EXPONENTIAL FUNCTION

Remember BEDMAS

Do the EXPONENT 1st

Goal:

- calculate values that are depreciating and appreciating in an exponential function
- find the rule of an exponential function from a graph.

$f(x) = ac^x$

Formula: $y = \text{start} \times (\text{keep}^{\text{time}})$

Exponent Length of time

Number you start with

Amount you are keeping

1 + % (if its increasing)

1 - % (if its decreasing)

100% ± %

Dec 14-12:03 PM

When the value of y is INCREASING

Words that mean it is increasing: increasing, growing, appreciating, appreciation, interest

Example: St Hubert has a population of 50000 people. If the population is increasing at a rate of 2% per year, how many people will there be in 5 years.

start, keep, time, +

Start: 50 000 Keep: 1 + 2% = 1.02 Time: 5

$\frac{2}{100} = 0.02$

$y = \text{start} \times \text{keep}^{\text{time}}$

$y = 50{,}000 \times (1.02)^{5} = 55{,}204.$

1.104080803

Dec 15-10:01 AM

Example: A bacteria triples every hour. If there were 25 bacteria to begin with, how many bacteria will there be in 2 days.

(keep: triples; time: hour; start: 25)

Start: 25 Keep: 3 Time: 2 × 24 = 48

y = start x keep ^{time}

$y = 25 \times (3^{48})$

$= 1.99 \times 10^{24}$

1,994,161,077,000,000,000,000.

Dec 15-10:04 AM

When the value of y is DECREASING

Words that mean it is decreasing: depreciation, decreasing

Example: My Porsche cost $112000 brand new. How much will it be worth in 8 years if its value depreciates by 15% every year?

(start: $112000; time: 8 years; keep: depreciates by 15%)

Start: 112000 Keep: 1 − 0.15 = 0.85 Time: 8

y = start x keep ^{time}

$y = 112{,}000 \times (0.85^{8}) = \$30{,}518.94$

Dec 15-10:05 AM

Example: My PK Subban rookie card cost $50 brand new. How much will it be worth in 8 years if its value depreciates by 15% every year?

Start: 50 Keep: 1 − 0.15 = 0.85 Time: 8

y = start x keep ^{time}

y = 50 x (0.85 ^{8}) = $13.62

Dec 15-10:06 AM

Ex. Each year the frog population of a small wooded area declines by 5% in contrast to the previous year. If this wooded area now has 2000 frogs, how many frogs will be present in 10 years from now?

S: 2000

K: 1 − 0.05 = 0.95

T: 10

$y = 2000(0.95)^{10} \approx 1197.$

Dec 15-10:22 AM

Ex. Among the options available to finance a purchase, credit cards are the ones that have the highest interest rates. If Diane makes a purchase worth $1200 with a credit card that has an interest rate of 1.5% each month, how much will she pay in interest if she can only clear her card a year later?

Dec 15-10:23 AM

Ex. Samuel is looking at making some investments to save for the future. His investment advisor has suggested a Mutual Fund that grows at an annual interest rate of 8% per year. If Samuel invested $5000 in the fund,

a) How much would his investment be worth after 5 years?

b) How long would it take Samuel's investment to double in value?

Dec 15-10:25 AM

Ex. Farah purchased a new car five years ago for $25 000 and the car has depreciated in value by 15% per year. She would like to sell the car today in order to purchase a used vehicle for $10 000. The used car she is intending to purchase is anticipated to retain 90% of its previous year's value each year.

a) If Farah sells the original car, will she have the $10,000 she needs to purchase the used car?

b) If Farah intends to sell the used car when it is worth $6561, how long will she own it for?

Dec 15-10:38 AM

Ex. If the population of rabbits doubles every 4 months, when will there be 5000 rabbits if there were only 2 rabbits.

Dec 15-10:40 AM

1. A community of 90 penguins increases in population by 4% per year. When will there be a population of 144?

Dec 16-4:27 PM

2. Jim bought a cottage a few years ago. He has been analyzing the water in the well every year.

$$f(x) = 16\ (1.5)^{x}$$

In 2012, there were 54 bacteria. In what year will there be more than 200 bacteria for the first time?

Dec 16-4:29 PM

3. A lab technician notes that the number of type A bacteria doubles every hour whereas the number of type B bacteria triples every hour. At the outset there are 1000 of type A bacteria and 500 of type B bacteria. Which of the two bacteria will be more numerous after five hours?

Dec 16-4:31 PM

4.

Dec 16-4:33 PM