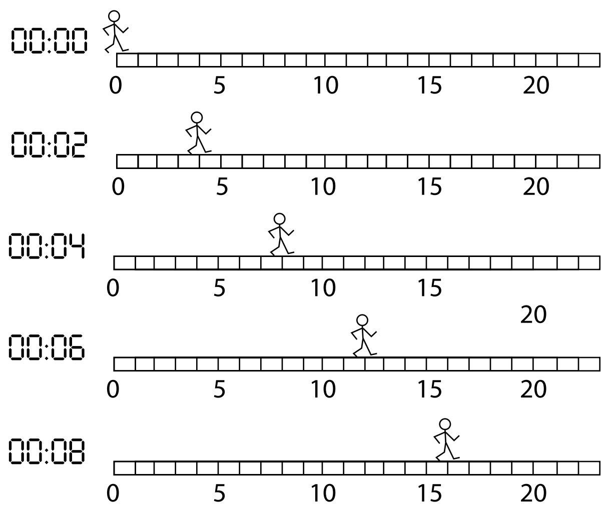
Suppose something is moving. If we collect corresponding clock reading and position measurements, these numbers form ordered pairs that can easily be plotted on a position vs. clock reading graph. We can also determine the velocity of the object within the given time intervals. Armed with velocity values, we can plot velocity vs. clock reading graphs. Consider the various little dudes shown below. They exist and move along a sidewalk marked in 1 meter increments. We are given snapshots of them at regular time intervals. Follow the instructions given below to construct velocity vs. clock reading graphs.

1. Complete the t and x sections of the data table based on the diagrams of Walking Dude below.



Clock R. t (s)	Position x (m)
0	0
2	4
4	8
6	12
8	16

DON'T COMPLETE THESE UNTIL INSTRUCTED TO DO SO

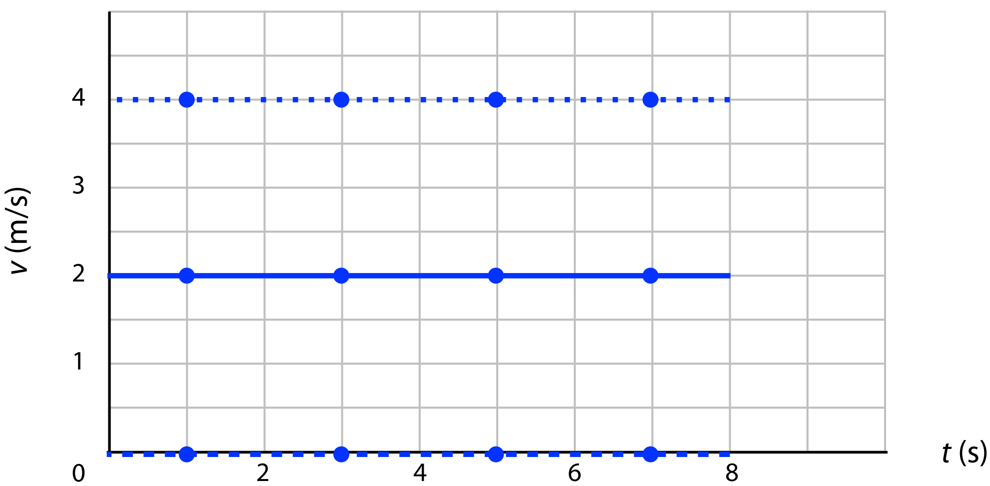
Velocity v (m/s)	CR Mid t (s)
2	1
2	3
2	5
2	7

2. Determine the average velocity of Walking Dude between clock readings 0 s and 2 s by dividing the distance traveled in the interval by the duration of the interval. Record this value on the data table. Calculate average velocities for all remaining intervals to complete the table.

3. Velocity values are averages across two-second time intervals. Complete the Clock Reading Midpoint column. For example, the clock reading midpoint between 4 s and 6 s is 5 s.

4. Plot velocity vs. clock reading values from the table.

VELOCITY vs. CLOCK READING

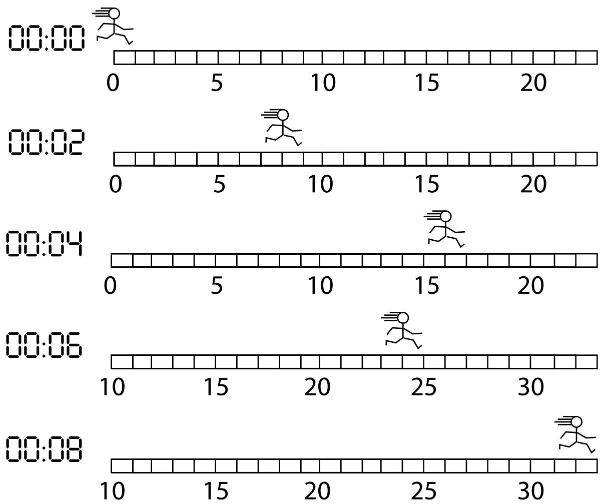


5. What assumptions about Walking Dude would we have to make if we wanted to connect the dots on the graph to form a straight, continuous line?

The motion is steady and smooth, not jerky.

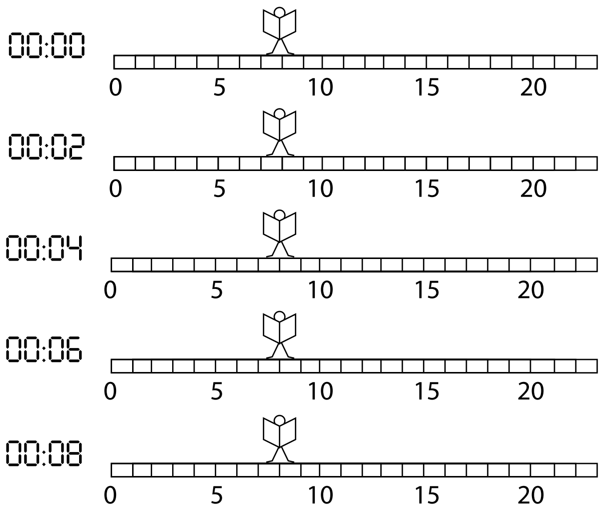
6. Make those assumptions and draw the line of the graph. Label the line, "Walking Dude."

7. On the axes on the front, plot velocity vs. clock reading for the two other little dudes shown below.



Clock R. t (s)	Position x (m)
0	0
2	8
4	16
6	24
8	32

Velocity v (m/s)	CR Mid t (s)
4	1
4	3
4	5
4	7



Clock R. t (s)	Position x (m)
0	0
2	0
4	0
6	0
8	0

Velocity v (m/s)	CR Mid t (s)
0	1
0	3
0	5
0	7

8. Recall Walking Dude II from the previous Little Dudes PhyzJob? (If not, go back and look him up.) Plot his velocity vs. clock reading graph on the axes above.

9. Notice all our velocity vs. clock reading plots yield horizontal lines. What does a horizontal velocity vs. clock reading line tell you about the motion of the object?

Velocity is constant (Δ v=0).

10. What would a non-horizontal (e.g. "diagonal") line on a velocity vs. clock reading graph mean
a. if it had positive slope?

Speed is increasing in the positive direction or decreasing in the negative direction.

b. if it had negative slope?

Speed is decreasing in the positive direction or increasing in the negative direction.

11. What would a vertical line on a velocity vs. clock reading graph mean?

An infinite acceleration; all velocities at one instant. Not likely!