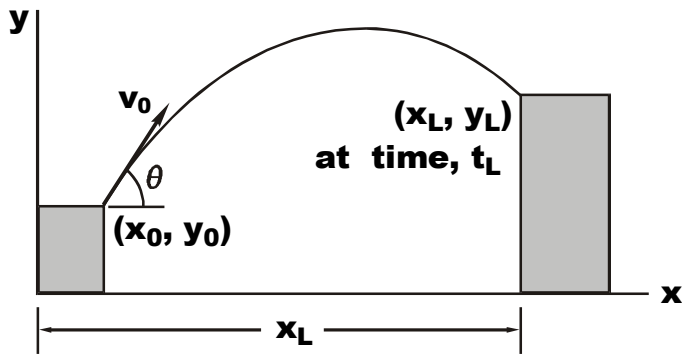


General Projectile Problem



Projectile Problem Variables:

Launch Location: (x_0, y_0)

Launch Velocity and Angle: $(v_0 \text{ at } \theta)$

Landing Location and Time: (x_L, y_L) at time, t_L .

Class A Projectile Problems:

For these, you are given complete launch data:

Given: (x_0, y_0) , $(v_0 \text{ at } \theta)$, and *one of* (x_L, y_L, t_L)

Find: The *remaining two of* (x_L, y_L, t_L)

① **Given:** $[(x_0, y_0), (v_0, \theta), \text{ and } x_L]$ **Find:** (y_L, t_L)

② **Given:** $[(x_0, y_0), (v_0, \theta), \text{ and } y_L]$ **Find:** (x_L, t_L)

③ **Given:** $[(x_0, y_0), (v_0, \theta), \text{ and } t_L]$ **Find:** (x_L, y_L)

For problems ① through ③, write the two position equations

$$x = x_0 + v_x t$$

$$y = y_0 + v_{0y} t - \frac{1}{2} g t^2$$

and solve for the two unknowns.

④ **Given:** $[(x_0, y_0), (v_0, \theta)]$ **Find:** $h_{\text{apex}}, t_{\text{apex}}$ (at apex)

⑤ **Given:** $[(x_0, y_0), (v_0, \theta), \text{ and sloped ground}]$ **Find:** (x_L, y_L, t_L)