Chapter 1, Sections 1.1-1.3

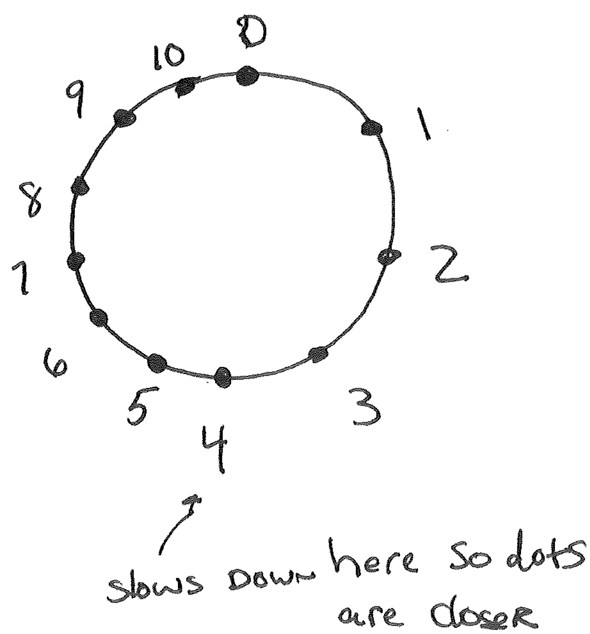
1.1 - Motion

(1.) Draw the motion diagram for the following two motions. Use the particle model to represent each moving object, use six to ten dots for each motion, and label the dots as shown in figure 1. 4 of the textbook.

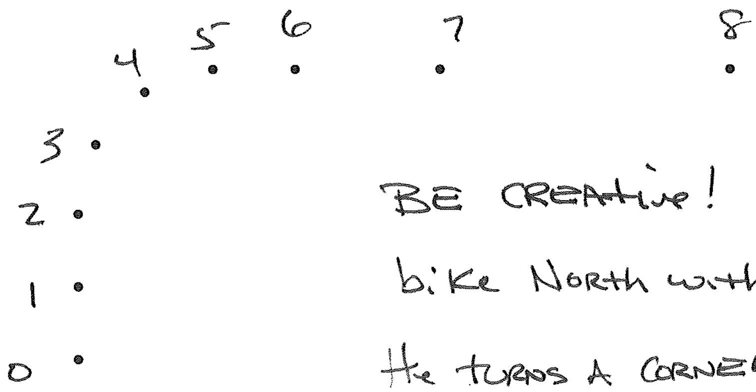
(a) A car going east steadily slows down from 50 mph to zero.

Make East to Right

(b) A man walks his dog around a circular track. For the first half of the walk, the dog is excited and walks quickly (but not speeding up or slowing down). For the second half, the dog has gotten tired and walks at a slower pace.

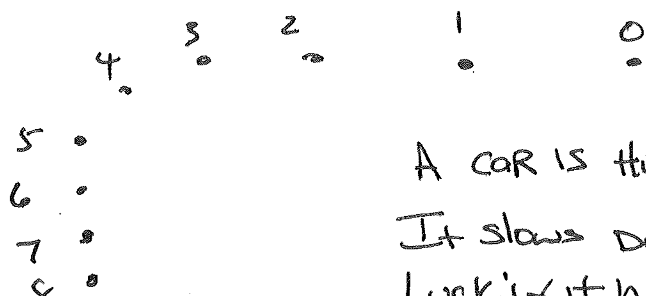


(2.) For the following motion diagram, label the dots as shown in figure 1. 4 of the textbook and write a one or two sentence "story" about a real object that would have that motion diagram.



BE CREAtive! Bob rides his bike North with Constant speed. He turns A CORNER AND then Speeds up

(3.) Now reverse the labeling of the dots on the the motion diagram shown above. Write a story about a *completely different* object with the new motion diagram.



A CaR IS HEADING TOWARDS A cliff. It slows DOWN but Falls off. Luckily it HAS A parachute that lets it FAll with Constant Speed

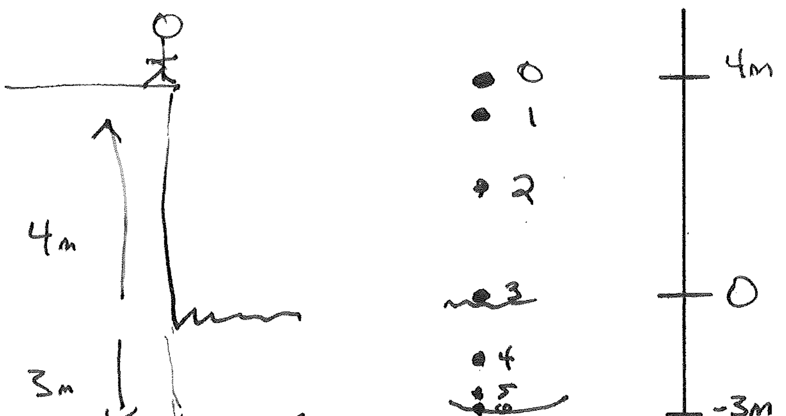
1.2 - Position and Time

(1.) A diver jumps off a cliff that is $4\,m$ above the surface of a lake. The lake is $3\,m$ deep. After speeding up while falling through the air, the diver enters the water, slows, and stops just at the bottom of the lake.

