

Exponential Growth / Decay Real Life Applications

Basic Growth/Decay:

$$A = P(1 \pm r)^t$$

A = ending amount

P = starting value or principle

r = rate (decimal)

t = number of years

Practice Problems.....

- 1) A flu outbreak hits your school on Monday, with an initial number of 20 ill students coming to school. The number of ill students increases by 25% per hour.
 - a) Is this an example of exponential growth or decay?
 - b) Write an exponential function to model this Monday flu outbreak.
 - c) How many students will be ill after 6 hours?

- 2) A total of 50,000 contestants participate in an internet on-line survivor game. The game randomly kills off 20% of the contestants each day.
 - a) Is this an example of exponential growth or decay?
 - b) Write an exponential function to model this game.
 - c) How many contestants are left in the game at the end of one week?

- 3) A new sports car sells for \$35,000. The value of the car decreases by 18% annually. Which of the following choices models the yearly value of the car since its purchase?
 - 1.) $y = 35000(1.18)^x$
 - 2.) $y = 35000(.82)^x$
 - 3.) $y = 35000(.18)^x$
 - 4.) $y = 35000(-0.18)^x$

- 4) At the end of last year, the population of Jason's hometown was approximately 75,000 people. The population is growing at the rate of 2.4% each year. Which equation models the growth?
 - 1.) $y = 75000(1.24)^x$
 - 2.) $y = 75000(1.024)^x$
 - 3.) $y = 75000(.76)^x$
 - 4.) $y = 75000(.976)^x$

NEW Formulas for word problems involving exponential equations ALGEBRA 2 LEVEL

<p>When interest is compounded “n” times per year:</p> $A = P\left(1 + \frac{r}{n}\right)^{nt}$ <p>A = ending amount P = starting value or principle r = rate (decimal) t = number of years n = # of times per year interest is compounded “monthly” n = _____ “yearly” n = _____ “quarterly” n = _____</p>	<p>When interest is compounded CONTINUOUSLY:</p> $A = Pe^{rt}$ <p>A = ending amount P = starting value or principle r = rate (decimal) t = number of years</p> <p>to get e use 2nd LN on calculator $e \approx 2.718281828 \dots$</p> <p>e is a math celebrity!</p>
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More Practice Problems:

1) Madeline decided to invest her \$500 Christmas money. She found a bank offering 5.5% compounded continuously. What will be her ending balance after investing for 4 years?

2) Your parents starts a college fund when you enter kindergarten at age 5. They invest \$14,000 in an account that earns 0.8% annual interest compounded continuously. If you are 18 years old when you enter college, how much money is available in your college fund at that time, to the nearest dollar?

3.) Your financial advisor recommends that you deposit \$3500 in a fund that earns 3.5% annual interest compounded monthly. What will be the value of your investment in 4 years, to the nearest ten cents?

- 4.) You buy a new car for \$24,000. The value decreases by 12% each year.
- Assuming the depreciation of the car is constant. Write a model $V(t)$ that represents the value of the car after t years.
 - Estimate the value of the car after 4 years.

Half Life

Half-life is the time required for a quantity to reduce to half its initial value. The term is used generally to characterize any type of **exponential** decay.

- 5) The half-life of carbon-14 is known to be 5720 years. If 300 grams of carbon-14 are stored for 1200 years, how many grams will remain?
- 6) When Sophia drinks a brewed cup of coffee, she ingests 130 mg of caffeine into her system. The half-life of caffeine in a typical adult is 5.5 hours. How much caffeine will be in her system 4 hours after she drinks the cup of coffee?