# **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** Understand that a function from one set (called the domain) to another set (called the CCSS.Math.Content.HSF-IF.A.1 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). CCSS.Math.Content.HSF-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. CCSS.Math.Content.HSF-IF.B.5 Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. CCSS.Math.Content.HSF-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. CCSS.Math.Content.HSF-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. CCSS.Math.Content.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. CCSS.Math.Content.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. Construct a function to model a linear relationship between two quantities. Determine the CCSS.Math.Content.8.F.B.4 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. CCSS.Math.Content.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. CCSS.Math.Content.HSA-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). CCSS.Math.Content.HSA-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

#### **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...

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 skilled at...

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
- I) 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 ▲
- <sup>■</sup> <u>Slope Activity</u> <sup>■</sup>
- Slope and Y-Intercept Investigation
- <sup>★</sup> <u>Stained Glass Window Activity</u> <sup>★</sup>
- Direct Variation Investigation ■

# **Activities to Differentiate Instruction**

Interactive Smart Board Activities will be utilized.

Students will work in mixed-level groups.

Students will be assigned optional and mandatory challenge problems on homework assignments.

Enrichment worksheets will be available for classwork and/or homework.

Homework will be modified as needed.

Guided notes and study guides will be provided accordingly.

Modified versions of quizzes and tests will be distributed.

Appropriately leveled problems for students to solve when participating in communicator practice will be provided.

# **Integrated/Cross-Disciplinary Instruction**

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

<u>Technology</u> - Students will utilize the TI-83 Plus graphing calculators.

# Resources

McDougal Littell Algebra 1 textbook and resource materials

Kuta software

SmartExchange resources

★ <u>McDougal Littell Algebra 1</u>
★ <u>SMART Exchange</u>