Unit 1 Intro to Functions & Systems of Equations

Content Area: **Mathematics**
Course(s):
Time Period: **Marking Period 1**
Length: **2-3 weeks**
Status: **Published**

Brief Summary of Unit

In this unit, students will demonstrate the ability to use the language of functions and use algebraic properties of functions to describe, interpret, and analyze graphs to model real-world data. In the first two sections, students review transformations of linear, absolute value, and quadratic functions. Then they will transform the functions with rigid transformations as well as dilations. In the third section, students will review modeling with linear functions. This involves finding lines of best fit by hand and by calculator. In the last section, students extend prior work with systems of equations to solve linear systems with three variables.

Revision Date: July 2024

Standards

Diversity and Inclusion: Students will focus on equity, inclusion, and tolerance when analyzing the comparison of various quantities regarding characteristics of people. Equality will also be highlighted which can be associated with both numerical representations and the connection between people. This can be associated with treating people fairly and equally.

ELA.L.KL.9–10.2.A	Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level.
MATH.9-12.F.BF.B.3	Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $k\ f(x)$, $f(kx)$, and $f(x + k)$ for specific values of k(both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology.
MATH.9-12.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.
MATH.9-12.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.
MATH.9-12.F.IF.B.5	Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.
MATH.9-12.A.REI.C.6	Solve systems of linear equations algebraically (include using the elimination method) and graphically, focusing on pairs of linear equations in two variables.
MATH.9-12.F.IF.C.7.b	Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.
MATH.9-12.A.REI.C.7	Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically.
MATH.9-12.F.IF.C.9	Compare properties of two functions each represented in a different way (algebraically,

	graphically, numerically in tables, or by verbal descriptions).
ELA.SL.PE.11–12.1.A	Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.
WRK.9.2.12.CAP.3	Investigate how continuing education contributes to one's career and personal growth.
WRK.9.2.12.CAP.6	Identify transferable skills in career choices and design alternative career plans based on those skills.

Essential Questions

- How can you determine which function family a graph belongs to?
- How do additional transformations affect the graph/equation of a given function?
- How do you use a real-life situation to solve for three unknown variables?
- What affect does each transformation have on a graph? On a function equation?
- What is a correlation coefficient, and how does it affect an equation?
- When can you write the linear equation for given data by hand or by linear regression?
- When will a system with three variables have no solution? Have infinite solutions?

Enduring Understandings

- Graph and describe transformations of functions.
- Solve linear systems with three variables.
- Use linear functions to model and analyze real-life situations.
- Write functions that represent transformations of functions.

Students Will Know

- How to solve linear systems.
- Modeling with linear functions.
- Parent functions and transformations.
- Transformations of parent functions.

Students Will Be Skilled At

- Comparing linear equations to solve real-life problems.
- Determining a line of best fit.
- Explaining how translations, reflections, stretches, and shrinks affect graphs of functions.
- Graphing transformations of functions.
- Identifying the function family to which a function belongs.
- Solving linear systems in three variables algebracally.

- Solving real-life problems using systems of equations in three variables.
- Visualizing solutions of linear systems in three variables.
- Writing equations of linear functions.
- Writing functions that represent transformations of absolute vale functions.
- Writing functions that represent transformations of linear functions.

Evidence/Performance Tasks

Assessments

- Formative: Daily assessments using examples from class notes, NJSLA test bank problems, and/or Albert/AP Classroom assessments
- Summative: Teacher-created assessments, NJSLA test bank problems, Big Ideas Math online platform problems, Albert/AP Classroom and/or Big Ideas Math unit assessments
- Benchmark: IXL or teacher created diagnostic assessments in addition to unit assessments from Big Ideas Math
- Alternative Assessments: Student-centered activities such as scavenger hunts, various projects involving real world applications, and differentiated learning tasks in Khan Academy, DeltaMath, and IXL

- Answer essential questions
- Class discussion of daily topic
- Classwork and homework that assess the essential questions
- Provide alternative means of assessments for certain students
- Teacher Observation
- Tests and quizzes that assess the essential questions
- Written assignments that assess the essential questions that involves providing explanations

Learning Plan

The following list is meant to create a day-to-day plan. Teachers are encouraged to slow down or condense days as appropriate to the student population in the class. Assessment(s) should be given when appropriate.

- Introduce four parent function graphs, and identify all types of transformations (excluding a horizontal reflection and horizontal stretch/shrink). To aid in this, refer students back to their Geometry knowledge of transformations.
- Students should recognize that multiple transformations can occur at the same time, as long as they do not negate each other.
- Using a given transformed function, instruct on how to create additional transformations, specifically focusing on how the equation would be altered.
- Recall student knowledge of slope-intercept form for linear equations and apply this to graphing the transformed linear functions.

- If given data instead of an equation, students should be taught to find the line of best fit. This should be taught by hand (solving for the data's slope-intercept equation) or by calculator (using linear regression).
- Students will likely need additional time to get used to using this feature of a calculator. A list of instructional steps is helpful, if one can be made.
- By recalling solving two variable systems, this process can be expanded into three variable systems. Be sure to also show examples of no solution systems and infinite solutions systems.
- Remind students that a system of equations is often found in the real world, and emphasize this with examples.
- Students will likely need additional time to practice these steps, along with setting up the system from a word problem.

Materials

Core instructional materials: Core Book List including Big Ideas Math Algebra 2 2022

Supplemental materials: Khan Academy, Edia, and DeltaMath

- District approved textbook
- Khan Academy
- Teacher created activites
- Teacher created notes

Suggested Strategies for Modifications

Possible accommodations/modification for Algebra 2