Acceleration (p. 57 – 64)

I. Velocity-Time Graphs

1. Define the term velocity-time graph.

Velocity-Time Graph – *a graph that plots an objects velocity versus time (velocity = y-axis) (time = x-axis)*

2. Define the term acceleration.

Acceleration – *rate at which an objects velocity changes (constant change of velocity = constant acceleration)*

p.59

Football Player, Basketball, Baseball,

Penny from a skyscraper

Bullet from a gun

3. What does the slope on a *v-t* graph indicate?

– Slope indicates the change in velocity (rise) versus a change in time (run)

II. Average & Instantaneous Acceleration

1. Define the term average acceleration.

Average Acceleration – *change in the velocity of an object during some measurable time interval divided by that time interval*

2. What is the unit used to measure acceleration? *m/sec.^{2}*

3. Define the term instantaneous acceleration.

Instantaneous Acceleration – *change in velocity at an instant of time*

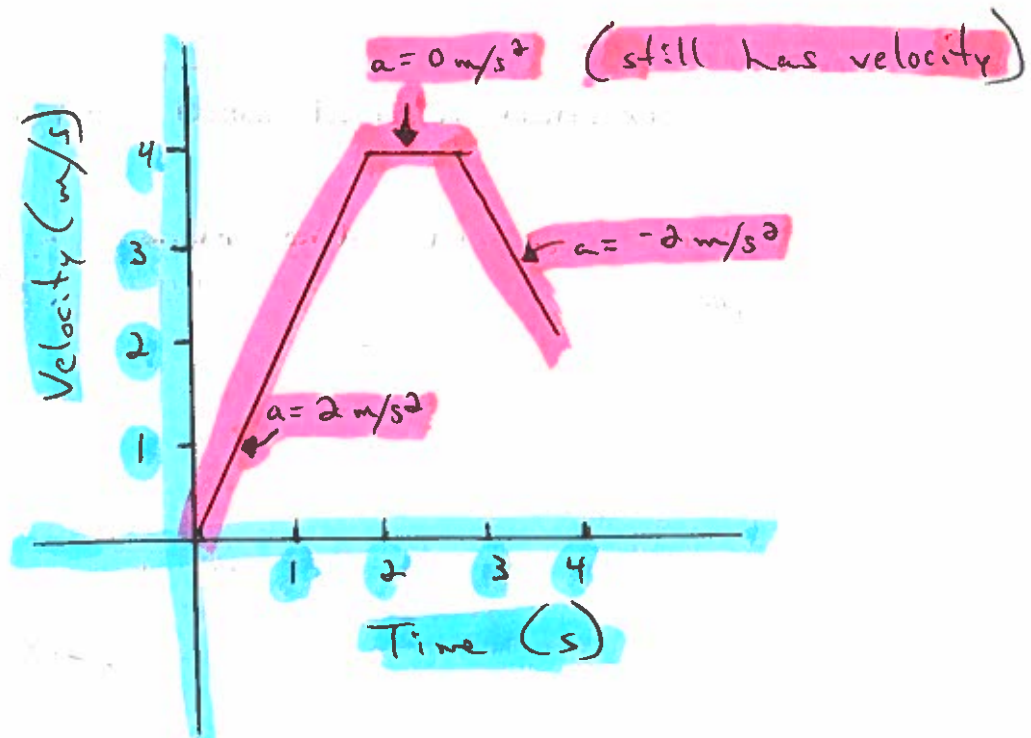## III. Displaying Acceleration On A Motion Diagram

1. Which is the correct way to determine the length and direction of an acceleration vector?

p.60

a. $\Delta v = (v_i - v_f)$, then divide by Δt
b. $\Delta v = (v_f - v_i)$, then divide by Δt
c. $\Delta v = (v_i + v_f)$, then divide by Δt
d. $\Delta v = (v_f + v_i)$, then divide by Δt

