Unit 5
Functions and Linear Equations

Acceleration to Algebra
(Grade 7 & 8 LSSM Standards)

Unit Description:

Students will explore the concept of function using input/output tables and maps. Functions will be compared using the concept of unit rate developed in 6th grade. Students will graph and analyze linear functions.

The concept of slope will be explored and used to write the equation of a line in slope-intercept form. Students will solve linear equations and determine the number of solutions. Solving linear equations will include variables on both sides of the equal sign. Students will solve simple systems of equations both graphically and algebraically and determine the number of solutions.

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.

Louisiana Student Standards for Mathematics (LSSM)

F – Functions	
A. Define, evaluate, and compare functions.	
8.F.A.1	Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output. (Function notation is not required in this grade level.)
8.F.A.2	Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a linear function represented by a table of values

	and a linear function represented by an algebraic expression, determine which function has the greater rate of change.
8.F.A.3	Interpret the equation $y = mx + b$ as defining a linear function, whose graph is a straight line; categorize functions as linear or nonlinear when given equations, graphs, or tables. For example, the function $A = s^2$ giving the area of a square as a function of its side length is not linear because its graph contains the points $(1, 1)$, $(2, 4)$ and $(3, 9)$, which are not on a straight line.
B. Use functions to model relationships between quantities.	
8.F.B.4	Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.
8.F.B.5	Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally.
EE – Expressions and Equations	
B. Understand the connections between proportional relationships, lines, and linear equations.	
8.EE.B.5	Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.
8.EE.B.6	Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation $y = mx$ for a line through the origin and the equation $y = mx + b$ for a line intercepting the vertical axis at b.
C. Analyze and solve pairs of simultaneous linear equations.	
8.EE.C.8	Analyze and solve pairs of simultaneous linear equations. **a.** Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously.

	b. Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection. For example, $3x + 2y = 5$ and $3x + 2y = 6$ have no solution because $3x + 2y$ cannot simultaneously be 5 and 6. **c.** Solve real-world and mathematical problems leading to two linear equations in two variables. For example, given coordinates for two pairs of points, determine whether the line through the first pair of points intersects the line through the second pair.

Enduring Understandings:

*Our world is filled with functions. By learning how to represent, construct, and analyze functions we gain a better understanding of how our world works.
*Verbal descriptions, tables, equations, and graphs can be used to represent linear and nonlinear functions.
*An equation can be written for two quantities that vary proportionally.
*The unit rate for a data set that represents a proportional relationship can be interpreted as slope when the data is graphed on a coordinate plane.
*The slope m is the same for any two distinct points on a non-vertical line graphed on the coordinate plane.
*Graphs of linear equations that intersect the y-axis at any point other than the origin $(0, 0)$ do not represent proportional relationships.
*The points (x, y) on a non-vertical line are the solutions of the equation $y = mx + b$.

Essential Questions:

*What is the difference between a relation and a function?
*How can you determine if a relation is a function?
*How does a change in the independent variable affect the dependent variable?
*What types of relationships can be represented as functions?
*How do we understand and represent linear relationships and various nonlinear relationships?
*What is the meaning of slope?
*How can we transfer data and information between multiple representations? (e.g. graphs, tables, equations, descriptions, etc.)
*What is the difference between a ratio and a unit rate?
*How can proportional relationships be used to represent authentic situations in life and solve actual problems?
*What does the point of intersection of two simultaneous equations represent?