Unit 3 Functions

3 Weeks

Connecticut Common Core Algebra I Curriculum

Today's Presenters

Today's Agenda

- Unit 3 Overview (20 minutes)
- Unit 2 Workshops
  - Multiple Representations and the Use of Journal Entries (30 minutes)
  - Function Machines and Function Notation (30 minutes)
  - Break (10 minutes)
  - Parent Functions (30 minutes)
  - Experiments (including performance assessment) (30 minutes)
- Assessments(15 minutes)
- Response to Post-its (15 minutes)

Unit Content

- Investigation 1: Relations and Functions (2 days)
- Investigation 2: What is a Function? (3 days)
- Investigation 3: Function Notation and Evaluating Functions (2 days)
- Investigation 4: Multiple Representations and Applications of Functions (2 – 4 days)
- Performance Task: Pendulum Experiment (2 days)
- End-Unit Review and Test (2 days)

What Students Need to Know

- Relation
- Function
- Domain and Range
- Independent and Dependent Variables
- Multiple Representations of Functions

What Students Need to Be Able to Do

- Determine whether a relation is a function
- Identify the domain and range of a function
- Represent a function using an equation, table, and graph
- Evaluate linear and non-linear functions
- Evaluate functions using function notation
- Recognize functions in contextual situations
- Use functions to solve problems in real world contexts

Investigation 1: Relations and Functions (2 days)

- Students explore and define relations, functions, domain, and range.
- Activities are designed for whole-class, small group, and paired discussions.

Investigation 2: What is a Function? (3 days)

- Students examine relations and functions presented by tables, graphs and verbal descriptions, identify the input and output variables, classify relations as functions or non-functions, and examine the domains of selected real world functions.
- Students perform experiments (Celsius and Fahrenheit, The Raven and the Jug) and collect data that can be modeled by a function.

Investigation 3: Function Notation and Evaluating Functions (2 days)

- Students are introduced to function notation, learn to evaluate functions written in function notation, and explore piecewise functions to solve real world problems.

Investigation 4: Multiple Representations and Applications of Functions (2 – 4 days)

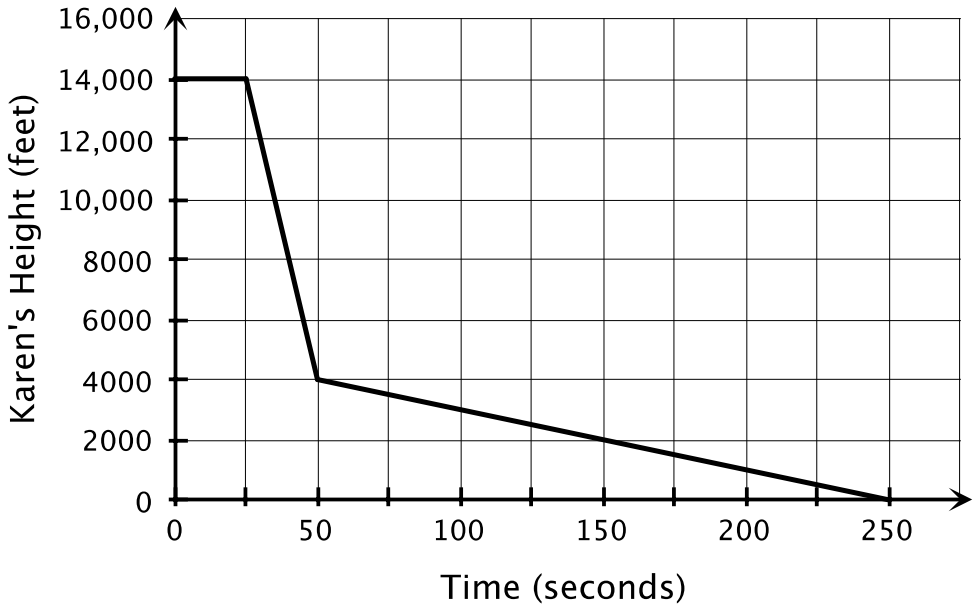
- Students are introduced to linear and non-linear functions and applications of linear and non-linear functions.

Performance Task: Pendulum Experiment (2 days)

- Students collect data on the period of a pendulum based on its length.
- Students make a table of the data and graph the data.
- Students identify the function as a square root function based on the graph.
- Students compare the predicted value from a formula with their empirical results.

End-Unit Review and Test (2 days)

Karen's Sky Diving Experience



- State the domain for this function.
- State the range for this function.
- What is the value of $f(50)$?
- Based on the context of the problem, what happens when t = 50 seconds?
- Find t when $f(t)=1500$ feet.
- Find t when $f(t)=0$ feet?

Essential Questions

By the end of this unit, students will be able to answer the following essential questions:

- What is a function?
- What are the different ways in which functions may be represented?
- How can functions be used to model real world situations, make predictions, and solve problems?

Investigation & Performance Task Exploration

- Participants will break into four groups. Each group will participate in the following four workshops: (30 minute rotation)
  - **Workshop 1**: Multiple Representations and the Use of Journal Entries (Investigation 1)
  - **Workshop 2**: Function Machines and Function Notation (Investigation 3)
  - **Workshop 3**: Parent Functions (Investigation 4)
  - **Workshop 4**: Experiments (Performance Task)

Assessment Plan

Investigation 1: Relations and Functions

- **Exit Slip 3.1** asks students to determine if a mapping diagram represents a function and to identify range and domain.
- **Journal Entry** asks students to define function in their own words and to give an example.

Assessment Plan

Investigation 2: What is a Function?

- **Exit Slip 3.2** asks students to create examples and non-examples of functions.
- **Journal Entry** asks students how to use a table or a graph to determine whether a relation is a function.

Assessment Plan

Investigation 3: Function Notation and Evaluating Functions

- **Exit Slip 3.3** asks students to represent a function using function notation and use function notation to explore the situation.
- **Journal Entry** asks students to describe the meaning of $f(x)$.

Assessment Plan

Investigation 4: Multiple Representations and Applications of Functions

- **Exit Slip 3.4** asks students to explore the graph of a non-linear function and identify its domain and range.
- **Journal Entry** asks students to explain how to identify the domain and range of a function from its graph.

Common Core Content Standards (priority standards are in bold)

- **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 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).
- F-IF 1. Understand that a function from one set (called the domain) to another set (called the 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 $y = f(x)$.
- **F-IF 2. Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.**

Common Core Content Standards (priority standards are in bold)

- **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....****
- F-IF 5. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. *For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in factory, then the positive integers would be an appropriate domain for the function.**
- F-IF 7b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions
- F-IF 9. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).

Common Core Standards for Mathematical Practice (bold standards to be emphasized)

- *Mathematical Practices #1 and #3 describe a classroom environment that encourages thinking mathematically and are critical for quality teaching and learning. Practices in bold are to be emphasized in the unit.*

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively
3. Construct viable arguments and critique the reasoning of others.
4. **Model with mathematics.**
5. **Use appropriate tools strategically.**
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Summary and Closure

- How well aligned are the assessments for the Unit with the Unit's objectives
- Reflect on presenters' responses to feedback from yesterday's post-it exercise.