Unit 4: Graphing Linear Equations and Inequalities

Content Area: **Mathematics**
Course(s): **Mathematics**
Time Period: **Week 14**
Length: **5 Weeks**
Status: **Published**

Unit Overview

In this unit, students will identify the domain and range of a function. They will graph linear equations on the coordinate plane by making tables, using x-and y-intercepts, and using the slope and y-intercept. Students will interpret slope as a rate of change in real-world situations and explore how changing the slope and y-intercept changes the graph. They will use slope to identify parallel lines. Students will also graph linear inequalities in two variables They will write and graph direct variation equations and use them to solve real-world problems. Students will graph absolute value functions.

Standards

MA.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.
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.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.
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.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.

Essential Questions

- How can change be best represented mathematically?
- How are patterns of change related to the behavior of functions?
- How can patterns, relations, and functions be used as tools to best describe and help explain real-life situations?
- Where are linear inequalities used in real-world situations?

Application of Knowledge and Skills...

Students will know that...

- 1) the Cartesian plane (coordinate plane) is comprised of an x-axis and y-axis.
- 10) direct variation is an equation in the form y=kx
- 11) the graph of absolute value functions is in the shape of a "V"
- 2) the domain of a function is the set of all inputs
- 3) the range of a function is the set of all outputs
- 4) a relation represented by a graph is a function provided that no vertical line passes through more than one point on the graph
- 5) the intercepts of a graph are the locations where a line crosses the axes.
- 6) the slope of a non-vertical line is the ratio of the vertical change to the horizontal change between any two points on the line
- 7) slope intercept form is y=mx+b
- 8) parallel lines have the same slope
- 9) perpendicular lines have slopes that are opposite reciprocals

Students will be able to...

- a) Identify and plot points on the coordinate plane
- b) Identify the domain and range of a function
- c) Use the vertical line test to identify functions on the coordinate plane
- d) Identify x-intercepts and y-intercepts
- e) Calculate slope of a line
- f) Graph linear equations using tables
- g) Graph linear equations in slope-intercept form
- h) Identify parallel and perpendicular lines given the slope
- i) Graph linear inequalities in two variables
- j) Identify and graph direct variation equations
- k) Solve for the constant of variation
- l) Graph absolute value functions

Assessments

- Communicator Practice Diagnostic: Other written assessments
- Daily Do Now Problems Diagnostic: Other written assessments Students will complete daily Do Now problems to assess readiness.
- Graphing Test Summative: Written Test Topics will include: Identifying domain and range, calculating slope, graphing equations using a table, graphing equations using intercepts, graphing equations in slope-intercept form, parallel and perpendicular lines, graphing inequalities in two variables, graphing direct variation equations, and graphing of absolute value functions.
- One or two problems will be used to determine whether students mastered material taught during the lesson.
- Quiz 1 Formative: Written Test
- Students will solve practice problems on communicators to receive immediate feedback.
- Students will take a quiz on domain and range, functions, and graphing linear using a table of values. Students will also identify and calculate the slope of a line and calculate intercepts.
- Tickets to Leave Formative: Other written assessments

Activities

Intercepts Investigation

Students discover how to find intercepts of an equation by interpreting the meaning of the intercepts in the context of a real-world problem.

Slope Activity

Students visualize the rise and the run of slope by creating a ramp using a ruler and textbooks. This leads to the algebraic representation of slope.

Exploring Slope and Y-Intercept Investigation

Students use algebra to find the y-intercepts and slopes of equations and then compare their results to each equation to find that the y-intercept of a graph $y=mx+b$ is b and the slope is m.

Stained Glass Window Activity

Students graph multiple linear equations in slope-intercept form on graph paper. The result is a stained glass design.

Linear Inequality in Two Variables Investigation

Students will use knowledge of graphing equations and checking solutions to discover how to graph linear

inequalities in two variables.

Graphing Calculator Activity

Pairs of students will use graphing calculators to graph linear equations and inequalities and check answers to independent practice problems.

