Unit 04 - An Introduction to Functions

Content Area: **Mathematics**
Course(s): **Algebra I**
Time Period: **October**
Length: **25 days**
Status: **Published**

Unit Overview

In this unit, students will be introduced to the topic of functions. In this unit, students will develop the answers to the Essential Questions as they learn the concepts and skills of representing functions using words, tables, graphs, and rules (equations).

Enduring Understandings

• A function is a special type of relation in which each value in the domain is paired with exactly one value in the range.

• A graph may include solutions that do not appear in a table.

• A real-world graph should only show points that make sense in the given situation.

• Just like linear functions, nonlinear functions can be represented using words, tables, equations, sets of ordered pairs, and graphs.

• Many real-world functional relationships can be represented by equations.

• Such relationships may be represented using tables, words, equations, sets of ordered pairs, and graphs.

• The set of all solutions of an equation forms the equation's graph.

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

• When you can identify a pattern in a sequence, you can use it to extend the sequence.

• You can also model some sequences with a function rule that you can use to find any term in the sequence.

• You can use an equation to find the solution of a given real-world problem.

• You can use graphs to visually represent the relationships between two variable quantities as they both change.

Essential Questions

• Can functions describe real world situations?

• How can you represent and describe functions?

• What is a linear function?

Standards/Indicators

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.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.A-SSE.A.1	Interpret expressions that represent a quantity in terms of its context.
MA.A-SSE.A.1a	Interpret parts of an expression, such as terms, factors, and coefficients.
MA.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.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.A-SSE.A.1b	Interpret complicated expressions by viewing one or more of their parts as a single entity.
MA.K-12.4	Model with mathematics.
MA.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.K-12.5	Use appropriate tools strategically.
MA.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.F-IF.B.5	Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.
MA.N-Q.A.2	Define appropriate quantities for the purpose of descriptive modeling.
MA.K-12.6	Attend to precision.
MA.K-12.7	Look for and make use of structure.
MA.F-BF.A.1	Write a function that describes a relationship between two quantities.
MA.F-BF.A.1a	Determine an explicit expression, a recursive process, or steps for calculation from a context.
MA.A-CED.A.2	Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
MA.F-BF.A.2	Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.
MA.F-LE.A.2	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.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 line).
MA.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.

Student Learning Objectives (SLOs)

- To determine whether a relation is a function
- To find domain and range and use function notation
- To graph equations that represent functions
- To identify and extend patterns in sequences
- To identify and represent patterns that describe linear functions
- To identify and represent patterns that describe nonlinear functions
- To represent arithmetic sequences using function notation
- To represent mathematical relationships using graphs
- To write equations that represent functions

Lesson Titles

- Arithmetic Sequences
- Formalizing Relations and Functions
- Graphing a Function Rule
- Patterns and Linear Functions
- Patterns and Nonlinear Functions
- Using Graphs to Relate Two Quantities
- Writing a Function Rule

Career Readiness, Life Literacies & Key Skills

TECH.9.4.2.CI.1	Demonstrate openness to new ideas and perspectives (e.g., 1.1.2.CR1a, 2.1.2.EH.1, 6.1.2.CivicsCM.2).
TECH.9.4.2.CI.2	Demonstrate originality and inventiveness in work (e.g., 1.3A.2CR1a).
TECH.9.4.2.CT.2	Identify possible approaches and resources to execute a plan (e.g., 1.2.2.CR1b, 8.2.2.ED.3).
TECH.9.4.2.DC.1	Explain differences between ownership and sharing of information.
TECH.9.4.2.DC.2	Explain the importance of respecting digital content of others.
TECH.9.4.2.DC.3	Explain how to be safe online and follow safe practices when using the internet (e.g., 8.1.2.NI.3, 8.1.2.NI.4).
TECH.9.4.2.TL.2	Create a document using a word processing application.
TECH.9.4.2.TL.3	Enter information into a spreadsheet and sort the information.

Inter-Disciplinary Connections

LA.RL.11-12.4	Determine the meaning of words and phrases as they are used in the text, including figurative and connotative meanings; analyze the impact of specific word choices on meaning and tone, including words with multiple meanings or language that is particularly fresh, engaging, or beautiful. (e.g., Shakespeare as well as other authors.)
LA.RST.9-10.1	Accurately cite strong and thorough evidence from the text to support analysis of science and technical texts, attending to precise details for explanations or descriptions.

LA.W.9-10.2	Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.
LA.W.9-10.2.A	Introduce a topic; organize complex ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
LA.WHST.9-10.7	Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
LA.W.9-10.6	Use technology, including the Internet, to produce, share, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.
9-12.HS-ETS1-4.5	Using Mathematics and Computational Thinking
9-12.HS-PS1-7.5	Mathematical and computational thinking at the 9–12 level builds on K–8 and progresses to using algebraic thinking and analysis, a range of linear and nonlinear functions including trigonometric functions, exponentials and logarithms, and computational tools for statistical analysis to analyze, represent, and model data. Simple computational simulations are created and used based on mathematical models of basic assumptions.

