Unit #03: Linear Equations and Functions

Content Area: **Mathematics**
Course(s): **Algebra II**
Time Period: **October**
Length: **3 weeks**
Status: **Published**

Unit Overview

The first part of this unit deals with linear equations and their graphs. Open sentences in two variables are presented with regard to their form and their solution sets. Finding the slope and using the slope of the equation of a line are main ideas in the first part of this unit. The second part of this unit continues with linear equations and systems of linear equations and inequalities. In the final part of this unit, functions and relations are defined and compared with emphasis on linear functions and identifying relations that are also functions.

Enduring Understandings

Students will develop critical thinking by graphing linear equations and inequalities.

Students will identify functions that reveal patterns to solve real-world problems.

Essential Questions

- How can formulas be used in everyday life?
- How do you graph a system of linear equations and inequalities?
- How might you solve a real-world math problem using a system of linear functionss?

Standards/Indicators/Student Learning Objectives (SLOs)

Student Learning Objectives:

- SWBAT describe the domain and range of a function.
- SWBAT determine if a relation is a function.
- SWBAT find an equation of a line given its slope and a point on the line.
- SWBAT find an equation of a line given its slope and the y-intercept.
- SWBAT find an equation of a line given two points on the line.
- SWBAT find equations of linear functions.

- SWBAT find solutions of open sentences in two variables.
- SWBAT find the slope of a line.
- SWBAT find the values of functions.
- SWBAT graph a line given its slope and a point on the line.
- SWBAT graph functions.
- SWBAT graph linear equations in two variables.
- SWBAT graph linear inequalities in two variables.
- SWBAT graph systems of linear inequalities.
- SWBAT solve problems involving open sentences in two variables.
- SWBAT solve systems of linear equations in three variables.
- SWBAT solve systems of linear equations in two variables.
- SWBAT use systems of equations to solve problems.

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.F-IF.A	Understand the concept of a function and use function notation
MA.K-12.2	Reason abstractly and quantitatively.
MA.F-IF.A.1	Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then $f(x)$ denotes the output of f corresponding to the input x. The graph of f is the graph of the equation $y = f(x)$.
MA.F-IF.A.2	Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.
MA.K-12.4	Model with mathematics.
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.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.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.
MA.S-ID.C.8	Compute (using technology) and interpret the correlation coefficient of a linear fit.
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-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.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.
MA.A-REI.A.2	Solve simple rational and radical equations in one variable, and give examples showing

	how extraneous solutions may arise.
MA.A-REI.B.3	Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
MA.F-LE.A	Construct and compare linear and exponential models and solve problems
MA.A-REI.C.5	Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions.
MA.A-REI.C.6	Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.
MA.A-REI.C.8	Represent a system of linear equations as a single matrix equation in a vector variable.
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.A-REI.D.12	Graph the solutions to a linear inequality in two variables as a half plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.
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).

Indicators

	Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.
MA.F-IF.A	Understand the concept of a function and use function notation
	Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending

	to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.
MA.F-IF.B	Interpret functions that arise in applications in terms of the context
	Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.
MA.S-ID.B.6a	Fit a function to the data (including with the use of technology); use functions fitted to data to solve problems in the context of the data.
MA.S-ID.B.6b	Informally assess the fit of a function by plotting and analyzing residuals, including with the use of technology.
MA.S-ID.B.6c	Fit a linear function for a scatter plot that suggests a linear association.
MA.F-IF.C	Analyze functions using different representations
MA.A-REI.B	Solve equations and inequalities in one variable
MA.A-REI.C	Solve systems of equations
MA.A-REI.D	Represent and solve equations and inequalities graphically

Lesson Titles

- Evaluate Functions
- Finding the Slope of a Line
- Graphing Functions
- Graphing Linear Inequalities
- Graphing Systems of Linear Inequalities
- Problem Solving in Two Variables
- Relations & Functions
- Solve Systems of Linear Equations in 2 Variables
- Solve Systems of Linear Equations in 3 Variables
- Writing Equations of Lines

Career Readiness, Life Literacies & Key Skills

TECH.9.4.2.CI.2	Demonstrate originality and inventiveness in work (e.g., 1.3A.2CR1a).
TECH.9.4.2.CT.2	Identify possible approaches and resources to execute a plan (e.g., 1.2.2.CR1b, 8.2.2.ED.3).

TECH.9.4.2.CT.3	Use a variety of types of thinking to solve problems (e.g., inductive, deductive).
TECH.9.4.2.TL.2	Create a document using a word processing application.
TECH.9.4.2.TL.3	Enter information into a spreadsheet and sort the information.

