Functions

Content Area: **Math**
Course(s):
Time Period: **MP1**
Length: **45**
Status: **Published**

Unit Overview

Unit Summary	Unit Rationale
Unit 2 focuses on extending students' understanding of linear equations. Students analyze descriptions of lines and write their equations in different forms.This unit also focuses on students extending their understanding of linear equations and inequalities to systems of linear equations and inequalities. Students learn methods to solve systems of linear equations and inequalities. Students identify when each solution method is most useful.	In this unit students will build capacity related to applying algebraic concepts to real world situations and using equations to model real world situations. Applications of functions and linear relationships are skills that are built upon in future coursework.

NJSLS

S.ID.C.7	Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.
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.
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.
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.
A.REI.C.6	Solve systems of linear equations algebraically (include using the elimination method) and graphically, focusing on pairs of linear equations in two variables.
F.IF.C.7.b	Graph square root, cube root, and piecewise-defined functions, including step functions

	and absolute value functions.
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).
F.LE.A.2	Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).

Standards for Mathematical Practice

1	Make sense of problems and persevere in solving them
2	Reason abstractly and quantitatively
3	Construct viable arguments and critique the reasoning of others
4	Model with mathematics
5	Use appropriate tools strategically
6	Attend to precision
7	Look for and make use of structure
8	Look for and express regularity in repeated reasoning

Unit Focus

Enduring Understandings	Essential Questions
• When a linear equation is written in slope-intercept form, y=mx+b, m is the slope, and the line intersects the y-axis at (0, b), so the y-intercept is b. • The point-slope form of a linear equation is used to write the equation of a line using the slope and any point on the line. • The standard form of a linear equation is helpful for identifying the x- and y-intercepts. These are used to graph the line and to aid in understanding the constraints within a real-world context. • Many real-world problem situations can be represented with a mathematical model, but that model might not represent the real-world situation exactly. • The equations of lines can be used to help identify whether the lines are parallel or perpendicular. • Parallel lines have the same slope but different x- or y-intercepts; perpendicular lines have slopes that are opposite reciprocals. • The intersection of the graphs of a pair of linear equations is used to estimate the	• What information does the slope-intercept form of a linear equation reveal about a line? • What information does the point-slope form of a linear equation reveal about a line? • What information does the standard form of a linear equation reveal about a line? • How can the equations of lines help identify whether the lines are parallel, perpendicular, or neither? • How can you use a graph to illustrate the solution to a system of linear equations? • How do you use substitution to solve a system of linear equations? • Why does the elimination method work when solving a system of equations? • How does the graph of a linear inequality in two variables help you identify the solutions of the inequality? • How is the graph of a system of linear inequalities related to the solutions of the system of inequalities?

solution to the system. If two lines intersect at a point, there is exactly one solution. If two lines are the same, there are infinitely many solutions. If two lines are parallel, there is no solution. • Substitution is one method for solving systems of equations. The process involves solving one equation for a variable and substituting the solution into the system's other equation. This results in an equation in one variable. Solve for the variable and substitute its value into one of the original equations in the system to find the value of the second variable. • Elimination is an alternate method for solving systems of equations when it is not easy to use substitution. Multiply one or both equations by a constant to get like coefficients that are opposite to use elimination. • The graph of a linear inequality in two variables shows that solutions of the inequality as a half-plane above or below the boundary line. The boundary line is included in the solution when the inequality symbol is ≤ or ≥ excluded when the inequality symbol is < or >. • Many real-world problem situations can be represented with a mathematical model, but that model might not represent the real-world situation exactly. • Systems of linear inequalities can be solved by graphing. The solution of a system of inequalities is the intersection of the corresponding half-planes, excluding the boundary lines in the case of a strict inequality.	

