TUE, NOV 30th PHYSICS (ACADEMIC)

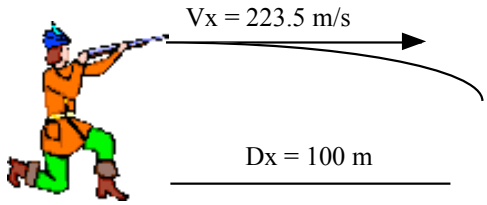
1) Get out HW to be checked. Go over answers.

2) Work on Projectile Problems 2. Hand in at end of class or next class.

3) Read Lab Sheet on Projectiles for next class. Remember that you will be working individually.
TEST TUE DEC 7th!!!

Projectile Problems 2: Remember the steps and formulas…. Solve on a fresh piece of paper to leave yourself room to work!!!

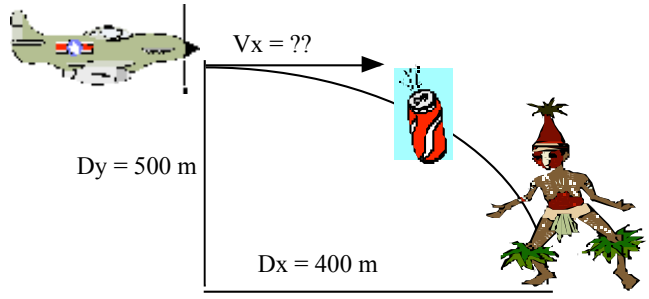
1)If a bullet from a gun is shot horizontally at 500 mph (223.5 m/s), how far does it drop after 100 meters?
Answer:Dy = - .98 m



X
Vx = 223.5 m/s
Dx=100 m
Dx=VxT
*100 = 223.5 * T*
T= 100/223.5 =.4474 sec

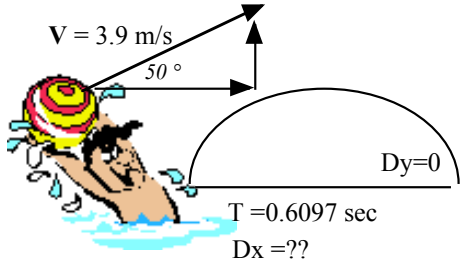
Y
Viy = 0
Ay = -9.8 m/s²
T = .4474 sec
Dy = ViyT + ½ AyT²
Dy = 0(.4474) + ½ (-9.8)(.4474)²
Dy=-.98 m

2) In the movie "The Gods must be Crazy", it begins with a pilot dropping a bottle out of an airplane. It is recovered by a surprised native below, who thinks it is a message from the gods. IF the plane from which the bottle was dropped was flying at an altitude of 500 m, and the bottle lands 400m horizontally from the initial dropping point, how fast was the plane flying when the bottle was released?
Answer: Vx =39.6 m/s (gave the wrong answer initially, sorry!!!)



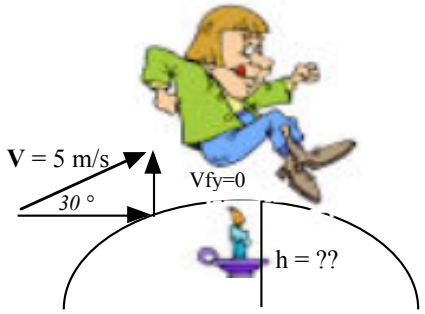
Y
Dy = - 500m
Ay = -9.8 m/s²
Viy = 0 m/s
T=??
Dy = ViyT + ½ AyT²
-500 = 0T+ ½ -9.8 T²
-500 = -4.9T²
-500/-4.9 = T²
T= 10.1 sec
X
Dx = 400 m
T = 10.1 sec
Dx=VxT
400 = Vx (10.1)
Vx = 400/10.1
Vx = 39.6 m/s

3) If I toss a marble into the air at a velocity of 3.9 m/s at an angle of 50 degrees, and it reaches the same height 0.6097 seconds later, how far did it travel horizontally?
Answer: Dx=1.528 m



