Suppose a compressed air cannon fires a pumpkin straight up into the air from a height of 18 feet and provides an initial upward velocity of 105 feet per second. What function rule would combine these conditions and the effect of gravity to give a relation between the pumpkin's height ***h*** in feet and its flight time ***t*** in seconds?

$$h(t) = h_0 + v_0 t - 16t^2$$

$$h(t) = 18 + 105t - 16t^2$$

$$-16t^2 + 105t + 18$$

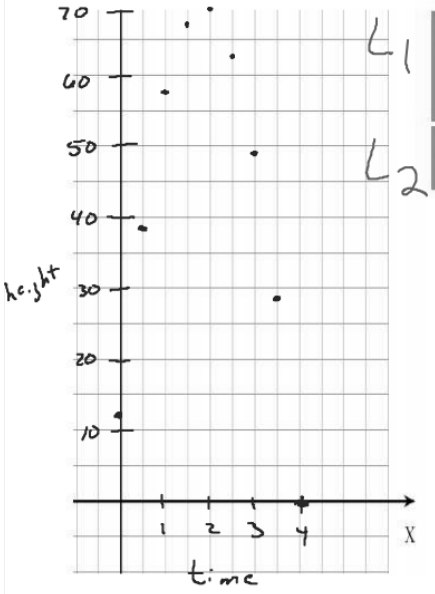
$$h(2) = 18 + 105(2) - 16(2)^2$$

$$18 + 210 - 64$$

$$164 \text{ ft}$$

Suppose that you were able to use a ranging tool that records the height of a flying pumpkin every half second from the time it left a cannon. A sample of the data for one pumpkin launch appears in the following table. Plot the data on a graph and experiment with several values of v_0 and h_0 in search of a function that models the data pattern well.

$h(t) = 12 + 61t - 16t^2$



Time (in seconds)	0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0
Height (in feet)	12	38	57	67	69	63	49	28	0

t

= t

= h(t)

h(t)

$h(t) = h_0 + V_0 t - 16t^2$

$h_0 = 12$

$V_0 = ?$

$h(t) = 12 + V_0 t - 16t^2$

$0 = 12 + V_0(4) - 16(4)^2$

$0 = 12 + 4V_0 - 256$

$0 = -244 + 4V_0$

$+244 \quad +244$

$\frac{244}{4} = \frac{4V_0}{4}$

$61 = V_0$

Use a calculator that offers quadratic curve-fitting to find a quadratic model for the sample data pattern. Compare that automatic curve-fit to what you found with your own experimentation.

Hand = $h(t) = -16t^2 + 61t + 12$

Calc → $h(t) = -15.75t^2 + 59.76t + 12.32$