**Activity 5.4.1Exponetial and Logarithmic Equations and Applications**

1. In this activity, we want to rewrite exponential expressions with base For example,

Rewrite each of the following exponential expressions with base

1.
2.
3. =
4.
5. Convert the function P = 200(1.4)t to the form P = a*e*kt.
6. Convert the function G = 6 *e*0.2t to the form P = abt.
7. Solve for t
8. =125
9. log = log
10. Find the following decay constants r in P0*e*rt. Use 7 decimal digits.
11. The half-life of cesium-137 is 30 years.
12. The half-life of plutonium-238 is 86 years.
13. The Joker buried 100 gm of krypton near Superman’s ice home.

A.)Find the half-life of krypton if r = -0.0641. Round to the nearest year.

B. If Superman cannot tolerate being close to more than 0.5 gm, how long will he need to stay away from his ice home?

Write down the equation you need to solve and then round your answer to the nearest year.

1. Find the doubling time for annual growth rates of 2%, 3%, 5%, 6% and 8%.

|  |  |
| --- | --- |
| Rate as a percent | Doubling time |
| 2 |  |
| 3 |  |
| 5 |  |
| 6 |  |
| 8 |  |

Does it appear that the doubling time is a linear function of the percent. You might want to plot the points or use your table and compute the average rates of change.

1. Bankers often use the Rule of 70 to estimate the doubling time for money invested at different rates, divide 70 by 100 times the interest rate. Thus for an interest rate of 4% using the Rule of 70 we would take 70 and divide by 100(.04) and get 17.5 years.
2. Find the doubling time the hard way☺ \_\_\_\_\_\_\_\_\_How good is the estimate?
3. Now find estimates for the percentages in number 5 above and comment on whether you would use the Rule of 70. You might want to add to your table in 5 to make a comparison.
4. UConn’s tuition and fees for 2014-5 was $10,658. On average there have been 6% yearly increases since 2011. If the rate increases continue to be 6%, what will be the tuition for 2020-21?
5. For fiscal 2015 the federal budget deficit is 439 billion dollars. Thirty year treasury bond yields, at all-time lows, have a 3% yield compounded annually. A number of taxpayers got together and suggested taxpayers loan the government the money to pay down the debt. Suppose Americans decide this is a good move and buy 439 billion dollars of treasury bonds so the government can pay off the debt. In 30 years how much will the U.S. government have to pay back to its citizens ---principal and interest? (Source. U.S. Dept. of Treasury)
6. E. coli keeps making the news most recently with outbreaks at Chipotle Restaurants and Costco Warehouses. The bacteria double in number about every 30 minutes.
7. What is their continuous growth rate?
8. Suppose there are 250,000 bacteria per milliliter to start. How many would there be in 4 hours?
9. After 1 full day?
10. When will there be about 1,400,000,000 per milliliter? Round to the nearest quarter hour.
11. The half-life of radium-226 is about 1600 years. After 4000 years, what percentage remains?
12. On November 29, 2015 the population of India was 1,289,305,500 for an instant [www.worldometer.info/worldpopulation/India-population](http://www.worldometer.info/worldpopulation/India-population). It was 1 billion in the year 2000 and was projected to be 1.4 billion in 2025. Find a model of the form P = P0 *e*rt . Does your model support the projection made in 2000?