High School Algebra 1 Topic 6 - FCPS 2025-2026

Topic 6: Exponents and Exponential Functions	Estimate Time Frame: 10 blocks
Essential Standards: KY.HS.N.1, KY.HS.N.2, KY.HS.F.5b, KY.HS.F.11, KY.HS.F.12, KY.HS.A.3 Supporting Standards: KY.HS.A.1, KY.HS.A.3, KY.HS.F.1, KY.HS.F.3, KY.HS.F.6, KY.HS.F.7, KY.HS.F.14, KY.HS.N.4, KY.HS.N.5 Assessment Resource: enVision Topic 6 and Formative Assessment Lesson **(FAL):** Representing Linear and Exponential Growth	

FCPS Supporting Links	Additional Supporting Links
Pacing Guide Standards Resources Crosswalk FCPS P-12 Mathematics Guidance Document FCPS Achievement & Trauma-Informed Strategies in the Classroom	Kentucky Academic Standards KSA Blueprint Target of the Standards - conceptual, procedural & application Three-Reads Routine Notice and Wonder Routine MILC Resources: Topic 6: Exponents and Exponential Functions ***enVision Teacher Guide: page 214A to 214I for specific Topic 6 Focus-Coherence-Rigor***

Big Ideas
Build upon and extend understanding of integer exponents to exponential functions. Extend the laws of exponents to rational exponents.

Essential Questions	Common Preconceptions/Misconceptions
How do you use exponential functions to model situations and solve problems? How can you identify and apply the appropriate property to simplify exponent expressions? How can you write an exponential equation to represent a real-world situation?	• When working with rational exponents, students may confuse the concepts of additive inverses and multiplicative inverses. Provide problems that allow students to differentiate between the two. • Negative exponents can be a problem when using fractional exponents. Using a calculator and looking at a graph helps. • Ensure that students know what closure means by working with integers and subsets of integers with addition, subtraction, multiplication, and division. • Skills Previously Taught:

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Why will an exponential decay situation never equal zero? How do you apply the geometric sequence to find a term in the sequence?	○ Properties of Exponents, but will need to review as a part of Lesson 6-0. ● A common misconception for students occurs when adding and multiplying like terms if students have not used manipulatives or models before learning the rules. One method to address this is to use Algeblocks or Algebra Tiles to introduce polynomials. Both are available for checkout from the District Math Lab in the Teacher Resource Center at Central Office or from Math Chairs.
Standards for Mathematical Practices	**Kentucky Interdisciplinary Literacy Practices (KILP)**
MP.1. Make sense of problems and persevere in solving them. MP.2. Reason abstractly and quantitatively. MP.3. Construct viable arguments and critique the reasoning of others. MP.4. Model with mathematics. MP.5. Use appropriate tools strategically. MP.6. Attend to precision. MP.7. Look for and make use of structure. MP.8. Look for and express regularity in repeated reasoning. ***enVision Teacher Guide: page 214D for specific Topic 6 Math Practice suggestions***	1. Recognize that text is anything that communicates a message. 2. Employ, develop, and refine schemas to understand and create text. 3. View literacy experiences as transactional, interdisciplinary, and transformational. 4. Utilize receptive and expressive language arts to better understand self, others, and the world. 5. Apply strategic practices, with scaffolding and then independently, to approach new literacy tasks. 6. Collaborate with others to create new meaning. 7. Utilize digital resources to learn and share with others. 8. Engage in specialized, discipline-specific literacy practices. 9. Apply high-level cognitive processes to think deeply and critically about text. 10. Develop a literacy identity that promotes lifelong learning. *Incorporating texts into math instruction fosters interdisciplinary learning for a more engaging educational experience.*

Essential Standards	Sample Learning Intentions & Success Criteria	HQIR/Resource Considerations
Cluster: Extend the properties of exponents to rational exponents.		
KY.HS.N.1 Extend the properties of integer exponents to rational exponents, allowing for the expression of radicals in terms of rational exponents. **MP.2, MP.7, KILP.5, KILP.6** ☐ *Conceptual* ❑ *Procedural* ❑ *Application*	I am learning to use my understanding of integer exponents to rational exponents, to express radicals using rational exponents. ● I can identify the key features of exponential functions, such as the base, exponent, and constant multiplier. ● I can use the properties of integer exponents and	● Lesson 6-0 will need to be supplemented. Review properties of exponents. ● Lesson 6-1: Rational Exponents and Properties of Exponents

Considerations: Students understand that a single root can be expressed as a rational exponent with a numerator of one and a base equal to the root index. Students understand that powers and roots can be concisely expressed as a single rational exponent where the numerator is the power and the denominator is the root index. For example, students understand that defining 4^1/3 is the same as the cube root of 4 because 4(⅓)^3 = (4⅓)^3 so 4(⅓)^3 must equal 4. *Supporting Standard: KY.HS.N.4, KY.HS.N.6*	apply them to rational exponents. • I can express radicals in terms of rational exponents. • I can simplify expressions involving rational exponents.	
KY.HS.N.2 Rewrite expressions involving radicals and rational exponents using the properties of exponents. **MP.7, KILP.1, KILP.2, KILP.8** Supporting Standard: KY.HS.N.4, KY.HS.N.6 ☐ Conceptual ☐ Procedural ❑ Application Considerations: Standard KY.HS.N.2 builds on standard KY.HS.N.1 by extending student understanding to situations where the numerator is not one.	I am learning to rewrite expressions with radicals and rational exponents. • I can apply the properties of exponents to rewrite a radical expression as an expression with a rational exponent. • I can apply the properties of exponents to rewrite an expression with rational exponents as a radical expression.	• Lesson 6-2: Radical Expressions

Attending to the Standards for Mathematical Practice

Students flexibly move between notating expressions as roots/powers or integers with rational coefficients (MP.2). They explain why rational expressions can be more desirable and what the notation means (MP.7).

Essential Standards	Sample Learning Intentions & Success Criteria	HQIR/Resource Considerations

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Cluster: Analyze functions using different representations.		
KY.HS.F.5 Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. b. Use the properties of exponents to interpret expressions for exponential functions and classify the exponential function as representing growth or decay **MP.3, MP.6, KILP.1, KILP.2, KILP.6** ☐ *Conceptual* ☐ *Procedural* ❑ *Application* *Supporting Standard: KY.HS.F.1, KY.HS.F.2, KY.HS.F.3, KY.HS.F.6* Considerations: b. Students examine real-world situations with constant multiplicative change, represented as expressions like growth or decay.	I am learning to use the properties of exponents to classify exponential functions. • I can examine the base of an exponential function to classify it as exponential growth or decay. • I can apply the properties of exponents to simplify and interpret expressions involving exponential functions. • I can classify exponential functions based on their behavior, including growth or decay, and the value of their base.	• Lesson 6-3: Exponential Functions • **3-Act Math Task:** Fry's Bank
Attending to the Standards for Mathematical Practice		
Students use graphs to answer questions and/or make predictions for a given context (MP. 4). Students use technology to explore concepts of function families and show key features of the graph (MP. 5). Students compare and contrast different characteristics of functions to connect features of the graph with different real-world contexts (MP.6). Students manipulate expressions, being careful to preserve equivalence and describe why a particular expression provides insights into the function (MP.3, MP.6).		
Essential Standards	Sample Learning Intentions & Success Criteria	HQIR/Resource Considerations
Cluster: Construct and compare linear, quadratic and exponential models and solve problems.		
KY.HS.F.11 Distinguish between situations that can be modeled with linear and exponential functions. **MP.3, MP.8, KILP.1, KILP.7, KILP.8** ☐ *Conceptual* ☐ *Procedural* ☐ *Application*	I am learning to distinguish between linear and exponential functions. • Identify that linear functions grow by equal differences over equal intervals. • Identify that exponential functions grow by equal	• Lesson 6-4: Exponential Growth and Decay • ❗ Exclude Lesson 6-6: Transformations of

