

Unit 01: Functions

Content Area: **Mathematics**
Course(s): **Trigonometry/Pre-Calculus**
Time Period: **September**
Length: **5 weeks**
Status: **Published**

Unit Overview

This unit reviews functions and relations and operations with functions. Students evaluate, find the zeros of, write, and graph linear functions and inequalities. Students also write equations of parallel and perpendicular lines. In addition, they use scatter plots and piecewise functions to model real-world data.

Enduring Understandings

- All functions have algebraic, numerical, and graphical representations.
- Mathematical models can be used to describe and quantify physical relationships.
- Operations and transformations apply to all types of functions.
- Real world situations can be modeled and solved by using various functions.
- There are several types of functions.

Essential Questions

- How can patterns, relations, and functions be used as tools to best describe and help explain real-life situations?
- How do we create, test and validate a model?
- In what way are the algebraic, numerical, and graphical representations of functions related?
- What are the different types of functions?
- What are the operations that apply to all functions?

Standards

	Modeling Standards:
MA.F-IF.A	Understand the concept of a function and use function notation
MA.F-IF.B	Interpret functions that arise in applications in terms of the context
MA.F-IF.C	Analyze functions using different representations
MA.K-12.7	Look for and make use of structure.
MA.F-BF.A	Build a function that models a relationship between two quantities
MA.A-CED.A	Create equations that describe numbers or relationships
MA.F-BF.B	Build new functions from existing functions

MA.A-REI	Reasoning with Equations and Inequalities
MA.F-LE	Linear and Exponential Models
MA.A-REI.D	Represent and solve equations and inequalities graphically
	Modeling

Indicators

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.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.F-IF.A.3	Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers.
MA.F-IF.B.5	Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.
MA.F-IF.C.7	Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.
MA.F-BF.A.1b	Combine standard function types using arithmetic operations.
MA.F-BF.A.1c	Compose functions.
MA.A-CED.A.3	Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context.
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.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.A-REI.D.12	Graph the solutions to a linear inequality in two variables as a half plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.

Student Learning Objectives

- SWBAT determine whether a given relation is a function.
- SWBAT draw and analyze scatter plots.
- SWBAT draw and analyze scatter plots.
- SWBAT evaluate functions.
- SWBAT find composite functions.
- SWBAT find the slope of a line through two points.
- SWBAT find the x - and y -intercepts of a line.

- SWBAT find the zeros of linear functions.
- SWBAT graph linear equations and inequalities.
- SWBAT graph linear inequalities.
- SWBAT identify and graph piecewise functions including greatest integer, step, and absolute value functions.
- SWBAT identify domain and range of a relation or function.
- SWBAT iterate functions using real numbers.
- SWBAT perform operations with functions.
- SWBAT solve problems using prediction equation models.
- SWBAT write a prediction equation and draw best-fit lines.
- SWBAT write equations of parallel and perpendicular lines.
- SWBAT write linear equations.

Lesson Titles

- Composition of Functions
- Graphing Linear Equations
- Piecewise Functions
- Relations and Functions
- Writing Linear Equations
- Writing Parallel and Perpendicular Lines

Career Readiness, Life Literacies & Key Skills

WRK.K-12.P.1	Act as a responsible and contributing community members and employee.
WRK.K-12.P.4	Demonstrate creativity and innovation.
WRK.K-12.P.5	Utilize critical thinking to make sense of problems and persevere in solving them.
WRK.K-12.P.9	Work productively in teams while using cultural/global competence.

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.11-12.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 11-12 texts and topics.
LA.RI.11-12.4	Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze how an author uses and refines the meaning of a key term or terms over the course of a text (e.g., how Madison defines faction in Federalist No. 10).

Instructional Strategies/Learning Activities/Levels of Blooms/DOK

- Demonstrate how to graph inequalities
- Discuss boundaries including compound inequalities
- Discuss how slopes of lines determine parallel and perpendicular lines
- Discuss linear relationships and correlations
- Explain and graph absolute value function
- Explain and graph greatest integer function
- Group activity
- Guided Practice
- Homework Review
- Independent Practice
- Notes and examples will be completed together
- Notes and examples will be given on how to write equations in standard form and slope intercept form
- Pair and share activity
- Review graphing and solving absolute value functions
- Review graphing scatter plots given a table of data, explain how to write a prediction equation and draw a line of best fit
- Student volunteers will place answers on the board with explanations
- tutoring during Delsea One

MODIFICATIONS

ELL Modifications

- 1:1 testing
- Create planned opportunities for interaction between individuals in the classroom: skits, cooperative and collaborative learning, student generated stories based on personal experience
- Digital translators
- Intentional scheduling/grouping with student/teacher who speaks the same language if possible
- Offer resources for specific topics in primary language (Youtube web resources)

IEP & 504 Modifications

- for testing - allowing student to correct mistakes or answer wrong questions correctly for additional credit if failed the first test (another way to re-teach material)
- for testing - rewording questions so that there are not higher level vocabulary within the question (you are testing for understanding of the content not the ability to understand the question)
- 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
- math tests could have formula's available on the test and/or sample problems
- modeling and showing lots of examples
- non-verbal redirection of behaviors
- providing study guides that don't lead the student to study too much extraneous information (less unnecessary details)/scaffolded study guides
- students could use calculator and/or other math tools (x grids, chips, ect)
- teaching the main ideas/concepts (limiting not needed details) to be taught and repeating them in several different ways over several different days (
- tutoring during Delsea One

G & T Modifications

- 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.
- Effective questioning techniques (focus on what's important, provide processing time, require higher order thinking
- Encourage students to explore concepts in depth and encourage independent studies or investigations.
- Math- provide additional rigorous challenge problems for advanced students
- Refrain from having them complete more work in the same manner.

At Risk Modifications

- additional help during tutoring/Delsea One/Academic Enrichment
- allowing student to take notes in class for reinforcement but also providing a copy of completed/correct notes to study from
- guided notes and study guides
- speaking to students privately when redirecting behaviors
- testing modifications

Benchmark Assessments

Skill-based assessments - math practice

Alternative Assessments

Performance tasks

Project-based assignments

Problem-based assignments

Presentations

Formative Assessment

- Anticipatory Set
- Closure
- Group Work
- Guided Practice
- Homework
- Observation
- Oral Responses
- Quiz on Functions
- Quiz on Piecewise Functions
- Quiz on Writing Equations of lines
- Warm Up

Summative Assessment

- Alternate Assessment
- Benchmark Assessment
- Marking Period Assessment
- Mid-Chapter Test Relations and Functions

Resources & Materials

- Advanced Mathematical Concepts Precalculus with Applications textbook
- Cooperative learning exploration
- evoke student participation from their seats and at the board
- Google Classroom
- Power Point Lessons
- Teacher Generated Worksheets
- Youtube videos to introduce/demonstrate concepts in real-life situations

Technology

- Chromebook
- Desmos graphing calculator
- Equatio
- Graphing Calculator
- Promethean Board
- Quizizz

TECH.8.1.12.A

Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems and operations.

TECH.8.1.12.B

Creativity and Innovation: Students demonstrate creative thinking, construct knowledge and develop innovative products and process using technology.

TECH.8.1.12.D

Digital Citizenship: Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior.