Course: Algebra I **Unit #/Name:** Unit #2 Linear Functions	**Year of Implementation:** 2019-2020

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Stage One - Desired Results

Link(s) to New Jersey Student Learning Standards for this course:
https://www.state.nj.us/education/cccs/2016/math/standards.pdf

Unit Standards:

NJSLS.F-IF: A1-2; B5-6; C7a

- Understand the concept of a function and use function notation.
- Analyze functions using different representations.

NJSLS.F-BF.A1B,C; B3

- Build new functions from existing functions.

NJSLS.F-LE.A1B

- Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.

NJSLSA-CEDA1-4

- Create equations that describe numbers or relationships

NJSLS-G-GPE.B-5

- Use coordinates to prove simple geometric theorems algebraically

Interpreting Categorical and Quantitative Data S-ID: 1, 2, 3, 5, 6, 7, 8, 9

- Summarize, represent, and interpret data on a single count or measurement variable
- Summarize, represent, and interpret data on two categorical and quantitative variables
- Interpret linear models

Transfer Goal(s): *Students will be able to independently use their learning to solve problems and effectively communicate their reasoning.*

Enduring Understandings Students will understand that. . .	*Essential Questions*
EU1 math allows us to see patterns that might have remained unseen and gives us a way to communicate real-world relationships.	EU1 ● Why is data collected and analyzed? ● What can patterns reveal? ● How can we use mathematical models to describe real-world relationships?
EU2 patterns and relationships can be represented graphically, numerically, symbolically, and verbally.	EU2 ● What is the best way of approaching this problem? ● How do I express a pattern to show a relationship?
EU3 math can be used to make predictions, some that aren't always obvious.	EU3 ● How can patterns be used to make predictions? ● Given a pattern or relationship, what can we conclude? What can't we conclude?
Knowledge Students will know. . .	*Skills* Students will be able to. . .

EU1 ● real-world situations can be graphed and interpreted using an algebraic model. ● slope is a rate of change EU2 ● functions can be represented as ordered pairs, graphs, tables, and mappings. ● linear functions can be written in a variety of forms. EU3 ● output values are dependent on input values.	EU1 ● describe how changing the slope and/or y- intercept affect the graph of a line. ● identify the domain and range of a given function ● interpret slope as a rate of change. EU2 ● express relationships using function notation. ● recognize relationships as functions from graphs, tables, and descriptions. ● write linear equations in slope-intercept form. ● write linear equations in point-slope form. ● write linear equations in standard form . EU3 ● use lines of best fit to model and interpret data and make predictions.

Stage Two - Assessment

Other Evidence:

- Tests on recognizing and writing relationships as functions given a data table, graph or equation, solving linear equations, graphing linear equations and functions, and writing linear equations
- Quizzes on identifying relationships as functions, identifying independent and dependent variable given a real life situation, writing rules and graphing from linear data tables, and finding slope.
- Rubrics to assess above tasks.
- Assessed Elements from Recommended Performance Tasks
- Other teacher-graded evaluations
- Presentations of student research

- Cumulative Benchmark Assessment at end of each marking period.

Stage Three - Instruction

Learning Plan: **Suggested Learning Activities to Include Differentiated Instruction and Interdisciplinary Connections: Each learning activity listed must be accompanied by a learning goal of A= Acquiring basic knowledge and skills, M= Making meaning and/or a T= Transfer.**

Activities:

- Give students a series of graphs labeled as functions and non-functions. Have them work in pairs to use these graphs to determine what makes a graph a function. Identify the domain and range for those that are functions. (A)
- Brainstorm non-numeric relationships that represent functions. (i.e., success on a test depends on amount of time spent studying). Students will determine from the sentences they are given as to which of the variables are dependent or independent. They will be given (5) sentences to analyze. Students will then create (3) on their own. Differentiation Activity: Quiz-Quiz-Pass. (M)
- **Functions:** Represent functions in different forms (mapping, ordered pairs, tables, and graphs) (Worksheet in Google Drive) (M)

  (i.e., Given: Ordered Pairs → Mapping

  Function Notation → Ordered Pairs

  Graph → Function Notation

  Table → Graph

- Transformation: Students will create and demonstrate the shifting of a line. They will make a poster to show the shifts right/left and up/down compared to the parent graph of $f(x) = x$.(M)

- **Cell Phone Plans:** Students will be given cell phone plans and make a table and graph to determine which plan is better for them. (Worksheet in Google Drive) (M)
- Using your phone's camera, capture an image of the following in the world around you :
  - A line
  - Parallel Lines
  - Intersecting Lines
  - Perpendicular Lines

Print these images onto graph paper, then determine the equation(s) of these lines. (Note: for students without cell phones, they may find these images in magazines.) (T)

- Understanding Slope - https://education.ti.com/en/84activitycentral/us/detail?id=2FB930B4AB064A04B6B440BB0E573CEB (M)

Critical Vocabulary:

The following terms should be utilized:

-ratio
-ordered pair
-standard form of a linear function
-domain
-linear function
-slope
-point-slope form
-line of best fit (best fit line)
-scale (axes)
-coordinate plane
-range
-quadrants
-correlation coefficient
-function notation
-function
-relation
-y-intercept
-slope-intercept form
-vertical line test
-dependent variable
-independent variable
-mapping
-parent function
-zeros
-positive correlation
-negative correlation
-origin
-set
-x-intercept
-parallel
-perpendicular
-rate of change

The following is the suggested sequence of learning activities for the Algebra 1 ACC class.

- Determine whether or not a relation is a function. Include discussion of domain and range, vertical line test.
- Discuss independent/dependent variables.
- Determine different ways to represent functions. (i.e., ordered pairs, graphs, tables, mapping, function notation)
- Evaluate functions. (Given domain, find range)
- Graphing linear functions
    - Using a table of values
    - By finding intercepts (standard form)-
    - Discuss slope as a rate of change graphically, verbally, numerically, algebraically.
    - Given slope-intercept form. (Discuss how graph changes a slope and y-intercept changes, i.e., transformations)
    - Given point-slope form.
- Writing linear functions given:

    - A table of values
    - A point and a slope
    - A slope and y-intercept
    - Two points
    - A graph
- A recommended Performance Task
- Write a linear function that is parallel and/or perpendicular to a given line and goes through a given point.
- Using collected data displayed on a scatter plot, model linear relationship through line of best fit. (Discuss fit with respect to positive/negative/zero correlation and correlation coefficient)