Monday Oct 17 Physics

1) Try This Word Problem in Class:

Marvin the marble starts from rest with an acceleration of 3 m/s^2. Sammy the sphere starts 2 m behind him with an acceleration of 5 m/s^2. How far does each travel before they collide?

Marvin Vi=0, A = 3, D=??, T=??

$D=ViT + 1/2AT^2$ $D= 0 + ½(3)T^2$ $D=1.5T^2$

Sammy Vi=0, A= 5, Dsam=??=Dmarv+2, T=??

$D+2=ViT + 1/2AT^2$ $D= 0 + ½(5)T^2-2$ $D=2.5T^2-2$

Sammy hits Marv in the same place (disp) at the same time so:

Sammy	=	***Marv***
$2.5T^2-2$	=	***$1.5T^2$***
$1T^2$	=	***2***
T	=	***1.414 sec***

$D= 1.5 (1.414)^2 = 3$ meters (marv), Dsam=5 meters

2) Go over any questions from pg 55, 58 (check answers)

3) Finish questions on and hand in Ramp Lab…

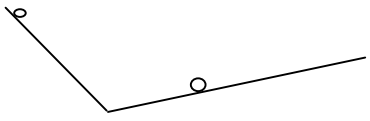
4) Wed/Thur Start Balls Collide (as part of Ramp Lab) so read ahead!

5) Homework, Word Problems on back (do on separate paper please)

6) Get yellow light project tomorrow/Thur

Ball1 rolls down a 2m ramp in 3 seconds.
What is its initial velocity? ***Vi=0 m/s***
What is its average velocity? (Eq 1 or 2) ***Vavg=D/T=2/3=.667 m/s***
What is its final velocity? (Eq 1 or 2) ***Vavg=(vi+vf)/2 .667 = (0+vf)/2, Vf=1.333 m/s***

What is its acceleration? (Eq 3 or 4) ***$D=ViT + ½AT^2$ $2=0+1/2A(3)^2$, $2=4.5A$, $A=.4444$ m/s^2***
OR $A=(1.333-0)/3=.444$ m/s^2



Ball2 rolls down a shallower 2m ramp in 4 seconds.
What is its initial velocity?
Vi=0 m/s
What is its average velocity? (Eq 1 or 2) ***Vavg=D/T=2/4=.5 m/s***
What is its final velocity? (Eq 1 or 2) ***Vavg=(vi+vf)/2 .5 = (0+vf)/2, Vf=1 m/s***

What is its acceleration? (Eq 3 or 4) ***$D=ViT + ½AT^2$ $2=0+1/2A(4)^2$, $2=8A$, $A=.25$ m/s^2***
OR $A=(1-0)/4=.25$ m/s^2

If I want Ball2 to collide into Ball1, what will be the same between them? ***TIME***
Use the TIME of Ball1 and the ACCELERATION of Ball2 and find the Distance I have to place Ball2 at to make it crash into Ball2.***Time = 3 seconds, $A=.25$ m/s^2, Vi=0 m/s D=????***
Eq 4 , $D= ViT+1/2AT^2$ $D= 0+ ½(.25)(3)^2 = 1.125$ m to make ball2 collide with ball1

A speeder passes a parked police car at a constant 30 m/s. The police car starts from rest with a uniform acceleration of 2.44 m/s^2.

a) How much time passes before the speeder is overtaken by the police car?

Speeder: ***Vi=30, Vf=30, D=VavgT D= 30T***

or D =ViT+1/2AT^2=20T +1/2(0)T^2 = 30T = D

Police: ***Vi=0, A=2.44, D =ViT+1/2AT^2= (0)T + ½ (2.44)T^2 = 1.22T^2***

"overtaken" means same place (D) at same time (T) so

speeder = police

30 T = 1.22T^2

one solution is T=0, but we know they are in the same place then!

30 = 1.22 T

T= 30/1.22 = 24.59 sec

b) How far does the speeder get before being overtaken by the police car?

D=30T = 20 (24.59) = 737.7 meters

I am 50 meters away from an intersection that is 10 m across going 20 m/s. I see the light turn yellow. My car can accelerate at the rate of 3 m/s^2. What is the shortest time I can make it across the intersection?

Vi = 20 m/s, D=50+10=60 meters, A = 3

D =ViT+1/2AT^2

60=20T+1/2(3)T^2

0=1.5T^2+20T-60

Using quadratic equation or math solver….

T= 2.522 sec or T=-15.86 so T=2.522 sec…

4) I start off going 50 m/s and deaccelerate at the rate of -2 m/s^2. How far do I have to travel before I stop?

Vi=30 m/s, A = -2 m/s^2, Vf=0 D=???

Vf^2=Vi^2+2AD

0=(30)^2 +2(-2)D

-900= -4 D

D= 225 m

**** (H)When will I be 35 m from the start?

Vi = 50 m/s, D=35 meters, A = -2

D =ViT+1/2AT^2

35=50T+1/2(-2)T^2

0=-1T^2+50T-35 or 0= T^2-50T+35

Using quadratic equation or math solver….

T= 49.28 sec or T= .71 both are correct (once going and once in the reverse direction!)

****(H) One car (Frank) starts 4 meters ahead of another (Bob) . They both accelerate at the rate of 3 m/s^2. If car one (Frank) stops accelerating after 4 meters, when will car two (Bob) catch up to him?

Bob: Di=0, Vi=0, A=3 $D = ViT+1/2AT^2 = (0)T + ½ (3)T^2 = 1.5T^2$

Frank Di=4, Vi=0, A=3, Df =8 for the first part of the journey

$Vf^2=Vi^2 + 2 A D = 2 (3)(4)$, ***Vf = 4.899 m/s at the end of the first part***

$8-4=4= D =ViT+1/2AT^2= (0)T + ½ (3)T^2$ ***so*** $4=1.5T^2$, ***T =1.633 for the first part to go 4 meters (8 meters from the start)***

for the second part of the journey, Frank went 4.899 m/s for (T-1.633) seconds, so D= Vavg T = 8.9 (T-1.633) for the second part.

So Frank's total displacement (after he stops accelerating) is

D= 4 (start)+4 (first part)+ 4.899 (T-1.633)(even speed)

Bob "catch up" to Frank in same place at same time:

Bob	=	***Frank***
$1.5T^2$	=	***4+4+ 4.899 (T-1.633)***
0	=	$1.5T^2$ ***– 4.899 T -4.899(-1.633)-8***
0	=	$1.5T^2$ ***– 4.899 T -4.899(-1.633)-8***
0	=	$1.5T^2$ ***– 4.899 T +8-8***
0	=	$1.5T^2$ ***– 4.899 T +0***

T= 3.266 sec