Instructional Strategies, Learning Activities, and Levels of Blooms/DOK

- students will work as a team and explain their work
- #1- Blooms Knowledge - Remember previously learned information
- #2 - Blooms Comprehension - Demonstrate an understanding of facts
- #3 - Blooms Application - Apply Knowledge to actual situations
- #4 - Blooms Analysis - Break down objects or ideas into simpler parts and find evidence to support generalizations
- #5 - Blooms Synthesis - Compile component ideas into a new whole or propose alternative solutions
- #6 - Blooms Evaluation - Make and defend judgments based on internal evidence or external criteria
- Discussion on vocabulary including slope and rate of change, y-intercept, vertical, horizontal, parallel, perpendicular
- Introduction, notes, and examples on finding the slope given a graph
- Introduction, notes, and examples on finding the slope given a table
- Introduction, notes, and examples on finding the slope given an equation
- Introduction, notes, and examples on finding the slope given two points
- Introduction, notes, and examples on graphing equations by using the slope and y-intercept
- Introduction, notes, and examples on graphing inequalities
- Introduction, notes, and examples on parallel and perpendicular lines
- Introduction, notes, and examples on translating an equation to put it in slope intercept form
- Introduction, notes, and examples on writing equations in slope intercept form given two points
- review homework if need - answers posted on Google Classroom
- review warm up
- students will work individually

- tutoring during Delsea One

Modifications

This unit includes: using graphs to relate two quantities, patterns and linear functions, patterns and non linear functions, graphing and writing a function using Rules, formalizing relations,

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ELL Modifications

- Acquire the help from the Foreign Language Department if possible
- Assess ELL students continuously using formative assessment methods
- Be flexible with time frames and deadlines
- During Delsea One - one on one with a student who speaks the same language
- Intentional scheduling/grouping with student/teacher who speaks the same language if possible
- Khan Academy offers lesson in several languages: https://es.khanacademy.org/
- Offer resources for specific topics in primary language (Youtube web resources)
- Repeat, reword, clarify
- The NEA Portal offers lessons in several languages: http://neaportal.k12.ar.us/index.php/algebra-1-en-espanol/
- tutoring during Delsea One
- Use google translator, especially for application problems
- Using technology, such as but not limited to: graphing calculator and desmos

IEP & 504 Modifications

- Allow re-takes only after a tutoring session
- Assessments will allow for calculator use and/or other math tools
- Give assessments on mathxl that are from the interactive algebra 1; however, the homework/classwork on mathxl will be from algebra 1 to expose them to the material
- Higher level reasoning questions would have less weight than other questions or provide as extra credit questions to provide exposure to these questions but not something that will be a determinant to the student's ability to share knowledge of content
- if not in a co-teaching setting allowing time in the schedule for a special education teacher to consult with general education teachers on what specifically can be modified or how to paraphrase things in a different way specific to that lesson
- Keep updated videos on google classroom for reinforcement outside of the classroom

- Less questions overall or possibly break the test into two parts

- Modeling and showing several examples

- Show solving an inequality that includes fractions an alternative way to solve instead of reciprocating the fraction

- speaking to students privately when redirecting behaviors

- tutoring during Delsea One

- Upload several youtubes on the concepts that are in this specific unit

- Use a colored highlighter to highlight the variable that needs to be isolated

G&T Modifications

- Allow to go ahead on concepts on mathxl

- Ask students' higher level questions that require students to look into causes, experiences, and facts to draw a conclusion or make connections to other areas of learning

- Employ differentiated curriculum to keep interest high

- Encourage students to make transformations- use a common task or item in a different way

- Flip the lessons to push further ahead

- Flip the lessons using videos of more in depth work

- Include more in depth problems involving application

- Include quadratics at this point

- Invite students to explore different points of view on a topic of study and compare the two

- Provide more rigorous problems; either off the NJ State website or from the Pearson Algebra 2 textbook (available on mathxl)

- tutoring during Delsea One

- Videos that offer extra practice and examples in all areas are posted on google classroom and taken from: mathispower4u

At Risk Modifications

- Refer students to Organizational Management

- Require Delsea One tutoring

- Stay in contact with parents/guardians and guidance counselors on student progress

- tutoring during Delsea One

Formative Assessment

- Connecting previous lessons

- Connecting vocabulary with root words

- Discussion including vocab review/recall

- Evaluate your understanding of the lesson

- Guided Review
- Homework/classwork
- Mathxlforschool
- NJSLA Math type of question
- Pass out of class
- SAT question of the day
- Skill needed to do lesson
- Teacher observation
- Think-pair-share
- Turn to your partner and discuss
- Use What You Know - type of question
- Video Clip
- Warm up review
- White Boards

Alternate Assessment

Performance tasks

Project-based assignments

Problem-based assignments

Presentations

Benchmark Assessment

Skills Based assessment- math practice

Summative Assessment

- Benchmark Assessment
- Marking Period Assessment
- Quiz on Graphing Functions
- Unit test on An Introduction to Functions

Resources & Materials

- Colored pencils/highlighters
- Google Slides
- Mathispower4u video clip to introduce or demonstrate concepts
- Pearson 2015 Algebra 1 textbook
- Teacher generated worksheets
- White board paddles

Technology

- Chromebooks
- Desmos
- Edpuzzle
- Equatio
- Google Classroom
- Google Forms
- Graphing Calculator
- Mathway
- Mathxlforschool
- PearDeck
- Remind
- Video Clips

TECH.8.1.12	Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
TECH.8.1.12.A.4	Construct a spreadsheet workbook with multiple worksheets, rename tabs to reflect the data on the worksheet, and use mathematical or logical functions, charts and data from all worksheets to convey the results.
TECH.8.1.12.A.CS1	Understand and use technology systems.
TECH.8.1.12.A.CS2	Select and use applications effectively and productively.