**Human Vampire Conflict**

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| **Teachers: Ms. Baker, Ms. Dion, Ms. Solis** |
| **Date: April 26th, 2016 (STEM Tuesday)** |
| **Subject / grade level: Algebra** |
| **Materials:**   1. **Calculators (one per student)** 2. **Do Vampires Exist? handout** |
| **TEKS:**  **(9) Exponential functions and equations. The student applies the mathematical process standards when using properties of exponential functions and their related transformations to write, graph, and represent in multiple ways exponential equations and evaluate, with and without technology, the reasonableness of their solutions. The student formulates statistical relationships and evaluates their reasonableness based on real-world data. The student is expected to:**  **(C) write exponential functions in the form *f(x)* = *abx* (where *b* is a rational number) to describe problems arising from mathematical and real-world situations, including growth and decay;**  **(D) graph exponential functions that model growth and decay and identify key features, including *y*-intercept and asymptote, in mathematical and real-world problems; and** |
| **ENGAGEMENT**   1. **Teacher will share that today we are going to attempt to answer the question, “Do Vampires exist?” To get us thinking about this question we are going to watch a short video.** 2. **Show video, There are No Vampires: a Mathematical Proof”** [**https://www.youtube.com/watch?v=QLm9JZfk1OU**](https://www.youtube.com/watch?v=QLm9JZfk1OU)**. STOP at 3:05 right after he says, “It is growing exponentially.”**   **Probing questions:**   1. **How many vampires are there initially?** 2. **How do the vampires reproduce?** 3. **How often do the vampires reproduce?** 4. **What kind of function describes this kind of growth?**   **Transition: Now that we have begun to think about the relationship between humans and vampires, we are going to explore this topic in more detail.** |
| **EXPLORATION**   1. **We are going to make a few assumptions when we are trying to model the Human Vampire conflict:**    1. **We begin with one vampire.**    2. **We begin with our current world population of humans in 2016**    3. **Each week, every vampire kills one human.**    4. **Every time a human is killed, s/he turns into a vampire.** 2. **Teacher will pass out worksheet,** [**“Do vampires exist?”**](https://docs.google.com/document/d/1-AdpmduOGxcyLC9AsdbDrB5BFx0GPqFa_omD0MQIOHQ/edit) 3. **Students will work with partners to complete questions number 1 through 10.** 4. **Teachers will circulate around the room, asking questions to help students with problem areas such as: scaling the graph, determining the significance of 7.4 billion.**   **Probing questions:**   * **Why is it difficult to scale this type of graph?** * **How can you create a scale that would allow you to display enough data points to get an accurate picture?** * **What is happening to the human population during this time?**   **Transition statement: Now that we have explored the human-vampire conflict with a partner, let’s talk a bit more as a whole group about this problem.** |
| **EXPLANATION**   1. **What does the math show us about the existence of vampires given our model?** 2. **World population website: http://www.worldometers.info/world-population/** 3. **Answer as a whole group questions 11 and 12. What factors are not taken into consideration in this model? Some ideas include:**  **Do humans have any defense against vampires?****Can vampires mate?****Can vampires be destroyed?****Are humans dying of any other causes?****Are human babies being born?****Do vampire have preferences for certain blood types?** **Transition statement: We are going to continue our investigation by considering what happens to our vampire population after week 34.** |
| **ELABORATION**   1. **The students will explore exponential decay using the following scenario:**   **It is week 34. All the humans have been destroyed. The world is now completely populated with vampires. The vampires have no food source. Some vampires have greater reserves of energy since they feasted upon larger, stronger humans. Others are weak. The vampires begin dying out. Each week, the vampire population is reduced by 50% or ½.**  **2. The students will generate a table, graph, and equation that matches this scenario.**  **Probing questions:**   1. **What is the y-intercept for this graph?** 2. **Is there an asymptote? Where?** 3. **What does this tell us about the existence of vampires?**   **3. Watch the rest of the video, There are No Vampires: a Mathematical Proof.**   * **How is the video similar to our exploration?** * **What would be the equation for the situation in the video?** |
| **EVALUATION**   1. **Even though we have just proven that vampires can’t exist, exponential models can help us understand the spread of infectious diseases like ebola, AIDS, measles, mumps and even the common flu.** 2. **Using the graph below, how many people would you expect to be infected after 8 days?** 3. **What would be the equation of this graph?** |