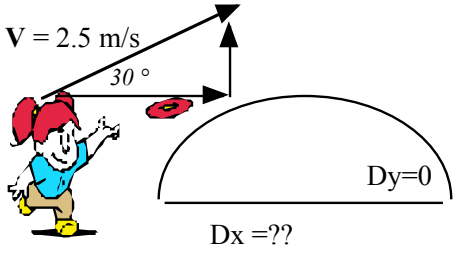
X
Vx = V cos θ
Vx = 3.9 cos (50°)
*Vx = 3.9 *.643*
Vx= 2.5 m/s
Dx = Vx T
Dx =??
T = .6097
Dx = 2.5 (.6097)
Dx= 1.528 m

4) Jack be nimble, Jack be quick, Jack jumped over the candlestick with a velocity of 5 m/s at an angle of 30 degrees. Did Jack burn his feet on the 0.25 m high candle?
Answer: Dy = .319 m, no!



Y
We want the distance at the top of the trip…. Dy = max height
Vfy=0
Ay = -9.8 m/s²
Viy = V sin θ
Viy = 5 sin(30°)
*Viy =5 * .5*
Viy = 2.5 m/s
Vfy²=Viy² + 2 Ay Dy
0² = 2.5² + 2 (-9.8) Dy
-6.25 = -19.6 Dy
Dy = -6.25/-19.6
Dy =.319 m

5) RANGE: How far away from a target, level with you, do you have to stand to hit it, throwing a ball at 25 m/s at a 30 degree angle?
Answer: Dx=55.23 m



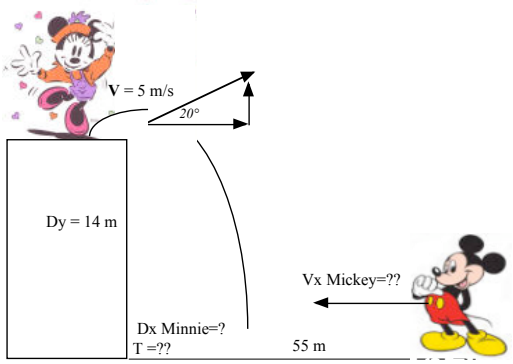
X
Vx = V cos θ
Vx = 25 cos 30°
Vx =21.65 m/s
Dx = Vx T
Dx = 21.65 T

Y
Target is level, so Dy = 0
Ay = -9.8 m/s²
Viy = V sin θ
Viy = 25 sin 30°
Viy = 12.5 m/s
Dy = ViyT + ½ AyT²
0 = 12.5 T + ½(-9.8)T²
0 = T (12.5 + -4.9 T)
0 = 12.5 + -4.9 T
-12.5 = -4.9T
T = -12.5/-4.9
T =2.551 sec
Back to X

Dx = 21.65 T
Dx = 21.65 (2.551)
Dx = 55.23 m

6) Minnie jumps up off a 14 meter high cliff at a 20 degree angle with a speed of 5 m/s. Mickey is at the bottom of the cliff, 55 meters away from the bottom. He starts running when she jumps . How long does it take Minnie to reach the bottom? How fast should Mickey run to catch her?

Answer: T=1.87 sec, Vmickey=29.411 m/s (to the cliff, or Vx = 24.65 m/s to exactly catch her)



<u>Y for Minnie</u>

Dy = - 14 m

Ay = -9.8 m/s^2

Viy = V sin θ

Viy = 5 sin 20°

Viy = 1.71 m/s

Dy = ViyT + ½ AyT^2

-14 = 1.71 T + ½(-9.8)T^2

0 = (-4.9)T^2 + 1.71T + 14

Using quadratic formula or math solver

T =1.874 sec

<u>X for Minnie</u>

Vx = V cos θ

Vx = 5 cos 20°

Vx =4.698 m/s

Dx = Vx T

Dx = 4.698 (1.874)

Dx = 8.8 m

<u>Mickey in the X</u>

Dx = 55 – 8.8 = 46.2 m

Dx = Vx T

46.2 = Vx (1.874)

Vx = 24. 65 m/s