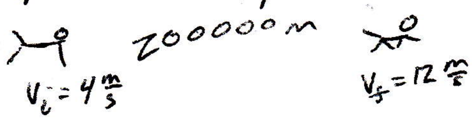
Acceleration math part 1. Drawings, drawings and more drawings!

1) A cheetah is running at 4 $\frac{m}{s}$ in the positive direction. The cheetah then speeds up to run at 12 $\frac{m}{s}$ in the positive direction. What is the cheetah's ΔV?

let positive be positive



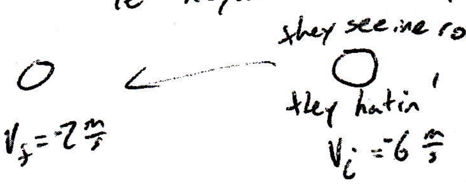
$\Delta V = V_f - V_i$

$= 12\frac{m}{s} - 4\frac{m}{s}$

$= 8\frac{m}{s}$

2) A ball is rolling at 6 $\frac{m}{s}$ in the negative direction. It slows to 2 $\frac{m}{s}$ in the negative direction. What it the ball's ΔV?

let negative be negative



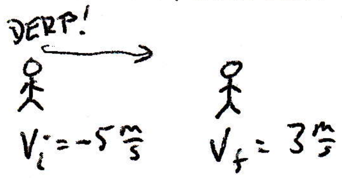
$\Delta V = -2\frac{m}{s} - (-6\frac{m}{s})$

$= 4\frac{m}{s}$

↑ sign opposite of direction of travel means slowing down

3) A person is travelling at 5 $\frac{m}{s}$ towards the west. He turns around and starts moving at 3 $\frac{m}{s}$ towards the east. What is the person's ΔV?

let east be positive



$\Delta V = V_f - V_i$

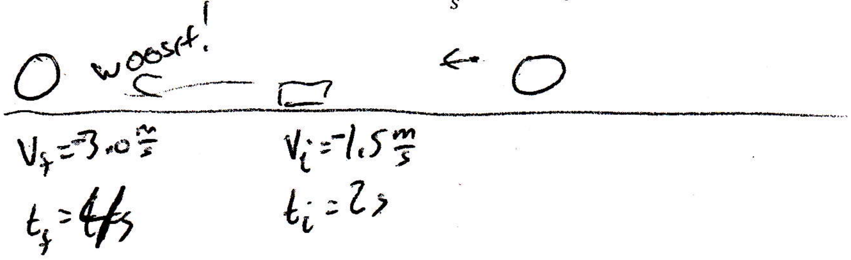
$= 3\frac{m}{s} - (-5\frac{m}{s})$

$= 3\frac{m}{s} + 5\frac{m}{s}$

$= 8\frac{m}{s}$

4) A bowling ball is travelling south along a channel at 1.5 $\frac{m}{s}$. It hits a pair of spinning wheels at t=2 s that accelerates it to 3.0 $\frac{m}{s}$ south by t=4s. What is the bowling ball's acceleration?

let south be negative



$A = \frac{\Delta V}{\Delta t}$

$= \frac{V_f - V_i}{t_f - t_i}$

$= \frac{-3.0\frac{m}{s} - (-1.5\frac{m}{s})}{4s - 2s}$

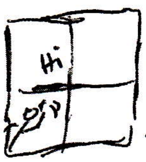
$= \frac{-1.5\frac{m}{s}}{2s}$

$= -0.75\frac{m}{s^2}$

5) A tennis ball falling downwards passes the top of a window 5 s after a stopwatch is started. If it has a velocity of 3.6 $\frac{m}{s}$ downward as it crosses the window top, what is its velocity when the stopwatch reads 8 s?

let down be negative

Acceleration due to gravity is $-9.8\frac{m}{s^2}$



$t_i = 5s$

$V_i = -3.6\frac{m}{s}$

$t_f = 8s$

$V_f = ?$

$\Delta V = a \Delta t$

$V_f - V_i = a(t_f - t_i)$

$V_f - (-3.6\frac{m}{s}) = -9.8\frac{m}{s^2}(8s - 5s)$

$V_f + 3.6\frac{m}{s} = -9.8\frac{m}{s^2} \times 3s$

$V_f + 3.6\frac{m}{s} = -29.4\frac{m}{s}$ -3.6

$V_f = -~~25.8~~\frac{m}{s}$

$-33\frac{m}{s}$

6) A .357 magnum is fired west at a test range. It passes a radar device 1 second after it has been fired that measures the velocity to be 410 $\frac{m}{s}$ [W]. If the bullet is subjected to a uniform **deceleration** of 20 $\frac{m}{s^2}$, what is its velocity when the timing device reads 8 s?

let W be negative

$t_f = 8s$

$V_f = ?$

$A = 20\frac{m}{s^2}$

deceleration, so sign is opposite direction of travel

$t_i = 1s$

$V_i = -410\frac{m}{s}$

$\Delta V = a \Delta t$

$V_f - V_i = a(t_f - t_i)$

$V_f - (-410\frac{m}{s}) = 20\frac{m}{s^2}(8s - 1s)$

$V_f + 410\frac{m}{s} = 20\frac{m}{s^2}(7s)$

$V_f + 410\frac{m}{s} = 140\frac{m}{s}$

$V_f = -270\frac{m}{s}$

7) A car is travelling west at 20 $\frac{m}{s}$ [W] at 11:45 am. At 11:47 am, the car is travelling at 45 $\frac{m}{s}$ [E]. What is the cars acceleration?

let W be negative

$V_i = -20\frac{km}{min}$

$t_i = 0m$

$V_f = 45\frac{km}{min}$

$t_f = 2m$

$A = \frac{\Delta V}{\Delta t}$

$= \frac{45\frac{km}{min} - (-20\frac{km}{min})}{2min - 0min}$

$= \frac{65\frac{km}{min}}{2min}$

$= 32.5\frac{km}{min}$