

Name(s) _____

Date _____

Design Your Own Logistic Model of Population Growth

The goal of this activity is to use *Microsoft Excel* to design, manipulate & analyze a working model of population growth, using the Logistic Model Equation:

• *The change in Population over time* = $r N \left(\frac{K-N}{K} \right)$

- *r* is the natural growth rate of the species in the absence of predation
- *N* is the Population of the given species
- *K* is the Carrying Capacity for that species in the given environment

You must satisfy the following guidelines when completing your model:

- Fields must be established for 3 parameters: (“Initial Rabbit Population Size”=100), (“Birthrate”=.40) & (“Carrying Capacity”=1000).
 - A “sliding bar” must be provided and associated with the “Birthrate” field. This will be manipulated during the analysis section of the activity.
 - A “Time (Months)” Column must be established and must range from 0-50 months. This column will represent values for the horizontal “x-axis”.
 - A column for “Rabbit Population” must be established, starting with the “Initial Rabbit Population” of 100 (at Time=0). This column will represent values for the vertical “y-axis”.
 - Use the Logistic Model Equation (to be inserted into the formula bar) in order to calculate population growth for each month.
 - Be sure that the calculation of population size for each sequential cell is based upon the respective population size of the immediately preceding cell.
 - A line graph must be inserted, representing changes in the “Rabbit Population” versus “Time” (over the period of 50 months)
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Prediction Section

Before the completion of your model, you must predict how many months you think it would take for the rabbit population (with an initial population of 100) to reach the carrying capacity of 1000 rabbits (given the initial birthrate of .40). Justify your prediction with a statement or some calculations:

Justification

**Predicted # of Months to reach
Carrying Capacity of 1000 = _____**

Analysis Section

Having successfully completed your model, answer the following questions:

1) Would you describe the shape of your graph to be linear or exponential? _____

2) How many months did it take for the rabbits to reach their carrying capacity given the initial birthrate of .40? _____

3) How many months did it take for the rabbits to come within one unit of their carrying capacity (999 rabbits), given the initial birthrate of .40? _____

Is this time period significantly different than your answer from Question 2? Explain.

4) If the initial rabbit population is changed to 200, then how many months would it take for the rabbits to reach their carrying capacity of 1000? _____

Is this time period significantly different than your answer from Question 2? Explain.

5) Return the "Initial Rabbit Population" to 100. Then, adjust the birthrate (using the sliding bar) in order to answer the following questions:

a) What birth rate will allow the rabbits to reach their carrying capacity in 30 months? _____

b) What birth rate will allow the rabbits to reach their carrying capacity in 25 months? _____

c) What birth rate will allow the rabbits to reach their carrying capacity in 20 months? _____

d) If the birth rate is changed to .20, will the rabbit population reach the carrying capacity of 1000 during the allotted time of 50 months? _____

6) Changing which of the following parameters ("Initial Rabbit Population", "Birthrate" or "Carrying Capacity") yields the greatest change in the shape of your population curve? Explain.
