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Crows Dropping Nuts

A reciprocal function is multiplicative inverse or reciprocal of a number *x,* denoted by $\frac{1}{x}$ or x^{-1}.The purpose of this portfolio is to help us explore the reciprocal function and discover that we can determine an equation through trial and error by making an educated guess through knowing the rule and patterns of the parameters.

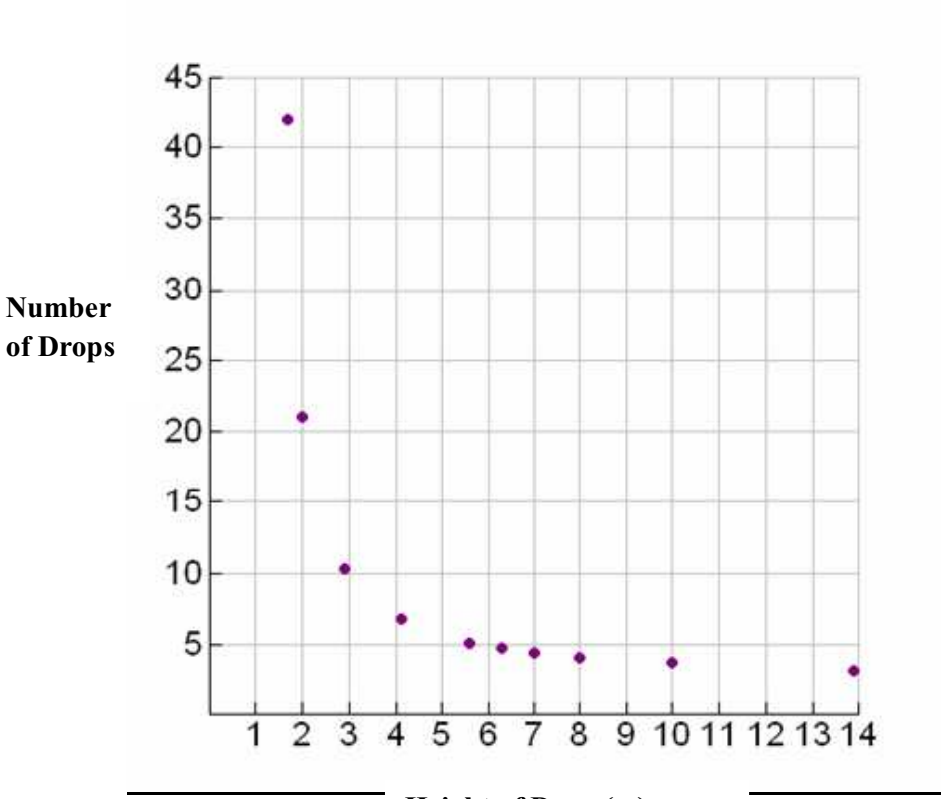
Part 1- Large Nuts

Crows cannot break nuts since their beaks are weak, instead they will drop the nut repeatedly on a hard surface to open the nut. The following table shows the number of average drops it takes at a certain height to break the nut.

Height of drop(m)	1.7	2.0	2.9	4.1	5.6	6.3	7.0	8.0	10.0	13.9
Number of drops	420	21.0	10.3	6.8	5.1	4.8	4.4	4.1	3.7	3.2

This is a graphical representation of the large nuts data using TI InterActive.

