Algebra 1
Unit 4: Modeling & Analyzing Exponential Functions

Volume 1 Issue 4

References

HMH Georgia Coordinate Algebra Text:
Unit 3: Modules 12-13

Check with you teacher for online and print access:

Online website:
my.hrw.com

Web Resources

- Graphing Exponential Functions
  http://cms.gavirtualschool.org/Shared/Math/GSEAlgI16/GSEAlgI_PropofExpandGraphExpFunc_Shared/GSEAlgI_PropofExpandGraphExpFunc_Shared4.html
- Characteristic of Exponential Functions
  http://cms.gavirtualschool.org/Shared/Math/GSEAlgI16/GSEAlgI_PropofExpandGraphExpFunc_Shared/GSEAlgI_PropofExpandGraphExpFunc_Shared7.html
- Exponential Functions
  http://www.purplemath.com/modules/expofcns.htm
- Exponential functions
  https://mathbitsnotebook.com/Algebra1/FunctionGraphs/FNGTypeExponential.html
- Exponential functions
  http://www.mathsisfun.com/sets/function-exponential.html
- Geometric sequences
  http://mathbitsnotebook.com/Algebra1/Functions/FNSequences.html
- Geometric sequences
  http://www.purplemath.com/modules/series3.htm
- Geometric sequences
  http://www.basic-mathematics.com/geometric-sequence.html

Dear Parents

Below you will find a list of concepts that your child will use and understand while completing Unit 4: Modeling & Analyzing Exponential Functions. Also included are references, vocabulary and examples that will help you assist your child at home.

Concepts Students will Use and Understand

- Analyze & interpret exponential functions in real-world applications.
- Build on and informally extend understanding of integer exponents to consider exponential functions.
- Use function notation.
- Interpret expressions for functions in terms of the situation they model.
- Analyze exponential functions and model how different representations may be used based on the situation presented.
- Build a function to model a relationship between two quantities.
- Recognize geometric sequences as exponential functions.
- Create new functions from existing functions.
- Construct and compare exponential models and solve problems.
- Reinforce their previous understanding of characteristics of graphs and investigate key features of exponential graphs.
- Investigate a multiplicative change in exponential functions.
- Create and solve exponential equations.
- Apply related linear equations solution techniques and the laws of exponents to the creation and solution of simple exponential equations.

Vocabulary

- **Explicit Expression.** A formula that allows direct computation of any term for a sequence $a_1, a_2, a_3, \ldots, a_n, \ldots$.
- **Exponential Function.** A nonlinear function in which the independent value is an exponent in the function, as in $y = ab^x$.
- **Exponential Model.** An exponential function representing real-world phenomena. The model also represents patterns found in graphs and/or data.
- **Geometric Sequence.** A sequence of numbers in which the ratio between any two consecutive terms is the same. In other words, you multiply by the same number each time to get the next term in the sequence. This fixed number is called the common ratio for the sequence.
- **Recursive Formula.** A formula that requires the computation of all previous terms to find the value of a_n.

Exponential Growth & Decay

Growth: $y = a(1+r)^x$

Decay: $y = a(1-r)^x$

a = initial **amount** before measuring growth/decay
r = growth/decay **rate** (often a percent)
x = number of **time** intervals that have passed

Compound Interest

$$A = P\left(1+\frac{r}{n}\right)^{nt}$$

Where,

- P = principal amount (initial investment)
- r = annual nominal interest rate (as a decimal)
- n = number of times the interest is compounded per year
- t = number of years

Geometric Sequence: Recursive

$$a_n = a_{n-1}r$$

Geometric Sequence: Explicit

$$a_n = a_1 r^{n-1}$$

Algebra 1 Unit 4 Practice Problems

Formulas

Exponential Growth/Decay:

Growth: $y = a(1+r)^x$

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Geometric Sequences:

Recursive

$$a_n = a_{n-1}r$$

Explicit

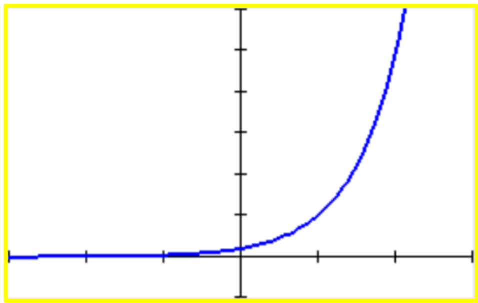
$$a_n = a_1 r^{n-1}$$

1.) Tell whether each set of ordered pairs satisfies an exponential function. Explain your answer.

{(-1, 1), (0, 0), (1, 1), (2, 4)}

Yes; as the x-values change by a constant amount, the y-values are multiplied by a constant amount.

2.) Choose several values of x and generate ordered pairs. Then use the ordered pairs to graph the function: $y = 0.2(5^x)$



x	y
-1	.04
0	.2
1	1
2	5

3.) In the definition of an exponential function, the value of b cannot be 1, and the value of a cannot be 0. Why?

If the value of b were 1, the function would be constant.
If the value of a were 0, the function would be the constant function of $y = 0$.

4.) Technology Application:
Moore's law states that the maximum number of transistors that can fit on a silicon chip doubles every two years. The function $f(x) = 42(1.41)^x$ models the number of transistors, in millions, that can fit on a chip, where x is the number of years since 2000. Using this model, in what year can a chip hold 1 billion transistors?

About 2009

5.) The population of a town is decreasing at a rate of 3% per year. In 2000, there were 1700 people. Write an exponential decay function to model this situation. Then find the population in 2012.

$y = 1700(0.97)^t$
Population: 1180 people