

# 05 An Introduction to Functions

Content Area: **Mathematics**  
Course(s):  
Time Period: **Week1**  
Length: **5 Weeks**  
Status: **Published**

## Stage 1: Desired Results

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### Unit Overview/ Rationale

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A function is a relationship between variables in which each value of the input variable is associated with a unique value of the output variable. Functions can be represented in a variety of ways, such as graphs, tables, equations, or words. Each representation is particularly useful in certain situations. A function that models a real-world situation can be used to make estimates or predictions about future occurrences.

### Standards & Indicators

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MA.9-12.N-Q.A	Reason quantitatively and use units to solve problems.
MA.9-12.F-IF.A.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 $y = f(x)$ .
MA.9-12.N-Q.A.1	Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.
MA.9-12.F-IF.A.2	Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.
MA.9-12.N-Q.A.2	Define appropriate quantities for the purpose of descriptive modeling.
MA.9-12.F-BF.A.1a	Determine an explicit expression, a recursive process, or steps for calculation from a context.
MA.9-12.F-IF.B	Interpret functions that arise in applications in terms of the context
MA.9-12.F-BF.A.1c	Compose functions.
MA.9-12.F-IF.B.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.
MA.9-12.F-IF.B.5	Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.
MA.9-12.A-REI.D.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

MA.9-12.F-LE.A.2	line). Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).
MA.9-12.A-SSE.A.1	Interpret expressions that represent a quantity in terms of its context.
MA.9-12.A-SSE.A.1a	Interpret parts of an expression, such as terms, factors, and coefficients.
MA.9-12.A-REI.D.11	Explain why the x-coordinates of the points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$ ; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where $f(x)$ and/or $g(x)$ are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.
MA.9-12.A-SSE.A.1b	Interpret complicated expressions by viewing one or more of their parts as a single entity.

### **Big Ideas - Students will understand that...**

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-A function can be used to represent the relationship between two quantities as they change. These relationships can be represented with words, tables, equations and graphs.

-The value of one variable may be uniquely determined by the value of another variable.

### **Essential Questions - What provocative questions will foster inquiry and transfer of learning**

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-How can you represent and describe functions?

-What relationships are found between variables?

### **Content - Students will know...**

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Key Vocabulary:

continuous graph, dependent variable, discrete graph, domain, range, function, function notation, linear function, non linear function, relation, sequence, input, output, vertical line test, arithmetic sequence

## **Skills - Students will be able to...**

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- Use graphs to visually represent the relationship between two variable quantities as they change. ☐
- Understand that the value of one variable may be uniquely determined by the value of another variable. ☐
- Use words, tables, equations, sets of order pairs and graphs to represent relationships.☐
- Analyze sequences and determine a rule to find the nth term

## **Stage 2: Assessment Evidence**

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### **Assessment**

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## **Stage 3: Learning Plan**

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### **Learning Activities**

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Objective: ☐To represent mathematical relationships using graphs. ☐

Activity: ( 1 day)

☐Students will be given different graphs. ☐They will read the titles, describe how the variables on the axes are related. ☐  
Use key words to describe the relationship between the variables. Example ( rises quickly, stops rising, falls quickly/slowly)

Check for understanding:

☐Students will match tables to graphs and or sketch a graph given a situation ( hours of daylight each day over the course of one year)

Objective: To identify and represent patterns that describe linear functions.

Activity: ( 2 days)

Given a picture, graph, table or list, students will describe the linear pattern in words, an equation and / or graph. Students will classify relations as functions and/or linear functions.

Check for Understanding

: Students will graph a set of ordered pairs, describe the pattern shown in the graph, determine if it is a function.

Objective: To identify and represent patterns that describe nonlinear functions.

Activity: ( 2 days)

Given a picture, graph, table or list, students will justify why the relation is a function, classify the function as linear or non-linear, graph the function and/or match the function with an equation.

Check for Understanding:

Students will come up with an example of a non-linear function and an example of a non-linear relation that is not a function.

Objective: to graph equations that represent functions

Activity: ( 1 day)

Students will use a table and an equation to make continuous and discrete graphs of linear and non linear functions.

Check for Understanding:

Students will describe a relation that can be represented by a discrete graph.

Objective: Students will write equations that represent functions.

Activity: (1 day)

Students will be given a word problem, they will:

use text rendering to find key information, define the variables, write an equation, and use the equation to solve.

Check for Understanding:

A worker has dug 3 holes for fence posts. It will take 15 min to dig each additional hole. Your friend write the rule  $= 15n+3$  for the time  $t$ , in minutes, required to dig  $n$  additional holes. Describe and correct your friend's error.

Objective:

To determine whether a relation is a function. To find the domain and range and use function notation.

Activity:

Students will formally define the terms: relation, domain and range. Students will use mapping diagrams to determine if a relation is a function. Given a graph students will use the vertical line test to determine if a relation is a function. Students will evaluate functions given an input value. Example:  $f(3)=?$

Check for Understanding

: Given a set of ordered pairs and/or graph determine if the relation is a function. Evaluate the value of a function given an input.

Objective:

To identify and extend patterns and sequences and to represent arithmetic sequences using function notation.

Learning Activity:

students will be given a sequence and must find the next terms in the sequence. Given a pattern, students will write the function that represents the sequence. Students will use the function to find the  $n$ th term.

Check for Understanding:

Given two sequences, determine if it is arithmetic if it is write the rule for the sequence.

## **Resources**

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Prentice Hall Algebra 1

Chapter 4 - An Introduction to Functions