Absolute Value Graph Activity

Students will use TI-83 Graphing Calculators to graph absolute value functions.

Modeling Direct Variation Activity

Students will create a scatter plot of student standing height versus kneeling height to demonstrate direct variation.

Communicator Practice

Students will solve differentiated practice problems on SmartPal response boards.

- Intercepts Investigation
- Slope Activity
- Slope and Y-Intercept Investigation
- Stained Glass Window Activity
- Direct Variation Investigation

Activities to Differentiate Instruction

Differentiation for special education:

- General modifications may include:
  - Modifications & accommodations as listed in the student's IEP
  - Assign a peer to help keep student on task
  - Modified or reduced assignments
  - Reduce length of assignment for different mode of delivery
  - Increase one-to-one time
  - Working contract between you and student at risk
  - Position student near helping peer or have quick access to teacher
  - Break tests down in smaller increments

- **Content specific modifications may include:**
    - Provide personal handout for integer rules
    - Provide graphic organizer for remembering angle relationships
    - Provide completed examples for practice work and homework.
    - Provide calculator to assist with calculations.
    - Provide students with a formula sheet with one type of problem for each formula worked out for them already.

Differentiation for ELL's:

- General modifications may include:
    - Strategy groups
    - Teacher conferences
    - Graphic organizers
    - Modification plan

- **Content specific vocabulary important for ELL students to understand include:** Cartesian plane, coordinate plane, x-axis, y-axis, domain, function, input, output, vertical, horizontal, line, intercept, slop, ratio, parallel, perpendicular, reciprocal, equation, absolute value, domain, range, inequality

Differentiation to extend learning for gifted students may include:

- Challenge and enrichment homework, worksheets, and activity
- Optional weekly challenge problems

Integrated/Cross-Disciplinary Instruction

Art History - As students investigate direct variation, they will acquire knowledge about Leonardo da Vinci and his study of human proportion to create more accurate drawings.

Technology - Students will utilize the TI-83 Plus graphing calculators.

Resources

McDougal Littell Algebra 1 textbook and resource materials

Kuta software

SmartExchange resources

- McDougal Littell Algebra 1
- SMART Exchange

21st Century Skills

CRP.K-12.CRP2.1	Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive. They make connections between abstract concepts with real-world applications, and they make correct insights about when it is appropriate to apply the use of an academic skill in a workplace situation.
CRP.K-12.CRP4.1	Career-ready individuals communicate thoughts, ideas, and action plans with clarity, whether using written, verbal, and/or visual methods. They communicate in the workplace with clarity and purpose to make maximum use of their own and others' time. They are excellent writers; they master conventions, word choice, and organization, and use effective tone and presentation skills to articulate ideas. They are skilled at interacting with others; they are active listeners and speak clearly and with purpose. Career-ready individuals think about the audience for their communication and prepare accordingly to ensure the desired outcome.
CRP.K-12.CRP8.1	Career-ready individuals readily recognize problems in the workplace, understand the nature of the problem, and devise effective plans to solve the problem. They are aware of problems when they occur and take action quickly to address the problem; they thoughtfully investigate the root cause of the problem prior to introducing solutions. They carefully consider the options to solve the problem. Once a solution is agreed upon, they follow through to ensure the problem is solved, whether through their own actions or the actions of others.
CRP.K-12.CRP11.1	Career-ready individuals find and maximize the productive value of existing and new technology to accomplish workplace tasks and solve workplace problems. They are flexible and adaptive in acquiring new technology. They are proficient with ubiquitous technology applications. They understand the inherent risks-personal and organizational-of technology applications, and they take actions to prevent or mitigate these risks.
CRP.K-12.CRP12.1	Career-ready individuals positively contribute to every team, whether formal or informal. They apply an awareness of cultural difference to avoid barriers to productive and positive interaction. They find ways to increase the engagement and contribution of all team members. They plan and facilitate effective team meetings.