(a) Draw a motion diagram for the diver's motion. For clarity, include the top and bottom of the lake.

(b) Add a coordinate axis to the right of your motion diagram with the surface of the lake as the origin. Numerically label the initial position of the diver, x_i at the top of the cliff, and the final position, x_f, at the bottom of the lake.

(c) What is the diver's displacement, Δx, for this motion?



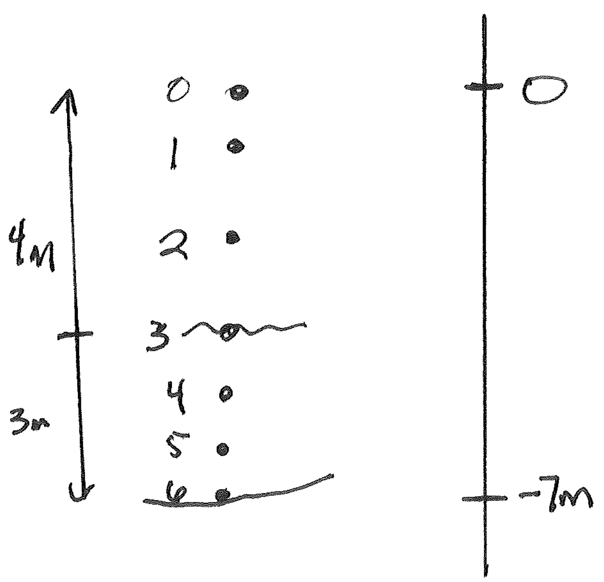
$X_i = 4m$

$X_f = -3m$

$\Delta X = X_f - X_i = -3m - 4m$

$= -7m$ ← He fell DOWN 7m

(d) Repeat parts (a), (b), and (c) but place the origin of your coordinate axis at the top of the cliff. Which of the physical quantities have changed and which are the same?



$X_i = 0, \quad X_f = -7m$

$\Delta X = -7m - 0 = -7m$

DIFFERENT position VALues but SAME DisplAcement

1.3 - Velocity

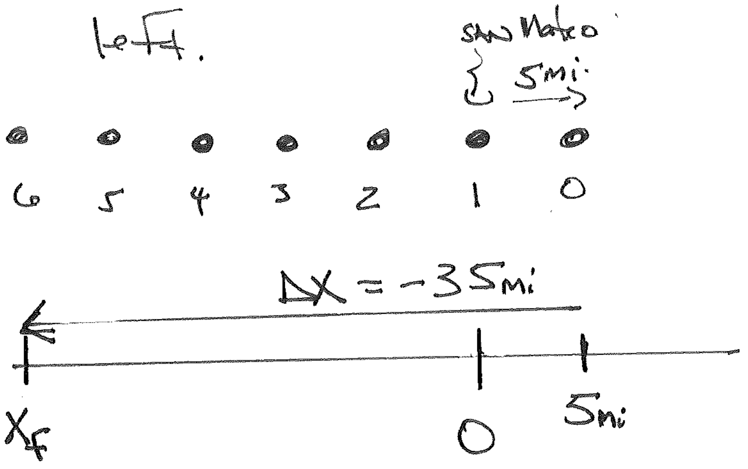
(1.) A car travels along Lomas Boulevard with a constant speed of 25 mph. It starts 5 mi to the east of San Mateo Boulevard and has a displacement of 35 mi to the west.

(a) Draw a motion diagram for the car's motion.

(b) Add a coordinate axis below your motion diagram. Put the origin at San Mateo Boulevard. Label the initial position of the car. Use your information about the displacement to find the final position of the car.

(c) How long does it take the car to travel from San Mateo to its final position?

Constant speed ⇒ EQUAL SPACING. Let East be to Right ⇒ West to Left.



Have to set $\Delta X = -35mi$ since Right = positive ⇒ Left is Negative

$X_i = 5mi$, $\Delta X = X_f - X_i \Rightarrow X_f = \Delta X + X_i$

$X_f = -35mi + 5mi = -30mi$

So Car 30mi West of San Mateo at END of Motion

$V = \frac{\Delta X}{\Delta t}$ $V = 25mph$ to West ⇒ $V = -25mi/h$

(Continued)

$\Delta X = -30mi$ For going From San Mateo to Final position

$$V = \frac{\Delta x}{\Delta t} \Rightarrow \Delta t = \frac{\Delta x}{V} = \frac{-30mi}{-25mi/h} = 1.2\text{ hour}$$

← obviously Not really true since no one's so lucky. they would have to stop at red lights.