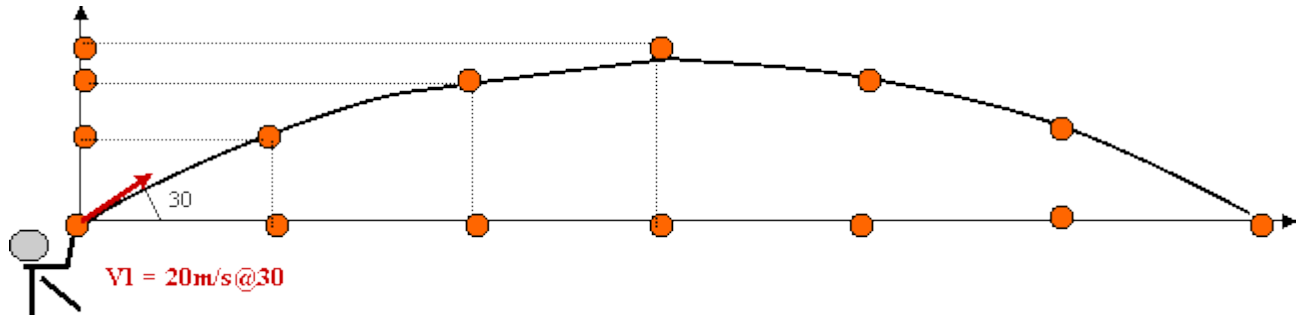


## ASSIGNMENT PROJECTILE MOTION

### part I

Suppose a player throws a ball at a initial velocity of 20m/s @ 30 degrees above horizontal . The ball follows a parabola before coming back to the same height.



The big idea of Galileo is that the motion can be divided into 2 independent components.

#### Along the horizontal we have:

no acceleration  $a = 0$

so velocity  $V = \text{initial velocity } V_{ox} = 20 \cos(30) = \underline{\hspace{2cm}}$

so the displacement  $x = V_{ox} t$

#### Along the vertical we have :

acceleration = acceleration due to gravity =  $-10\text{m/s/s}$

initial velocity  $V_{oy} = 20 \sin(3) = \underline{\hspace{2cm}}$

so velocity  $V = V_{oy} + at$

displacement  $y = V_{oy} t + 0.5 at^2$

$V^2 = V_{oy}^2 + 2ay$

Average  $V = 0.5 (V_{oy} + V)$

average  $V = y/t$

the origin is placed in the and of the player.

1.initial velocity along vertical  $V_{oy} = \underline{\hspace{2cm}}$  (y-component of the vertical velocity)

maximum height =  $y_{max} = \underline{\hspace{2cm}}$

time to reach the maximum height =  $\underline{\hspace{2cm}}$

time for flight =  $\underline{\hspace{2cm}}$

2.initial horizontal velocity =  $V_{ox} = \underline{\hspace{2cm}}$

Find the range of the projectile  $x_{max}$  (horizontal displacement  $x$  with time = time of flight)

3. How fast it is moving when  $t=1.5$  second, that is find final velocity  $V$ . To find the final velocity  $V$ , you need to find the final  $V_x$  (x-component) and the final  $V_y$  (y-component) because  $V^2 = V_x^2 + V_y^2$

To find  $V_x$  use the horizontal equations of kinematics (above) . To find  $V_y$  use the vertical equations of kinematics.

4. Draw the final velocity  $V$  on the trajectory (show if it is points up or down) depending on the signs of the components.

Find the direction of the velocity after 1.5 second. That is find the angle such as  $\tan(\text{angle}) = V_{oy}/V_{ox}$

**II. Solve the problem below so Peter does not get a F**

