ACC Linear Equations and Inequalities

Content Area: **Mathematics**
Course(s): **Algebra**
Time Period: **February**
Length: **17 Days**
Status: **Published**

Unit Summary

This unit leads students through the exploration of the linear function family. The topics include translating among verbal, tabular, graphical, and algebraic representations of linear functions with the goal of modeling real-world situations by graphing data and finding line of best fit. The building blocks of this function family address the skills and concepts of slope as a constant rate of change, y-intercept as a "starting point", that linear equations communicate transformations on the parent equation, and that infinitely many solutions form a line. Students will analyze and graph linear functions in slope-intercept, point-slope, and standard form. They will develop the vocabulary to compare and contrast linear functions within the linear function family preparing them to extend these concepts to other function families (quadratic and exponential) in upcoming units. These concepts will be extended to linear inequalities.

Standards

MA.8.F.A	Define, evaluate, and compare functions.
MA.8.F.A.2	Compare properties (e.g. rate of change, intercepts, domain and range) of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).
MA.8.F.A.3	Interpret the equation $y = mx + b$ as defining a linear function, whose graph is a straight line; give examples of functions that are not linear.
MA.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.
MA.8.EE.B	Understand the connections between proportional relationships, lines, and linear equations.
MA.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.
MA.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.
MA.8.SP.A	Investigate patterns of association in bivariate data.
MA.8.SP.A.2	Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit (e.g. line of best fit) by judging the closeness of the data points to the line.
MA.8.SP.A.3	Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept.
MA.F-BF.A	Build a function that models a relationship between two quantities
MA.F-BF.A.1	Write a function that describes a relationship between two quantities.
MA.F-IF.B	Interpret functions that arise in applications in terms of the context
MA.F-IF.B.4	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.
MA.F-IF.B.5	Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.
MA.F-IF.B.6	Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.
MA.F-IF.C	Analyze functions using different representations
MA.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.
MA.F-IF.C.8	Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.
MA.F-IF.C.9	Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).
MA.F-IF.C.7a	Graph linear and quadratic functions and show intercepts, maxima, and minima.
MA.F-LE.A	Construct and compare linear and exponential models and solve problems
MA.F-LE.A.1b	Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.
MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.4	Model with mathematics.
MA.K-12.5	Use appropriate tools strategically.
MA.K-12.6	Attend to precision.
MA.K-12.7	Look for and make use of structure.
MA.K-12.8	Look for and express regularity in repeated reasoning.
MA.A-CED.A	Create equations that describe numbers or relationships
MA.A-CED.A.1	Create equations and inequalities in one variable and use them to solve problems.
MA.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.
MA.A-REI.D	Represent and solve equations and inequalities graphically
MA.A-REI.D.10	Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line).
MA.A-REI.D.11	Explain why the x-coordinates of the points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where $f(x)$ and/or $g(x)$ are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.
MA.G-GPE.B.5	Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point).
CAEP.9.2.8.B.3	Evaluate communication, collaboration, and leadership skills that can be developed through school, home, work, and extracurricular activities for use in a career.
TECH.8.1.8.A.CS1	Understand and use technology systems.
TECH.8.1.8.A.CS2	Select and use applications effectively and productively.
TECH.8.1.8.D.CS2	Demonstrate personal responsibility for lifelong learning.

Student Learning Objectives

- Students will learn to graph linear equations from a table using slope-intercept and point-slope form.
- Students will learn to find the slope of a line from a table, graph, or 2 points.
- Students will learn to graph direct and inverse variation, find the constant of variation, and apply to word problems.
- Students will learn to use similarity to connect the concept of slope to geometry, specifically colinear points.
- Students will learn to compare and analyze characteristics of linear functions.
- Students will learn to write linear equations in slope-intercept form, point-slope form, and standard form.
- Students will learn to model real-world scenarios with linear functions in slope-intercept, point-slope, and standard form and to convert between these forms.
- Students will learn to identify x and y intercepts of linear functions from tables, equation, graphs and word problems.
- Students will learn to compare slopes to identify whether two linear functions represent parallel, perpendicular, or intersecting lines.
- Students will learn to interpret and compare the characteristics of linear functions as naked problems or with context.
- Students will learn to graph one linear inequality on a coordinate plane and identify the solution space.

Essential Questions

- Is life a straight line?
- How are linear inequalities related to linear equations?
- What types of relationships can be modeled by a straight line?
- What is the language of linear models?
- How can real life situations be represented by linear functions?

Enduring Understandings

- Students will understand that linear models allow us to understand the present and predict the future.

Application

- Students will be able to independently use their learning to identify the characteristics of linear functions and relate to the parent function.
- Students will be able to independently use their learning to identify that linear functions graph as straight lines.
- Students will be able to independently use their learning to explain slope as a ratio that quantifies the steepness of a line.
- Students will be able to independently use their learning to apply the numerical value of slope to problem situations as a constant rate of change.
- Students will be able to independently use their learning to explain when linear functions and proportions are related and explain when and how they are different.
- Students will be able to independently use their learning to identify relationships between two lines (parallel, perpendicular, and intersecting) from graphs, tables and equations.
- Students will be able to independently use their learning to model real world situations with linear equations and inequalities to find the best solution.
- Students will be able to independently use their learning to recognize linear patterns and their associated characteristics when presented with bivariate data.

Skills

Students will be skilled at:

- Calculating slope/rate of change from 2 points, a table, or graph.
- Graphing a linear function from a information imbedded in a table, equation, or description.
- Graphing and identifying the solution area of linear inequalities.
- Writing linear equations from a graph, table, or set of information.
- Modeling real world situations by writing and applying linear equations.
- Identifying, writing equations, and applying direct and inverse variation scenarios.
- Identifying how the various forms of linear functions can be applied to different problems.
- Converting between the forms of linear functions.
- Graphing data as a scatterplot, draw a line of best fit, write a model, and use the model to interpolate and extrapolate information.