Relationship of Height of the drop vs. Number of drops for the Large Nuts



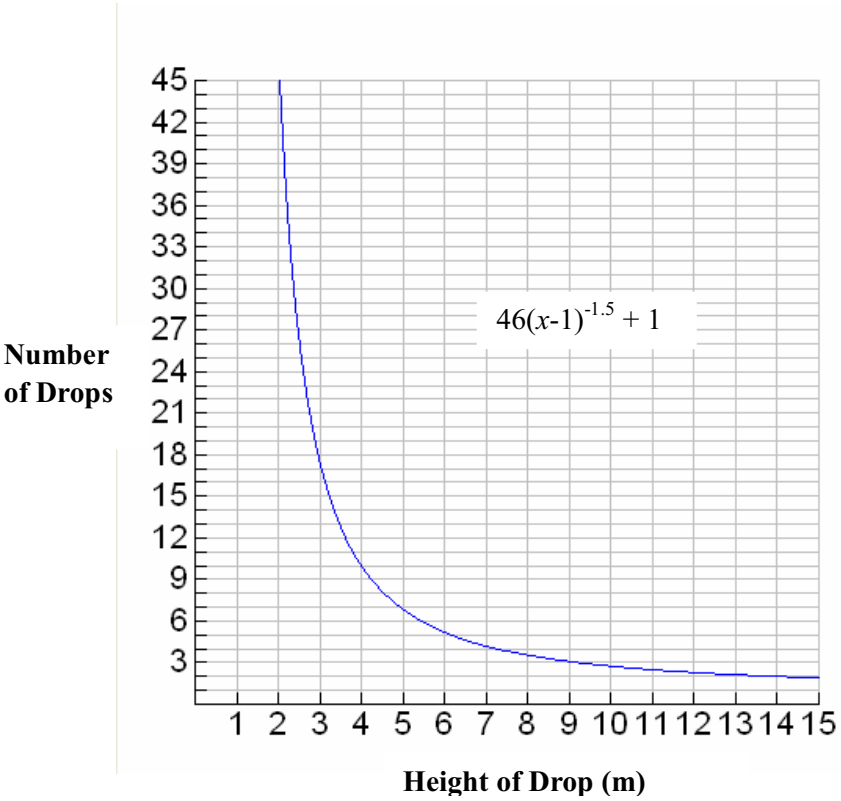
The variables in this data are that the ected the frequency, and this variable is put into an average. Another variable is the frequency of drops is also an average, where it is impossible to have 6.8 times of drops to open a nut. This has been converted into an average because it provides much clearer data, which could be put into one graph and distinguish the equation for it. Another variable is the size of the nut, since it takes a higher number of drops to break it at a lower height, but at a higher height it takes fewer drops.

The parameters in this data are for the reciprocal function $\frac{a}{(x-b)}$ +d

The parameters are that ***a*** is the vertical stretch, ***b*** is the horizontal shift and the vertical asymptote, ***c*** is the rate of fall or the vertical shift, and ***d*** is the horizontal asymptote.

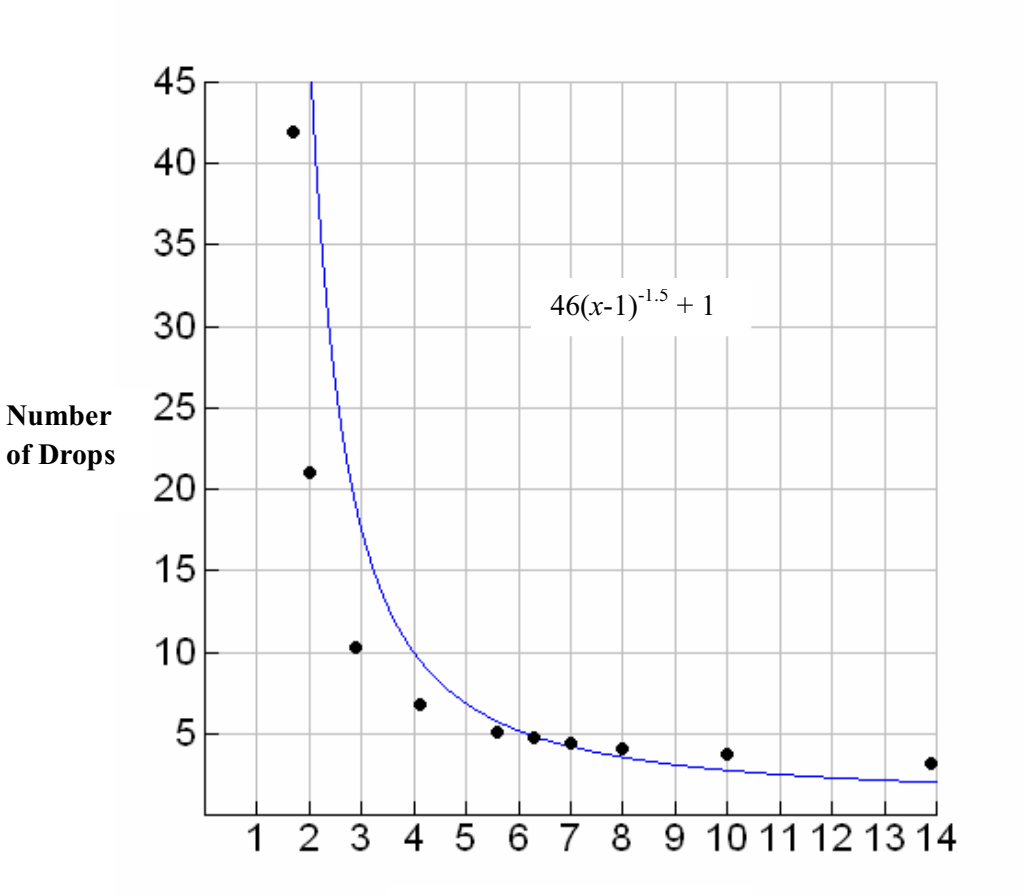
The function that models the behavior of the large nut graph is the reciprocal function as we can see below. I chose this function because it was they only function that met the criteria which were that the graph had to have the standard hyperbola (which is the reciprocal function) and it had to have a vertical asymptote because it would at least take one drop to break the nut.

