Projectile motion

Monday, 12 February 2024 7:21 pm

A projectile is an object upon which the only force acting is gravity

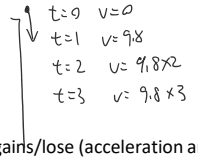
when

- Slowdown when object up, speed up when object down
- Assume no air resistance existing in projectile

In this graph, the ball is throwed at the angle
when this parabolic path happen - indicate the path is symmetrical
The object is

- Same time to go up and down
- Acceleration is same magnitude but different direction
- Same distance when go up and down
- Same speed when go up and down

As the object falling
The velocity increase at constant rate
The distance increase at increase rate (greater distance each time)
The acceleration is constant.



When explaining the acceleration - the object is moving (direction) and gains/lose (acceleration and unit)(speed) every second

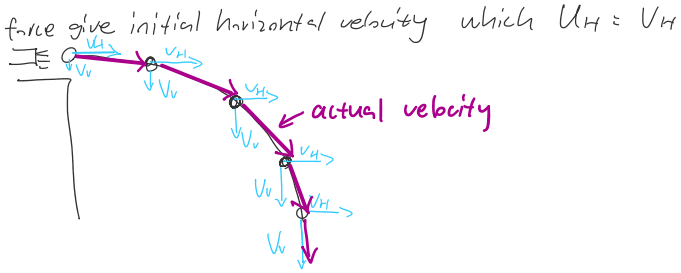
B) A projectile thrown up vertically

- As the ball goes up, it slows down, it decelerates i.e a=-9.8
- Its momentarily stationary (stop) when it reaches the maximum height (acceleration and velocity changes direction, speed become zero.)
- Its accelerates at 9.8m/s^2 on the way down
- The time eaken to travel up is the same as the time taken to travel down to its original starting point
- The speeds is the same when the ball is upwards and downwards (in the same height)

C) A projectile fired horizontally

- The projectile move horizontally at constant velocity because the horizontal force is zero
- The projectile move vertically with constant acceleration (gravity 9.81)

These two component of motion are independent of one another and are consider separately when doing calculations.
However, in both motion the time of: T(horizontal) = T(vertical)



When doing the question, we can list out all the information of horizontal and vertical seperately and calculate out

Eg: for how= far the horizontal travels(range)
Use. Kinematic equation: $s_v = ut + \frac{1}{2}at^2$

then consider $v = \frac{s}{t}$

$s = vt$

Except there is initial force acting on the object, the u is always 0

D) A projectile fired upwards at an angle to the horizontal:
Projectile goes up and down -full projectile motion

Gravity goes up = -9.81m/s^2

full projectile motion graph

V_H constant
V_v changes as a_v constant

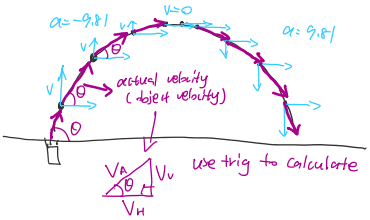
When change direction:(the object don't have to stop)

When an object is changing direction, its velocity changes direction as well. If the object is moving in a

Path projectile [illegible]

V_H constant

V_v changes as a_v constant



When change direction:(the object don't have to stop)
Acceleration do not change(always existing) - stay in constant
Velocity change due to direction change, which must first be 0 in order to change direction
Speed constant (always existing) do not change by direction change, as the Turning do not change the speed

When an object is changing direction, its velocity changes direction as well. If the object is moving in a circular path, its speed might remain constant, but its velocity is constantly changing because velocity is a vector quantity that includes both speed and direction. Acceleration occurs whenever there is a change in velocity, so when an object changes direction, it experiences acceleration even if its speed remains constant.

Deceleration is a include in acceleration

An object fired at smaller angle to horizontal, bigger horizontal velocity - do not go very far
An object fired at bigger angle to horizontal, less horizontal velocity big vertical velocity - do not go very far
Distance traveled with Horizontal angle 10 = horizontal angle 80
Horizontal angle 20 = horizontal angle 70....
Horizontal angle 90 - n = horizontal angle n