03-Graphing Linear Equations & Inequalities

Content Area: **Math**
Course(s):
Time Period: **Full Year**
Length: **3-4 weeks (12-14 blocks)**
Status: **Published**

General Overview, Course Description or Course Philosophy

In this unit, students will build on the knowledge of functions from unit 1. They will connect and extend on the key characteristics of functions to graph, write, and interpret linear functions. Students will make connections between the three forms of linear equations and their graphs. Students will be able to identify linear relationships in real-world contexts, create equations and graphs to analyze the relationship, and interpret their key components (i.e. slope, intercepts) within that context. In addition to linear equations, students will extend these ideas to linear inequalities.

OBJECTIVES, ESSENTIAL QUESTIONS, ENDURING UNDERSTANDINGS

Students will understand that:

- Graphs can be represented by equations or inequalities and can be used to solve a problem and predict an outcome
- Data can be graphed and some data lend themselves to linear graphs from which formulas can be derived

Essential Questions:

- What information does the equation of a line give you? Does this information vary based on the form of the equation?
- How can you determine which form of a linear equation is most appropriate based on a given situation?
- What information can the graph of a real-world situation provide?
- What does the slope of a line indicate about the function?

CONTENT AREA STANDARDS

A.CED

A. Create equations that describe numbers or relationships

A.REI

A. Understand solving equations as a process of reasoning and explain the reasoning

B. Solve equations and inequalities in one variable

C. Solve systems of equations

D. Represent and solve equations and inequalities graphically

A.SSE

A. Interpret the structure of expressions

B. Write expressions in equivalent forms to solve problems

HS Functions

F.BF

A. Build a function that models a relationship between two quantities

B. Build new functions from existing functions

F.IF

A. Understand the concept of a function and use function notation

B. Interpret functions that arise in applications in terms of the context

C. Analyze functions using different representations

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.A-SSE.A.1a	Interpret parts of an expression, such as terms, factors, and coefficients.
MA.K-12.4	Model with mathematics.
MA.A-SSE.A.2	Use the structure of an expression to identify ways to rewrite it. For example, see $x^4 - y^4$ as $(x^2)^2 - (y^2)^2$, thus recognizing it as a difference of squares that can be factored as $(x^2 - y^2)(x^2 + y^2)$.
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.K-12.5	Use appropriate tools strategically.
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.N-Q.A.1	Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.

MA.N-Q.A.2	Define appropriate quantities for the purpose of descriptive modeling.
MA.S-ID.B.6b	Informally assess the fit of a function by plotting and analyzing residuals, including with the use of technology.
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.K-12.7	Look for and make use of structure.
MA.S-ID.B.6c	Fit a linear function for a scatter plot that suggests a linear association.
MA.K-12.8	Look for and express regularity in repeated reasoning.
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.F-IF.C.7a	Graph linear and quadratic functions and show intercepts, maxima, and minima.
MA.S-ID.C.8	Compute (using technology) and interpret the correlation coefficient of a linear fit.
MA.S-ID.C.9	Distinguish between correlation and causation.
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.F-BF.B.3	Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $kf(x)$, $f(kx)$, and $f(x + k)$ 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.
MA.F-LE.A.1a	Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.
MA.F-LE.A.1b	Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.
MA.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).
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).

RELATED STANDARDS (Technology, 21st Century Life & Careers, ELA Companion Standards are Required)

9.1.8.PB.5: Identify factors that affect one's goals, including peers, culture, location, and past experiences. •
9.1.8.PB.6: Construct a budget to save for short-term, long term, and charitable goals.

LA.K-12.NJSLSA.R7	Integrate and evaluate content presented in diverse media and formats, including visually and quantitatively, as well as in words.
CS.K-12.3.a	Identify complex, interdisciplinary, real-world problems that can be solved computationally.
CS.K-12.3.c	Evaluate whether it is appropriate and feasible to solve a problem computationally.
CS.K-12.7.a	Select, organize, and interpret large data sets from multiple sources to support a claim.
TECH.K-12.P.5	Utilize critical thinking to make sense of problems and persevere in solving them.
TECH.K-12.P.8	Use technology to enhance productivity increase collaboration and communicate effectively.

STUDENT LEARNING TARGETS

Declarative Knowledge

Students will understand that:

- Slope represents the constant rate of change for a linear function
- Intercepts indicate the points that the function crosses the x and y axes
- There are three forms of linear equations (slope-intercept, point-slope, standard)
- Parallel lines have the same slope
- Perpendicular lines have opposite reciprocal slopes
- A relationship between two variables in a scatterplot can be described using the line of best fit

Procedural Knowledge

Students will be able to:

- Identify the y-intercept from a graph, table, equation, and ordered pair
- Identify the slope from a graph, table, equation, and ordered pairs
- Create an equation of a line in slope-intercept, point-slope, or standard form from a graph, table, or ordered pairs
- Create the graph of a linear equation from an equation, the x- and y-intercepts, a table, or the slope and a point
- Categorize lines as parallel, perpendicular, or intersecting based on the slope
- Create a scatter plot from two sets of data
- Determine the line of best fit using a ruler and a graphing calculator
- Construct graphs of linear inequalities
- Analyze the key components of the graph of a linear inequality
- Create and interpret equations/inequalities and their graphs to represent real-world situations

EVIDENCE OF LEARNING

Alternate Assessments

- Portfolios

- Verbal Assessment (instead of written)

- Multiple choice

- Modified Rubrics

- Performance Based Assessments

Benchmark Assessments

Benchmark Assessments conducted three times per year, using Pear Assessment (Standards Based Assessments)

Formative Assessments

- Class Discussion/Exit Cards
- Homework/practice problems (assigned from textbook or various web resources, such as Khan Academy, Albert, Quizizz, or Desmos)

Summative Assessments

- Lesson quizzes
- Teacher-generated unit test
- Performance tasks

RESOURCES (Instructional, Supplemental, Intervention Materials)

Core Instructional Resources

- *Pearson Algebra 1: Common Core*, Chapter 5

Supplemental Resources

- Illustrative Math Tasks
- Arlington Algebra Project (Linear Functions)

- Desmos Activities:
    - [Point-Collector: Lines](#)
    - [Land the Plane](#)
    - [Parallel Lines Investigation](#)
    - [Perpendicular Lines Investigation](#)
    - Polygraphs: [Linear Equations](#) and [Linear Inequalities](#)

INTERDISCIPLINARY CONNECTIONS

Students can write and graph linear equations or inequalities to model real-world situations that arise in a variety of contexts. For example, students can apply equations to represent unknown quantities in a variety of contexts and inequalities to analyze constraints (i.e. monetary or supply constraints when completing a project).

ACCOMMODATIONS & MODIFICATIONS FOR SUBGROUPS

See link to Accommodations & Modifications document in course folder.