Relationship of Height of the drop vs. Number of drops for the Large Nuts

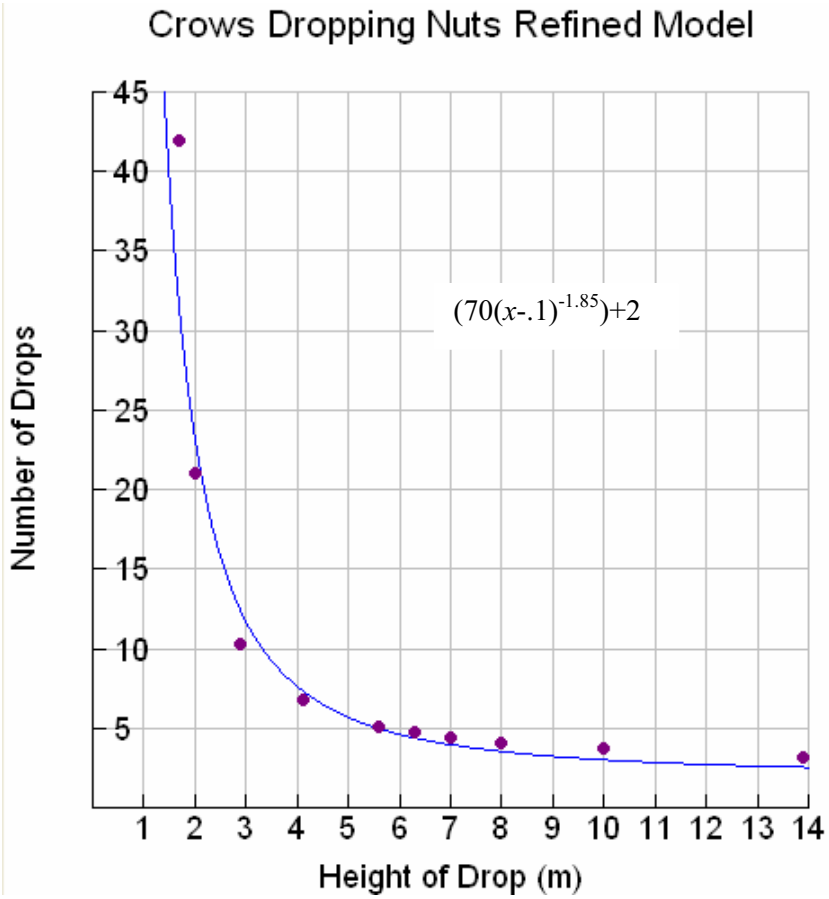


The graph below is the combination of my equation and the large nut data.

Relationship of Height of the drop vs. Number of drops for the Large Nuts



The graph that I determined is similar to the data except that, it needs to be translated to the left a little bit and the rate of the drop and the horizontal asymptote should increase. The refined equation is $f(x) = (70(x\text{-}.1)^{-1.85})+2$



To find another function that models the data I used my graphing calculator to find the Power Regression. The Power function is $(a)(x^b)$ and the function that I found was $(46.10)(x^{-1.15})$.