Modeling Real-World Data



Exponential, Logarithmic, and Logistic Growth Model





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Project Overview:

You will model real-world scenarios using exponential, logarithmic, or logistic growth models. This will be 3 grades, one grade for each scenario. You have one week to complete this.

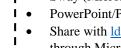
Standards:

MAFS.K12.MP.5.1 Use appropriate tools strategically. MAFS.K12.MP.4.1 Model with mathematics. MAFS.912.F-BF.1.1 Write a function that describes a relationship between two quantities.

Objectives:

- Create an exponential model of a savings account
- Create a model to represent a country's population growth or decay
- Create an exponential model of a pharmaceutical drug's decay

Tasks:



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- Create an exponential model of a savings account $A = P\left(1 + \frac{r}{n}\right)^{n}$ 1.
 - Identify the bank and include a picture of the offer (screenshot of website)
 - Convert APY to APR
 - Assume monthly interest (unless stated otherwise)
 - Graph the exponential model (Label axes)
 - Choose a year and predict the accumulated amount using your model (Show point on graph). Explain how much • money was accumulated and the difference from your initial balance. Is this the amount you expected? Explain.
- Create a model to represent a country's population growth or decay 2.
 - Identify the country name along with a world map of that country's location
 - Create a data table showing 10 data entries from 1968 to 2018 .
 - Years should be years after 1968 (t = 0 for 1968) \circ
 - Population should be in terms of thousands or millions $(3,485,294 \approx 3.49 \text{ million}) \text{LABEL}$ the units
 - Use exponential, logarithmic, or logistic growth to model a <u>country's population</u>. Explain why you chose said model and why the other models are not appropriate.
 - Two options for coming up with a model:
 - By hand, solve for k using the exponential model with e and the initial and final data points (1968 and 2018) $A = A_0 e^{kt}$
 - A TI-84 calculator or desmos, using the regression capability (GC: instructions, desmos: instructions) 0

$$y = a \cdot b^x$$
 (or $y = a \cdot e^{kx}$) or $y = a + b \ln x$ or $y = \frac{c}{1 + ae^{-bx}}$

- Graph the model along with the 10 data points to show similarities and differences. (label axes)
- Predict what the population will be in 2030 using your model. (Show point on graph and work that leads to your answer)
- Create an exponential model of a pharmaceutical drug's decay $A = A_0 e^{kt}$ 3.
 - Identify the drug's generic name, brand name(s), and what it is mainly prescribed for
 - State the half-life and determine the decay rate (specify hours or days)
 - Graph the model (initial dose in mg as A_0) (label axes)
 - Using your model, identify how long it takes for the drug to decay to less than 1mg. Show how you found your • answer. (This is more simplistic than the actual process of decay and body absorption)

Display:

- Sway (Microsoft Office app) •
- PowerPoint/Prezi
- Share with ldelavega@dadeschools.net through Microsoft OneDrive. DO NOT EMAIL TO ME.