# Module 3: Functions and Models

## Learning Goal

The student is expected to investigate sequences as functions, as well as explore, create, graph, evaluate, and interpret functions in algebraic and graphical form in order to represent relationships between quantities.

## Essential Questions

1. How can you use functions to solve real-world problems?
2. How can you describe a relationship given a graph and sketch a graph given a description?
3. How do you represent relations and functions?
4. What is function notation and how can you use functions to model real-world situations?

## Vertical Progression

MAFS.8.F.1.1, F.1.2, F.1.3, F.2.4, and F.2.5: In Grade 8, students defined, evaluated and compared functions. Students also used functions to model relationships between quantities.

## Module Focus Standards

**Algebra 1 Test Item Specs**  (Reference Sheet at End)

### MAFS.912.A.CED.1.2: (DOK 2)
Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
- Identify the quantities in a mathematical problem or real-world situation that should be represented by distinct variables and describe what quantities the variables represent.
- Graph one or more created equations on coordinate axes with appropriate labels and scales.
- Create at least two equations in two or more variables to represent relationships between quantities.
- Justify which quantities in a mathematical problem or real-world situation are dependent and independent of one another and which operations represent those relationships.
- Determine appropriate units for the labels and scale of a graph depicting the relationship between equations created in two or more variables.

### MAFS.912.F.IF.1.1: (DOK 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).
- Identify the domain and range of a function.
- Determine if a relation is a function.

## Module Topics

### Graphing Relationships (F.IF.2.4)

**Core Resource:**
- Lesson 3.1 (HMH Book)

**Additional Resource:**
- *Module 3 Lesson 13* — Engage NY
- *Representing Functions of Everyday Situations* - MARS

**Formative Assessments:**
- Lesson Performance Task (HMH pg. 114)
- *Taxi Ride* — CPALMS
- *Bike Race* — CPALMS

### Understanding Relations and Functions (F.IF.1.1)

**Core Resource:**
- Lesson 3.2 (HMH Book)

**Additional Resource:**
- *Module 3 Lesson 9* — Engage NY

**Formative Assessments:**
- Lesson Performance Task (HMH pg. 126)
- *Writing Functions* — CPALMS

## Essential Vocabulary

- continuous graph
- discrete graph
- domain
- range
- function
- relation
- input
- output
- vertical line test
- independent variable
- dependent variable
- function notation
- function rule

## Higher Order Question Stems

- How would you represent _________.
- How are you showing the meaning of the quantities?

## Writing Connections

- Write to explain your visual representation.
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<tr>
<th>Modeling with Functions (F-IF.1.2, F-IF.1.1, A-CED.1.2)</th>
<th>Writing prompting questions to encourage others to write a more precise answer. <strong>Link to Webb’s DOK Guide</strong></th>
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- Determine the value of the function with proper notation.
- Evaluate functions for given values of x.
- Identify mathematical relationships and express them using function notation.
- Define a reasonable domain, which depends on the context and/or mathematical situation, for a function focusing on linear functions.
- Evaluate functions at a given input in the domain, focusing on linear functions.
- Interpret statements that use functions in terms of real world situations, focusing on linear functions.

**Mathematical Practices**

- **Link to Mathematical Practice Standards Rubric**
- *MAFS.K12.MP.4.1:* Model with mathematics.
- *MAFS.K12.MP.6.1:* Attend to precision.