Inter-Disciplinary Connections

LA.RST.9-10.1	Accurately cite strong and thorough evidence from the text to support analysis of science and technical texts, attending to precise details for explanations or descriptions.
LA.RI.11-12.3	Analyze a complex set of ideas or sequence of events and explain how specific individuals, ideas, or events interact and develop over the course of the text.
LA.RST.9-10.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics.
LA.RI.11-12.4	Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text (e.g., how Madison defines faction in Federalist No. 10).
LA.WHST.9-10.1.E	Provide a concluding paragraph or section that supports the argument presented.
LA.W.11-12.2	Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.
LA.WHST.9-10.2.D	Use precise language and domain-specific vocabulary to manage the complexity of the topic and convey a style appropriate to the discipline and context as well as to the expertise of likely readers.
LA.SL.11-12.1	Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with peers on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.
LA.SL.11-12.1.C	Propel conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives.
LA.L.11-12.6	Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.
12.9.3.ST.2	Use technology to acquire, manipulate, analyze and report data.
12.9.3.ST.4	Understand the nature and scope of the Science, Technology, Engineering & Mathematics Career Cluster and the role of STEM in society and the economy.
TECH.8.1.12.A	Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems and operations.
TECH.8.1.12.A.CS2	Select and use applications effectively and productively.

Instructional Strategies, Learning Activities, and Levels of Blooms/DOK

- Bloom's Analysis: Break the concept into parts to understand how each is related to one another
- Bloom's Application: Use knowledge gained in new ways
- Bloom's Comprehension: Make sense of what has been learned

- Bloom's Evaluation: Put new information together in an innovative way
- Bloom's Knowledge: Recall relevant knowledge from prior lessons and long-term memory
- Bloom's Synthesis: Make judgements based on a set of guidelines to create new meaning
- Intro how to write an equation of a line that passes through a given point and is parallel or perpendicular to the given slope
- Intro lesson composition of functions
- Intro lesson on evaluating functions
- Intro lesson on graphing linear equations in two variables
- Intro solving systems of equations by elimination method
- Intro solving systems of equations by linear combination method
- Intro vocab terms: domain, range, abscissa, ordinate and review the coordinate plane
- Lesson on relations and functions
- Notes will be taken using Smart Notebook
- Review homework
- Review how to find the slope between two points and from a graphed line
- Review solving equations for y and graphing on coordinate plane
- Review solving systems of equations by graphing
- Review warm up
- Review writing an equation of a line given two points
- Review writing equations of a line given the slope and a point
- Students will present solutions on the board
- Students will work independently on examples
- Students will work together on a worksheet
- Tutoring during Delsea One

Alternate Assessment

Performance tasks

Project-based assignments

Problem-based assignments

Presentations

Benchmark Assessment

Skills-based assessment- math practice

Modifications

ELL Modifications

- Focus on domain specific vocabulary and keywords
- Offer alternate/or modify assessments
- Offer resources for specific topics in primary language (Youtube web resources)
- Provide formal and informal verbal interaction to provide practice, increase motivation, and self-monitoring
- Tutoring during Delsea One
- Use real objects when possible

IEP & 504 Modifications

- Allow student to correct mistakes or answer wrong questions correctly for additional credit if failed the first test (another way to re-teach material)
- Allow student to take notes in class for reinforcement but also provide a copy of completed/correct notes to study from
- Provide formulas on the test and/or sample problems
- Tutoring during Delsea One

G & T Modifications

- Avoid drill and practice activities.
- Determine where students' interests lie and capitalize on their inquisitiveness. (Is there a specific career they are interested in? How would this apply to their interest?)
- Encourage creative expression and thinking by allowing students to choose how to approach a problem or assignment
- Encourage peer leadership or mentoring
- Provide additional rigorous challenge problems for advanced students

At Risk Modifications

- guided notes
- retesting
- slower pacing of materials

- speaking to students privately when redirecting behaviors
- tutoring during Delsea One

Formative Assessment

- Exit Ticket
- Group Work
- Guided Practice
- Individual Practice
- Journal Entry
- Kahoot!
- Observation
- Oral Responses
- Poll class to self-analyze their comfort level of the lesson
- Socrative
- Teacher Observation
- Vocabulary Review

Summative Assessment

- Alternative Assessment
- Marking Period Assessment
- Quiz on Composition of Functions
- Quiz on Methods for Finding Slope & Graphing Lines
- Unit Test on Relations and Functions
- Unit Test on Systems of Equations

Resources & Materials

- Chromebook
- Graphing Calculator
- Promethean Board
- Smart Notebook
- Teacher generated worksheets
- Textbooks: Algebra and Trigonometry Structure and Method Book 2 (McDougal Littell), Algebra II Common Core (Pearson)

Technology

- google classroom
- http://kutasoftware.com/
- http://mathxlforschool.com/home_school.htm
- https://create.kahoot.it
- https://njctl.org/
- https://quizizz.com/
- https://socrative.com/
- https://worldatlas.randmcnally.com/map
- https://www.desmos.com/
- https://www.resourceaholic.com/
- https://www.youtube.com/watch?v=jEh3r18MJxo&feature=youtu.be
- Student 1-1 Device (chromebook)
- TI Graphing Calculator

TECH.8.1.12	Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
TECH.8.1.12.A.CS1	Understand and use technology systems.
TECH.8.1.12.A.CS2	Select and use applications effectively and productively.
TECH.8.1.12.B	Creativity and Innovation: Students demonstrate creative thinking, construct knowledge and develop innovative products and process using technology.
TECH.8.1.12.C.CS4	Contribute to project teams to produce original works or solve problems.
TECH.8.1.12.E.CS1	Plan strategies to guide inquiry.
TECH.8.1.12.E.CS4	Process data and report results.