2. What color is used to indicate acceleration vectors on motion diagrams?

Violet

Acceleration = Slope of V-T graph

$a = 0 \, m/s^2$ (still has velocity)

$a = -2 \, m/s^2$

$a = 2 \, m/s^2$

Velocity (m/s)

4

3

2

1

1   2   3   4

Time (s)

IV. Positive & Negative Acceleration

1. **Which of the following causes an object to speed up?**

   (p.61)

   a. An object's acceleration and velocity are in the same direction. → Deceleration
   b. An object's acceleration and velocity are in opposite directions.
   c. A positive acceleration vector points in a positive direction. ⎤ Don't know velocity vectors!
   d. A negative acceleration vector points in a negative direction. ⎦

2. **Give an example of each of the following :**

   1. An object's acceleration in the same direction as velocity.

   A car speeding up as the accelerator is pushed.

   Velocity = car's forward movement → *acceleration = braking*

   2. An object's acceleration in the opposite direction as velocity. *Based on a certain frame of reference.*

   A car skids to a stop after brakes are applied.

   3. **An acceleration vector sign does not indicate an increase or decrease in speed.**
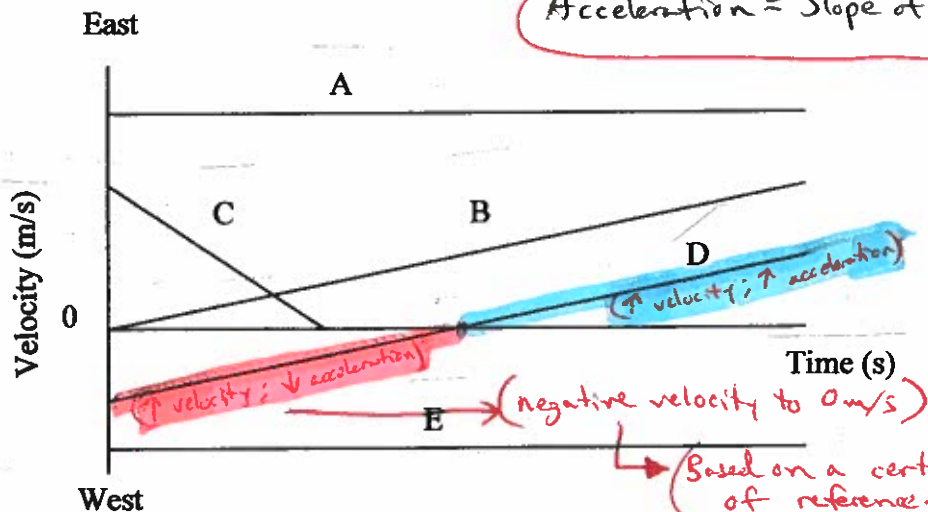
   It can, but... → Need to know direction of velocity and direction of acceleration.

   Circle One :   **True**   False

V. Determining Acceleration From A V-T Graph

1. **Identify the rate of acceleration for each slope in the v-t graph.**

   Acceleration = Slope of V-T graph

   (p.62)

   East

   A

   C   B

   D   (↑ velocity; ↑ acceleration)

   Velocity (m/s)   0

   (↑ velocity; ↓ acceleration)

   Time (s)

   E → (negative velocity to 0 m/s)

   (Based on a certain frame of reference.)

   West

   West: Velocity + acceleration = Opposite
   East: Velocity + acceleration = Same

   Slope A = _Zero acceleration._
   Slope B = _Constant, positive acceleration._   (Positive velocity) (Velocity + acceleration are opposite)
   Slope C = _Starts with positive velocity, slows down, stops_
   Slope D = _Starts west, slows down, zero, moves east → speeding up_
   Slope E = _Zero acceleration._

2. **Write out the formula for determining average acceleration.**

$$\bar{a} \equiv \frac{\Delta v}{\Delta t} = \frac{v_f - v_i}{t_f - t_i}$$