

```

1  !Name:Sachinkumar Joshi
2  !Date: 4/11/2022
3  !PRN: 2202100455
4  !Assinment-8: Q5 - Projectile Motion Using Verlet Algorithm
5
6  program Q5
7      implicit none
8      real::dt,t0,t1,theta
9      real*8::x0,v0,x1,vx0,vx1,vy0,vy1,ax,ay,y1,y0
10
11     open(1,file='Q5-Position.txt', status='unknown')
12     open(2,file='Q5-Velocity.txt', status='unknown')
13
14     dt=1                !increment
15     t0=0.0              !intial time
16     x0=0.0d0            !intial x position
17     y0=0.0d0            !intial y position
18     v0=1000             !initial velocity
19     theta=3.14/6        !Angel of throw
20     vx0=v0*cos(theta)   !initial velocity in x direction
21     vy0=v0*sin(theta)   !initial velocity in y direction
22
23     write(1,*) "#      t                                x                                y"
24     write(1,*) t0,x0,y0
25     write(2,*) "#      t                                Vx                                Vy"
26     write(2,*) t0,vx0,vy0
27
28     do
29         t1=t0+dt        ! time
30         ! X Component
31         x1=x0+(vx0*dt)+(0.5d0*ax(t0)*dt**2)    !Position at time t1
32         vx1=vx0+(0.5d0*(ax(t1)+ax(t0))*dt)      !velocity at time t1
33
34         ! Y Component
35         y1=y0+(vy0*dt)+(0.5d0*ay(t0)*dt**2)    !calculating value of x at time t1
36         vy1=vy0+(0.5d0*(ay(t1)+ay(t0))*dt)      !calculating value of x velocity at
time t1
37
38         if (y1<0.0d0) exit
39         write(1,*) t1,x1,y1
40         write(2,*) t1,vx1,vy1
41
42         t0=t1
43         x0=x1
44         y0=y1
45         vx0=vx1
46         vy0=vy1
47     enddo
48 end program Q5
49
50 function ax(t)
51     implicit none
52     real,intent(in)::t
53     real*8::ax
54
55     ax=0.0d0        ! acceleration along x direction
56     return
57 end function ax
58
59 function ay(t)
60     implicit none
61     real,intent(in)::t
62     real*8::ay
63
64     ay=-9.8d0        ! acceleration along y direction
65     return
66 end function ay

```