

Purpose of calculation:

To demonstrate that vertical motion is independent of horizontal motion.

Calculation Reference

HyperPhysics Trajectories:

<http://hyperphysics.phy-astr.gsu.edu/hbase/traj.html#tracon>

Calculation Validation

This calculation has been verified

with the HyperPhysics website.

$$t = 1.5 \text{ s}$$

$$a_x = 0 \text{ ft/s}^2$$

$$v_{0x} = 30 \text{ ft/s}$$

$$x_0 = 0 \text{ ft}$$

$$g = 32.15 \text{ ft/s}^2$$

$$a_y = -32.15 \text{ ft/s}^2 = -g$$

$$v_{0y} = 0 \text{ ft/s}$$

$$y_0 = 100 \text{ ft}$$

$$t_{\text{flight}} = 2.494161 \text{ s} = \sqrt{\frac{2y_0}{g}}$$

$$v_{y_impact} = -80.1873 \text{ ft/s} = -\sqrt{(2gy_0)}$$

$$R = 74.82483 \text{ ft} = v_{0x}t_{\text{flight}}$$

$$v_x = 30 \text{ ft/s} = v_{0x} + a_x t$$

$$x = 45 \text{ ft} = x_0 + v_{0x}t + 0.5a_x t^2$$

$$v_y = -48.225 \text{ ft/s} = v_{0y} + a_y t$$

$$y = 63.83125 \text{ ft} = y_0 + v_{0y}t + 0.5a_y t^2$$

