Unit F - *Visualizing Solutions to Equations*

Overview

In this unit students grasp the concept of a function as a rule that assigns to each input exactly one output. They understand that functions describe situations where one quantity determines another. They can translate among representations and partial representations of functions (noting that tabular and graphical representations may be partial representations), and they describe how aspects of the function are reflected in the different representations.

Students use linear equations and systems of linear equations to represent, analyze, and solve a variety of problems. Students recognize equations for proportions (y/x = m or y = mx) as special linear equations (y = mx + b), understanding that the constant of proportionality (m) is the slope, and the graphs are lines through the origin. They understand that the slope (m) of a line is a constant rate of change, so that if the input or x-coordinate changes by an amount A, the output or y-coordinate changes by the amount m·A. Students also use a linear equation to describe the association between two quantities in bivariate data (such as arm span vs. height for students in a classroom). Interpreting the model in the context of the data requires students to express a relationship between the two quantities in question and to interpret components of the relationship (such as slope and y-intercept) in terms of the situation.

21st Century Capacities: Synthesizing

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

CC.8.F.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. (Function notation is not required in Grade 8.)

CC.8.F.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.

Transfer:

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

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

Meaning:

UNDERSTANDINGS: *Students will understand that:*	ESSENTIAL QUESTIONS: *Students will explore & address these recurring questions:*
1. Mathematicians use various representations of relationships to build meaning. 2. Some relationships are linear,	A. How can I explain this mathematically? B. What is another way to represent this information? C. How do you express and describe a

CC.8.F.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. **CC.8.F.5** Describe qualitatively the functional relationship between two quantities by reading 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. **CC.8.F.2** Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change. **CC. 8.SP.1** Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association. **CC. 8.SP.2** Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line. **8.EE.5** Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional	some are proportional, and some are neither.	pattern and use it to make predictions and solve a problem? D. How can change be described? E. What story is this table / expression / equation / graph telling?
	Acquisition:	
	Students will know… 1. When you graph a linear equation, the points will form a straight line 2. The graph of proportional relationships go through the point (0,0) 3. The slope of a line can be found using any two points on the line 4. Vocabulary**:** scatterplot, line of best fit, function, proportional, iteration, independent, dependent, correlation, outlier, slope, y-intercept, unit rate	*Students will be skilled at…* 1. Drawing a best fit line 2. Using a best fit line to make predictions 3. Identifying positive, negative or no correlation between two events 4. Identifying the dependent and independent variable in a relationship 5. Interpreting graphs (for example distance vs time) 6. Identifying whether or not a relationship (from a table, story, graph) is a proportional relationship 7. Making a table and a graph from an equation with two variables 8. Identifying the appropriate graph as described by a real world situation 9. Representing a proportional relationship with an equation 10. Comparing tables, graphs and lines (especially the unit rate) 11. Identifying the slope (unit rate) of a graphed line, table, equation, diagram and verbal description 12. Identifying the y-intercept of a graphed line 13. Graphing equations using y = mx + b 14. Putting an equation into y=mx + b form 15. Explaining what the point (x,y) means in context

relationships represented in different ways. For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed. **8.EE.6** Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation y = mx for a line through the origin and the equation y = mx + b for a line intercepting the vertical axis at b. **7.RP.2** Recognize and represent proportional relationships between quantities. **7.RP.2a**. Decide whether two quantities are in a proportional relationship, e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin. **7.RP.2b**. Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships. **7.RP.2c**. Represent proportional relationships by equations. For example, if total cost t is proportional to the number n of items purchased at a constant price p, the relationship between the total cost and the number of items can be expressed as t = pn. **7.RP.2d.** Explain what a point (x, y) on the graph of a proportional relationship means in terms of the situation, with special attention to the points (0, 0) and (1, r) where r is the unit rate		