**Problem:**

A player kicks a football at an angle of 37o with the horizontal and with an initial speed of 48 ft/sec.

1. How long does it take to hit the ground? What is the hang time?

Draw a completely labeled diagram for the situation.

**Two – Dimensional Kinematic Equations**

**Parametric Equations:**

Horizontal Vertical

position X(t) = Vox t + xo Y(t) = (1/2) ay t2 + voy t + yo , where

ax = 0; ay = g = - 9.8m/s/s or -32ft/s/s

velocity Vx(t) = ax t + Vox Vy(t) = ay t + Voy

In our problem:

initial position X0 = 0; Y0 = 0;

Velocity components V0x = V0 cos 37°; V0y = V0 sin 37°

V0= 48 ft/sec . So substitute and get the velocity components.

V0x = V0 cos 37°= V0y = V0 sin 37°=

We insert the known values for acceleration & initial conditions and obtain the specific equations for the position of the football at any given time, t:

|  |  |
| --- | --- |
| x(t) = | y(t) = |

**We want to answer the following questions:**

Determine the hang time. *How long was the ball in the air for ?*

Determine the range. *How far away did the object land from its start position?*

What was the highest point reached? How long did it take to reach the highest point?

Additional Questions? ( Extend)

**Methods:**

Algebraically, Graphically and confirm in Golf Range Gizmo

Ready?

Again – what are we NOT accounting for? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

***Extension Problem:***

A second player is standing at a distance of 100 ft from the kicker in the direction of the kick and starts running to meet the ball at the instant it is kicked. How fast must he run in order to catch the ball before it hits the ground?

**Can you think of a few more?**