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September 11, 2014 11:27 AM

name:

group members:

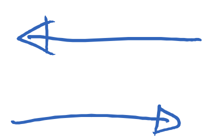
SCIENCE ONE PHYSICS WORKSHEET 1

1a) Draw a motion diagram for the motion demonstrated in class (you can use a particle model if you like):

2 a) For the motion diagram on the blackboard, draw vectors below to indicate the direction of velocity and acceleration at the time labelled by a star.

v

a



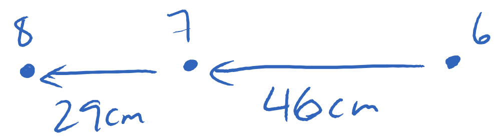
moving to the left.

acceleration in opposite direction to velocity since object is slowing down

b) Determine (as accurately as you can) the magnitude of the velocity and acceleration at this time.

We have $\Delta t = \frac{60s}{110} = 0.545s$.

We can approximate the velocity at point 7 by the average velocity between 6 and 8. This is



$$\frac{\Delta x_{68}}{\Delta t_{68}} = \frac{-(29cm + 46cm)}{2 \times (0.545)s}$$

$$= -0.69 m/s$$

For the acceleration at 7, we want $\frac{\Delta v}{\Delta t}$. We can approximate Δv as

$$\Delta V = V_{7 \to 8} - V_{6 \to 7} = -0.53 m/s - (-0.84) m/s$$
$$= 0.31 m/s$$

Here Δt is $0.545s$ (not $2\times$ this) since we are taking the difference between the velocities in two successive time intervals. So

$$a_7 \approx \frac{0.31 m/s}{0.545s} = 0.57 m/s^2$$

c) Can you estimate how accurate your velocity is (i.e. in what range of values would you be confident that the actual velocity is)?

simple method:

$$\text{upper bound} = \frac{\text{biggest you think } \Delta x \text{ might be}}{\text{smallest you think } \Delta t \text{ might be}}$$

$$\text{lower bound} = \frac{\text{smallest you think } \Delta x \text{ might be}}{\text{biggest you think } \Delta t \text{ could be}}$$

d) Is the acceleration constant? If not, is it increasing or decreasing? Would you expect it to be constant? Why or why not?

Can just estimate a for various times from the data. We find it changes.

Simple way to see this: a is nonzero intially, but zero after object stops moving.

3) Qualitatively sketch position, velocity, and acceleration vs time graphs below. You don't need to plot actual data points.