Instructional Focus

Learning Targets

- Write linear equations in two variables using slope-intercept form to represent the relationship between two quantities.
- Interpret the slope and the intercept of a linear model.
- Write and graph linear equations in point-slope form.
- Analyze different forms of a line to interpret the slope and y-intercept of a linear model in the context of data
- Write and graph linear equations in standard form.
- Use linear equations in standard form to interpret both the x- and y-intercepts in the context of given data.
- Use mathematical modeling to represent a problem situation and to propose a solution.
- Test and verify the appropriateness of their math models.
- Explain why the results from their mathematical models might not align exactly with the problem situation.
- Create equations to represent lines that are parallel or perpendicular to a given line.
- Graph lines to show an understanding of the relationship between the slopes of parallel and perpendicular lines.
- Solve real-world problems with parallel or perpendicular lines.
- Graph systems of linear equations in two variables to find an approximate solution.
- Write a system of linear equations in two variables to represent real-world problems.
- Use the substitution method to solve systems of equations.
- Represent situations as a system of equations and interpret solutions as viable/nonviable options for the
  situation.
- Solve systems of linear equations and prove that the sum of one equation and a multiple of the other produces a system with the same solutions as the original system.
- Represent constraints with a system of equations in a modeling context.
- Graph solutions to linear inequalities in two variables.
- Represent constraints with inequalities and interpret solutions as viable or nonviable options in a modeling context.
- Use mathematical modeling to represent a problem situation and to propose a solution.
- Test and verify the appropriateness of their math models.
- Explain why the results from their mathematical models might not align exactly with the problem situation.
- Graph a solution set of a system of linear inequalities in two variables.
- Interpret solutions of linear inequalities in a modeling context.

Prerequisite Skills

- Graphing two lines. Finding a solution of two lines
- solving a system algebraically and finding a solution of 2 lines
- solving a system algebraically and finding a solution of 2 lines
- comparing numbers

- graphing and reading a graph
- solving equations and finding a solution
- graphing inequalities
- types of lines for solution sets ex: no solution, parallel lines
- graphing inequalities and finding solutions
- different types of solutions of systems of equations
- evaluating an algebra equation and interpreting its meaning
- function notation
- defining variables, function notation
- domain and range
- finding a domain of the function from a given graph
- domain and range, graphing, finding slope
- finding an x- and y-intercept from a graph and writing it as an ordered pair, finding the slope from a graph and finding the domain of a function
- standard form of an equation, slope-intercept form of an equation, graphing an equation, creating a "t" chart of points for an equation
- slope, x-intercept, slope intercept form, negative reciprocals
- finding the slope of a line graphed, finding the slope of a table of values, absolute value

Common Misconceptions

- In solving systems graphically, students may mistake a system with infinite solutions for a system with no solutions.
- When solving by substitution, students may substitute into the same equation they used to isolate the variable.
- Students may attempt to solve a system of linear equations using a less efficient method.
- When students are graphing a system of inequalities, they might shade the wrong side of the line.
- When students are graphing a system of inequalities, they might confuse whether the boundary line should be solid or dashed.
- When students are graphing a system of inequalities, they might not know what to do if a point falls ON one of the lines in the system.

• When students are graphing a system of inequalities whose graph forms a set of parallel lines, they might assume that the system has no solutions.

Spiraling For Mastery

Current Unit Content/Skills	Spiral Focus	Activity
• Writing Euqations in Different Forms • Using Slope • Systems of Linear Equations • Systems of Linear Inequalities	• Operations on Real Numbers (Grade 8) • Solving Linear Equations (Grade 8) • Literal Equations (Algebra I) • Solving Inequalities (Grade 7) • Slope Intercept Form (Grade 8) • Standard Form (Algebra I)	• IXL • Math Diagnostic and Intervention System Actibities

Assessment

Formative Assessment	Summative Assessment
• Homework • Lesson Checks • MathXL • Quizzes • Exit Tickets • Lesson Reflections • Performance Tasks	• Topic Tests • Unit Benchmark (Link-It)

Resources

Key Resources	Supplemental Resources
• Savvas EnVision Algebra I	• IXL • Delta Math

	• Desmos • Khan Academy

Career Readiness, Life Literacies, and Key Skills

9.4.12.CT.2	Explain the potential benefits of collaborating to enhance critical thinking and problem solving (e.g., 1.3E.12profCR3.a).
9.4.12.IML.1	Compare search browsers and recognize features that allow for filtering of information.
9.4.12.TL.1	Assess digital tools based on features such as accessibility options, capacities, and utility for accomplishing a specified task (e.g., W.11-12.6.).
9.1.12.PB.2	Prioritize financial decisions by considering alternatives and possible consequences.

Interdisciplinary Connections

RI.AA.9–10.7	Describe and evaluate the argument and specific claims in an informational text, assessing whether the reasoning is valid and the evidence is relevant and sufficient; identify false statements and reasoning.
SL.PE.9–10.1.C	Propel conversations by posing and responding to questions that relate the current discussion to broader themes or larger ideas; actively incorporate others into the discussion; and clarify, verify, or challenge ideas and conclusions.
SL.ES.9–10.3	Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, identifying any false reasoning or distorted evidence.
9-12.HS-PS2-1	Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.
9-12.HS-PS2-4	Use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects.