Unit 1
Equation, Inequalities, Functions

Algebra II

Unit Description:

In this unit, students model real-world situations by using one- and two-variable equations. They will study inverse functions, composite functions, and piecewise-defined functions, perform operations on functions, and solve systems of equations and inequalities.

Standards for Mathematical Practice

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.

Louisiana Student Standards for Mathematics (LSSM)

The Louisiana Student Standards for Mathematics (LSSM), designates the following standards as A2: Algebra 2.
Italicized standards are designated as A1: Algebra 1 and are considered prerequisite standards for Algebra 2.
While these prerequisite standards are present in the curriculum for scaffolding purposes, teachers will focus instruction on Algebra 2 expectations.

A-CED: Creating Equations	
A. Create equations that describe numbers or relationships	
A-CED.A.1	Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions. ★
A-CED.A.2	Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. ★
A-CED.A.3	Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. For example, represent inequalities describing nutritional and cost constraints on combinations of different foods. ★
A-REI: Reasoning with Equations and Inequalities	
A. Understand solving equations as a process of reasoning and explain the reasoning.	
A-REI.A.1	Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has

	a solution. Construct a viable argument to justify a solution method.
C. Solve systems of equations.	
A-REI.C.6	Solve systems of linear equations exactly and approximately (e.g., with graphs), limited to systems of at most **three equations and three variables**. With graphic solutions, systems are limited to two variables.
A-REI.C.7	Solve a simple system consisting of **a linear equation and a quadratic equation** in two variables algebraically and graphically. For example, find the points of intersection between the line $y = -3x$ and the circle $x^2 + y^2 = 3$.
F-BF: Building Functions	
A. Build a function that models a relationship between two quantities.	
F-BF.A.1	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. For example, build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model.
B. Build new functions from existing functions.	
F-BF.B.3	Identify the effect on the graph of replacing $f(x)$ by $f(x) \pm \boldsymbol{k}$, $\boldsymbol{k}\, f(x)$, $f(\boldsymbol{k}x)$, and $f(x \pm \boldsymbol{k})$ for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.
F-BF.B.4	Find inverse functions. **a.** Solve an equation of the form $f(x) = c$ for a simple function f that has an inverse and write an expression for the inverse. For example, $f(x) = 2x^3$ or $f(x) = \frac{x+1}{x-1}$ for $x \neq 1$.
F-IF: Interpreting Functions	
C. Analyze functions using different representations	
F-IF.C.7	Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. ★
F-LE: Linear, Quadratic, and Exponential Models	
B. Interpret expressions for functions in terms of the situation they model.	
F-LE.B.5	Interpret the parameters in a linear, quadratic, or exponential function in terms of a context. ★
N-Q: Quantities	
A. Reason quantitatively and use units to solve problems.	
N-Q.A.2	Define appropriate quantities for the purpose of descriptive modeling. ★

★As defined by LSSM, the basic modeling cycle involves:

1. identifying variables in the situation and selecting those that represent essential features,
2. formulating a model by creating and selecting geometric, graphical, tabular, algebraic, or statistical representations that describe relationships between the variables,
3. analyzing and performing operations on these relationships to draw conclusions,

4. interpreting the results of the mathematics in terms of the original situation,
5. validating the conclusions by comparing them with the situation, and then either improving the model or, if it is acceptable,
6. reporting on the conclusions and the reasoning behind them.
Choices, assumptions, and approximations are present throughout this cycle.

Enduring Understandings:	**Essential Questions:**
• Systems of three equations can effectively be solved using similar strategies as systems of two equations. • Absolute value equations and inequalities can be used for real-world situations that have boundaries or extreme values. • Function notation and composition of functions are used to represent and model real-world problems. • Inverse functions make it possible to create a function that can be used to work backwards to find data.	• How do you solve a simple system of three linear equations by hand? • How do you solve a simple system of three with technology? • How do the graphical representations of functions help you understand the data?