Answer on Question#62075 – Physics – Mechanics – Relaativity

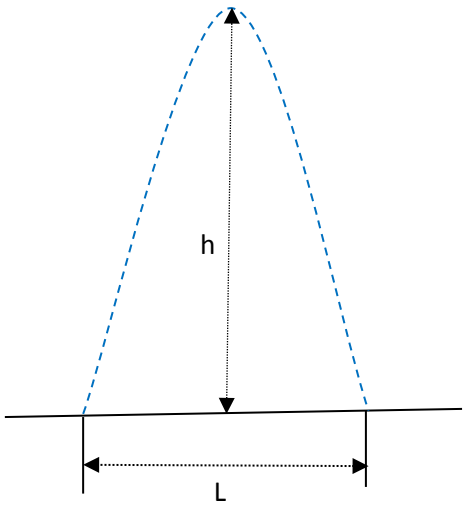
A softball is fouled off with a vertical velocity of 30m/s and a horizontal velocity of 15m/s. Assumed starting and stopping at height of 0m. How fast is the ball traveling horizontally 1.5sec after if is fouled off? How high does the softball travel? How far horizontally does it go?

Solution. Consider the motion a softball. Neglecting air friction in the horizontal direction on softball do not apply force, so the softball will move with constant speed $v_x = 15\frac{m}{s}$. Therefore 1.5sec after if is fouled off softball has horizontal speed $v_x = 15\frac{m}{s}$. In vertical direction the force of gravity so the softball has a downward acceleration $g = 9.8\frac{m}{s^2}$. Hence the speed and height of the body with time are described by the formulas:

$v_y = 30 - 9.8t$

$h = 30t - \frac{g \cdot t^2}{2}$.

As a result, the trajectory of the softball will be a parabola



In the vertical direction softball rises till its vertical speed will equal zero. Hence high does the softball travel equal to:

$0 = 30 - 9.8t \to t = \frac{30}{9.8} \approx 3.06$sec.

$h = 30 \cdot 3.06 - \frac{9.8 \cdot 3.06^2}{2} \approx 45.9m$.

Softball rises and falls at the same time.

$0 = v_x - gt_1 \to h = v_x t_1 - \frac{g \cdot t_1^2}{2} = gt_1^2 - \frac{g \cdot t_1^2}{2} = \frac{g \cdot t_1^2}{2}$ (t_1 – rise time)

$h = \frac{g \cdot t_2^2}{2}$ (t_2 the fall with zero initial velocity). Hence

$\frac{g \cdot t_1^2}{2} = \frac{g \cdot t_1^2}{2} \to t_1 = t_2$.

Therefore the length of the horizontal path is equal to

$L = v_y(t_1 + t_2) = 15 \cdot \frac{60}{9.8} \approx 91.8m$

Answer. 1) $v_x = 15\frac{m}{s}$ 2) 45.9m 3) 91.8m.