Unit 5: Linear Functions & Data Analysis
Algebra Prep
13 Class Meetings
Revised May 2023

Essential Questions

- What determines if a relation is a function?
- How can real-world situations be represented with functions?

Enduring Understandings with Unit Goals

EU 1: Functions relate each input to exactly one output. Functions can be linear or nonlinear relations and can be compared by their rates of change and initial values.
- Determine the slope of a line in an equation, in a table and on a graph
- Compare rates of change in various representations

EU 2: Functions can be used to represent relationships between two variables in real-world situations.
- Represent a line using an equation and a graph
- Create linear functions to represent real-world scenarios

EU 3: Scatter plots and frequency tables can be used to analyze associations between bivariate data
- Create and analyze linear associations in a scatter plot
- Represent data relationships using linear models
- Complete two-way frequency tables and determine if there is a relationship between two variables

Standards

Common Core State Standards:

- **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.[1]
- **8.F.A.2:** Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).
- **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.
- **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.
- **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
- **8.SP.A.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.
- **8.SP.A.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.SP.A.3:** Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept.
- **8.SP.A.4:** Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables.

ISAAC Vision of the Graduate Competencies

Competency 1: Write effectively for a variety of purposes.
Competency 2: Speak to diverse audiences in an accountable manner.
Competency 3: Develop the behaviors needed to interact and contribute with others on a team.
Competency 4: Analyze and solve problems independently and collaboratively.
Competency 5: Be responsible, creative, and empathetic members of the community.

Unit Content Overview

1. **Functions and their Characteristics**
   - Represent a function in a variety of ways
   - Determine if a relation represents a function
   - Utilize the Vertical Line Test on linear/non-linear graphs
   - Analyze characteristics of functions
2. **Functions in Real-World Scenarios**
   - Compare functions based on their rate of change and initial values
   - Create a function in a real-world scenario
   - Sketch the graph of a function given a verbal description or a real-world scenario
3. **Data Analysis**
   - Create and interpret scatter plots to interpret the relationships between two sets of data
   - Use linear models to interpret the slope and y-intercept of the relation
   - Create and analyze two-way frequency tables

<u>**Interdisciplinary Connection:**</u>
- Language Arts- Accountable Talk, Word Problems

Daily Learning Objectives with *TWPS Activities*

Students will be able to…
- Determine if a given relation represents a function
  - *TWPS – Why can't the vending machine have a second output for the input "A9"?*
- Represent relations in a variety of ways
  - *TWPS – How can you represent the graph as a series of points? Explain.*

- Determine if a function is linear or nonlinear, and identify intervals as increasing, decreasing, or constant
  - *TWPS – Explain how you can determine if a table of values is a linear function.*
- Compare two linear functions based on their rate of change and initial value
  - *TWPS – Which of the two functions has a greater rate of change? How do you know?*
- Sketch the graph of a function given a verbal description of its characteristics
  - *TWPS – What are three descriptive words you can use to describe a function?*
- Create a scatter plot and identify certain characteristics based on the locations of the data points
  - *TWPS – How can you tell which two variables are being compared on a scatter plot? What does the point (9,15) represent?*
- Analyze linear associations in a scatter plot to interpret the relation between bivariate data
  - *TWPS – Describe the difference between a linear and nonlinear association. How is this similar to functions?*
- Write an equation of a line of best fit in a scatter plot and use the equation to interpret the slope, y-intercept, and predict values not included in the set
  - *TWPS – What is the difference between a positive association and a negative association?*
- Create and analyze two-way frequency tables to determine possible associations between categorical values
  - *TWPS – What is the error that the student made when interpreting the data below?*

Instructional Strategies/Differentiated Instruction

- Whole-group instruction
- Graphic organizers
- Creating authentic connections for students
- Rephrasing and restatement of information and concepts
- Guided notes
- Independent problem-solving
- Collaborative problem-solving
- Cross-curricular problem solving (independent and collaborative)
- Accountable Talk
- Manipulatives
- Word walls with visuals
- Cumulative Homework
- Visuals to support instruction
- Small group instruction
- Pre-teaching and reteaching
- Multiplication charts
- Number lines
- Explicit instruction
- Color-coding
- Small group check in
- Differentiated homework assignments
- Differentiated assessments

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EL DIFFERENTIATED INSTRUCTION:

- Word Walls with visuals
- TWPS (Think, Write, Pair, Share)
- Pre-reading strategies
- Culturally responsive teaching
- Explicit Modeling
- Key Vocabulary
- Graphic Organizers
- Strategic Grouping
- Non-verbal Assessments

Assessments

FORMATIVE ASSESSMENTS:
- Accountable Talk Discussions
- Daily Think-Write-Pair Share (TWPS)
- Daily Do Now
- Whiteboards
- Mid-class check-ins
- Exit Slips
- Cumulative Homework
- Performance Task – Election Changes
  - Problem Solving Rubric

SUMMATIVE ASSESSMENTS:
- Edulastic Quiz 1 – EU 1
- Edulastic Quiz 2 – EU 2
- Unit 5 Test – EU 1, EU 2, and EU 3
- Performance Task – Election Changes

Unit Task

Performance Task Name: Election Changes

Description: Students will use information learned in this unit about representations of relationships (EU 1), comparing functions and their characteristics (EU 2), and data analysis (EU 3) to create a scatter plot representing a set of data from election statistics. Students will be analyzing their representations and creating linear functions to accurately portray the association. They will be asked utilize the newly learned information as well as review and apply the algebraic terms and concepts learned in this unit.

Evaluation: Problem Solving Rubric

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Unit Resources
- Worksheets   - Calculator   - Laptops   - SBAC Prep Online   - Edulastic   - Kahn Academy   - Gimkit   - Quizizz   - Individual Whiteboards   2 Truths & One Lie   - State Common Core Standards Transition Tasks   - Online resources