a. Recognize and justify that linear functions grow by equal differences over equal intervals and that exponential functions grow by equal factors over equal intervals. b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another. c. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another Considerations: Linear functions have the same average rate of change over same-sized intervals; the same value is added to the output over each interval. In contrast, the outputs of exponential functions grow or decay by the same percent over same-sized intervals; the same value is multiplied by the output over each interval. *Supporting Standard: KY.HS.F.6 , KY.HS.F.7, KY.HS.F.8, KY.HS.F.4*	factors over equal intervals. I am learning to recognize situations that can be modeled with linear and exponential functions. • I can recognize scenarios where the relationship between two quantities is a constant rate of change. • I can recognize the growth patterns of exponential functions based on their • I can determine if the constant rate of change indicates a linear or exponential relationship. • I can justify the choice of linear or exponential modeling based on the observed constant rate of change or constant percent rate of change.	Exponential Functions- KY.HS.F.4d & F. 8 are NOT algebra 1 standards. • Formative Assessment Lesson **(FAL):** Representing Linear and Exponential Growth
KY.HS.F.12 Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (including reading these from a table). **MP.7, MP.8** Considerations: Students construct functions with and without technology.	We are learning to construct arithmetic and geometric sequences from graphs, descriptions, or pairs of points. • I can tell if a relationship is linear or exponential. • I can find key features (slope, y-intercept, initial value, growth/decay) from graphs. • I can recognize arithmetic sequences as linear. • I can recognize geometric sequences as exponential. • I can build arithmetic and geometric sequences.	• Lesson 6-5: Geometric Sequences • Lesson 3-4 Arithmetic • **3-Act Task:** Big Time Pay Back. p.259
Attending to the Standards for Mathematical Practice		

Students reason about particular characteristics of linear, quadratic, and exponential functions, for example comparing rates of change across different types of functions (MP.3). They also recognize families of functions in a more general sense to discern that a quantity increasing exponentially eventually exceeds a quantity increasing linearly or quadratically (MP.8).

Supporting Standards

KY.HS.N.4 Use units in context as a way to understand problems and to guide the solution of multi-step problems; ★ MP.5, MP.6
a. Choose and interpret units consistently in formulas;
b. Choose and interpret the scale and the origin in graphs and data displays.

KY.HS.N.5 Define appropriate units in context for the purpose of descriptive modeling. ★ MP.1, MP.6

KY.HS.N.6 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. ★ **MP.2, MP.6**

KY.HS.F.1 Understand properties and key features of functions and the different ways functions can be represented.MP.2, MP.4
b Using appropriate function notation, evaluate functions for inputs in their domains and interpret statements that use function notation in terms of a context.
c. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities and sketch graphs showing key features given a verbal description of the relationship.
d. Relate the domain of a function to its graph, where applicable, to the quantitative relationship it describes. (algebraically, graphically, numerically in tables, or by verbal descriptions).
e. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).

KY.HS.F.3 Understand average rate of change of a function over an interval. a. Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. b. Estimate the rate of change from a graph. ★ MP.2, MP.4

KY.HS.F.6 Write a function that describes a relationship between two quantities. ★ a. Determine an explicit expression, a recursive process, or steps for calculation from a context. b. Combine standard function types using arithmetic operations. c. (+) Compose functions. MP.4, MP.7

KY.HS.F.7 Use geometric sequences to model situations and scenarios. a. Use formulas (explicit and recursive) to generate terms for geometric sequences. b. Write formulas to model geometric sequences and apply those formulas in realistic situations. ★

KY.HS.F.14 Interpret the parameters in a linear or exponential function in terms of a context. MP.1, MP.2

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KY.HS.A.1 Interpret expressions that represent a quantity in terms of its context. ★ a. Interpret parts of an expression, such as terms, factors, and coefficients. b. Interpret complicated expressions, given a context, by viewing one or more of their parts as a single entity. MP.2, MP.6

KY.HS.A.3 Choose and produce an equivalent form of an expression to **reveal and explain** the properties of the quantity represented by the expression. ★ **c.** Use the properties of exponents to rewrite exponential expressions. MP.5, MP.

Vocabulary

exponential function - the function e^x where e is the number (approximately 2.71.8281828) such that the function e^x equals its own derivative. It is used to model phenomena when a constant change in the independent variable gives the same proportional change (increase or decrease) in the dependent variable
Supporting Vocabulary: exponents, growth, decay, geometric sequence, common ratio, exponential functions, constant ratio, growth or decay factor, asymptote, rational exponent, radical, arithmetic sequence, equal differences, equal factors, geometric sequence, linear function, parameter, rate of change, properties of exponents, Fibonacci numbers

*Disclaimer: Success Criteria is the evidence students must produce to demonstrate learning. This example is not comprehensive.
** Mathematical Practices (A.MP.1- 8) should be evidenced at some point throughout each unit, depending on the explored tasks. It is important to note that MP. 2 should support learning in every lesson.
*** Modeling Standards: Modeling is best interpreted not as a collection of isolated topics but rather in relation to other standards. Making mathematical models is a Standard for Mathematical Practice, and specific modeling standards appear throughout the high school standards indicated by a star symbol (★). The star symbol sometimes appears on the heading for a group of standards; in that case, it should be understood to apply to *all* standards in that group.