ST. VRAIN VALLEY SCHOOLS
academic excellence by design

Unit 5 Plan

Algebra 1
2014-2015
2nd Semester

Unit/Topic Title: **Exponential Functions (Chapter 7)**

Estimated Time (When): **January – Feburary (5 weeks)** *(Includes time for reteaching and enrichment)*

Standard(s):
2. Patterns, Functions, and Algebraic Structures

Prepared Graduates:
- Use critical thinking to recognize problematic aspects of situations, create mathematical models, and present and defend solutions
- Understand that equivalence is a foundation of mathematics represented in numbers, shapes, measures, expressions, and equations

Grade Level Expectation: High School

Concepts and skills students master:
- Quantitative relationships in the real world can be modeled and solved using functions (2.2)
- Expressions can be represented in multiple, equivalent forms (2.3)

Evidence Outcomes	21st Century Skills and Readiness Competencies

Students can:
This Unit Plan focuses on the family of exponential functions. Consult Algebra 1 Families of Functions for additional evidence outcomes applied to exponential functions.
• Construct and compare linear and exponential models and solve problems. (CCSS: F-LE; 2.2.a)
  ○ Distinguish between situations that can be modeled with linear functions and with exponential functions. (CCSS: F-LE.1; 2.2.a.i)
  ▪ Prove that exponential functions grow by equal factors over equal intervals. (CCSS: F-LE.1a;
	Inquiry Questions:
	• Why do we classify functions?
	• What phenomena can be modeled with particular functions?
	• Which financial applications can be modeled with exponential functions? Linear functions? (PFL)
	• What elementary function or functions best represent a given scatter plot of two-variable data?
	• How much would today's purchase cost tomorrow? (PFL)
	• When is it appropriate to simplify expressions?
	
	Relevance and Application:
	• The understanding of the qualitative behavior of functions allows interpretation of the qualitative behavior of systems modeled by

2.2.a.i.1)
        - Identify situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another. (CCSS: F-LE.1c; 2.2.a.i.3)
    - Construct exponential functions, including geometric sequences, given a graph, a description of a relationship, or two input-output pairs.[i] (CCSS: F-LE.2; 2.2.a.ii) *(PARCC: i) Tasks are limited to constructing exponential functions in simple context (not multi-step).)*
- Interpret expressions for function in terms of the situation they model. (CCSS: F-LE; 2.2.b)
    - Interpret the parameters in an exponential function in terms of a context. (CCSS: F-LE.5; 2.2.b.i) *(PARCC: i) Tasks have a real-world context. ii) Exponential functions are limited to those with domains in the integers.)*
- Write expressions in equivalent forms to solve problems. (CCSS: A-SSE; 2.3.b)
    - Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. (CCSS: A-SSE.3; 2.3.b.i)
        - Use the properties of exponents to transform expressions for exponential functions.[ii] (CCSS: A-SSE.3c; 2.3.b.i.3) *(PARCC: i) Tasks have a*

functions such as time-distance, population growth, decay, heat transfer, and temperature of the ocean versus depth.
- The knowledge of how functions model real-world phenomena allows exploration and improved understanding of complex systems such as how population growth may affect the environment , how interest rates or inflation affect a personal budget, how stopping distance is related to reaction time and velocity, and how volume and temperature of a gas are related.
- The simplification of algebraic expressions and solving equations are tools used to solve problems in science. Scientists represent relationships between variables by developing a formula and using values obtained from experimental measurements and algebraic manipulation to determine values of quantities that are difficult or impossible to measure directly such as acceleration due to gravity, speed of light, and mass of the earth.
- The manipulation of expressions and solving formulas are techniques used to solve problems in geometry such as finding the area of a circle, determining the volume of a sphere, calculating the surface area of a prism, and applying the Pythagorean Theorem.

Nature of Mathematics:

- Mathematicians use their knowledge of functions to create accurate models of complex systems.
- Mathematicians use models to better understand systems and make predictions about future systemic behavior.
- Mathematicians reason abstractly and quantitatively. (MP)

real-world context. As described in the standard, there is an interplay between the mathematical structure of the expression and the structure of the situation such that choosing and producing an equivalent form of the expression reveals something about the situation. ii) Tasks are limited to exponential expressions with integer exponents.) • [i] include reading these from a table. (CCSS: F-LE.2) • [ii] For example the expression 1.15^t can be rewritten as $(1.15^{1/12})^{12t} \approx 1.012^{12t}$ to reveal the approximate equivalent monthly interest rate if the annual rate is 15%. (CCSS: A-SSE.3c)	• Mathematicians construct viable arguments and critique the reasoning of others. (MP) • Mathematicians model with mathematics. (MP) • Mathematicians abstract a problem by representing it as an equation. They travel between the concrete problem and the abstraction to gain insights and find solutions. • Mathematicians look for and express regularity in repeated reasoning. (MP)

Essential Vocabulary

Exponential function, exponential growth, growth factor, compound interest, exponential decay, decay factor, geometric sequence, common ratio

Assessments

- Prentice Hall Algebra 1 Chapter 7 Assessments (Lesson Quizzes, Quizzes, Tests, ExamView, Performance Tasks)
- Galileo Assessment
- Additional assessment resources

Instructional Resources

- Prentice Hall Algebra 1 Chapter 7 (Sections 7-1, 7-3 – 7-7)
- Additional or supplemental instructional resources for this Unit Plan (includes access to PH Algebra 1 CCSS supplemental lessons CC-10: Geometric Sequences & CC-11: A Family of Exponential Functions)