Unit C - *What's In A Line? - Elements of Linear Equations*

Overview

In this unit students will learn how to model with, interpret and graph linear functions. The ability to fluidly move between different representations of linear relationships is a skill that students will continue to use and to build upon in Algebra and later math courses. Students will use technology to experiment with changing the parameters of a linear equation and noting how those changes affect the graph of the relationship.

21st Century Capacities: Analyzing, Synthesizing, Product Creation

Stage 1 - Desired Results

ESTABLISHED GOALS/ STANDARDS

MP4 Model with Mathematics
MP7 Look for and make use of structure
MP8 Look for and express regularity in repeated reasoning

A.SSE.1 Interpret expressions that represent a quantity in terms of its context.
A.SSE.1a Interpret parts of an expression, such as terms, factors, and coefficients.
A.SSE.1b Interpret complicated expressions by viewing one or more of their parts as a single entity.
A.CED.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales
A.CED.3 Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context. For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.
A.CED.4 Rearrange formulas to highlight a quantity of

Transfer:

Students will be able to independently use their learning in new situations to...

1. Model relationships among quantities; (Analyzing)
2. Represent and interpret patterns in numbers, data and objects; (Product Creation)
3. Draw conclusions about graphs, shapes, equations, or objects. (Synthesizing)

Meaning:

UNDERSTANDINGS: *Students will understand that:*

1. There are many ways to represent a function.
2. Changing the parameters of a function changes key features of the relationship
3. Linear functions are characterized by a constant rate of change

ESSENTIAL QUESTIONS: *Students will explore & address these recurring questions:*

A. How can mathematics model observed relationships?
B. Which representation best communicates what I want the audience to understand?
C. What are the different ways a linear function can be represented?
D. What is the significance of the slope and the intercepts of a function?

interest, using the same reasoning as in solving equations. For example, rearrange Ohm's law V = IR to highlight resistance R. A.REI.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). 8.F.3 Interpret the equation y = mx + b as defining a linear function, whose graph is a straight line; F.IF.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. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity F.IF.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 F.IF.7 Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases F.IF.7a Graph linear and quadratic functions and show intercepts, maxima, and minima. F.IF.9 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum. F.BF.1 Write a function that describes a relationship between two quantities. F.BF.3 Identify the effect on the graph of replacing f(x) by f(x) + k, k f(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. Include	***Acquisition:*** *Students will know…* 1. Know what makes a function linear (from a graph, table, word problem) 2. The meaning of slope, the intercepts and any point in context 3. A horizontal line has zero slope and a vertical line has no slope 4. The effects of changing the parameters of an equation in the form y=mx+b 5. Vocabulary: parallel, perpendicular, direct variation	*Students will be skilled at…* 1. Reading a graph (distance vs time) 2. Graphing equations using a table 3. Determining if a graph is increasing or decreasing 4. Finding the slope of line (from two points, from a graph) 5. Finding unit rates (in context, from a graph) 6. Using the magnitude of slope to compare two functions 7. Graphing and writing equations of vertical and horizontal lines 8. Graphing lines in slope intercept form 9. Getting equations into y=mx+b form 10. Determining if two lines are parallel or perpendicular 11. Given a point, writing an equation perpendicular or parallel to another 12. Determining break even points of two scenarios 13. Identifying direct variation situations 14. Determining the slope of a direct variation situation 15. Using direct variation in context 16. Using proportion to find missing parts of direct variations 17. Getting an equation in standard form 18. Finding the intercepts of two functions 19. Fluidly moving between the forms of equation of line and use that form to interpret the graph a. slope intercept (context of m and b) b. standard (context of intercepts) c. point slope

recognizing even and odd functions from their graphs and algebraic expressions for them. F.LE.1b Recognize situations in which one quantity changes at a constant rate per unit interval relative to another. F.LE.1c Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another. F.LE.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). F.LE.5 Interpret the parameters in a linear or exponential function in terms of a context.		20. Identifying when to use each form to solve a problem 21. Write the equation of a line in slope-intercept form, point slope form, or standard form given: a. the slope and y intercept b. the slope and one ordered pair on the line c. two ordered pairs d. an ordered pair and an equation or a parallel or perpendicular line 22. Write a linear equation to describe a set of points 23. Application of all of the above