



Algebra 2 Level 2 - Unit 2 - Relations and Functions

Unit Focus

Students will appreciate the importance of functions and their domains and will use input/output language throughout unit. A significant part of this unit is transformations on parent functions, having students understand how parameters affecting the inputs differ from the parameters affecting the outputs. Graph analysis is introduced but somewhat limited in scope. Students will also explore systems of linear equations, systems of inequalities, and linear programming to see real world applications.

Stage 1: Desired Results - Key Understandings

Standard(s)	Transfer	
Common Core Mathematics: 9-12 - Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions. (CCSS.MATH.CONTENT.HSA.CED.A.1) - Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales. (CCSS.MATH.CONTENT.HSA.CED.A.2) - 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. (CCSS.MATH.CONTENT.HSA.CED.A.3) - 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. (CCSS.MATH.CONTENT.HSF.IF.B.4) - Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. (CCSS.MATH.CONTENT.HSF.IF.B.5) - Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. (CCSS.MATH.CONTENT.HSF.IF.C.7) - Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. (CCSS.MATH.CONTENT.HSF.IF.C.8)	<i>Students will be able to independently use their learning to...</i> T1 model relationships among quantities based on given constraints T2 make sense of a problem, initiate a plan, execute it, and evaluate the reasonableness of the solution. T3 justify reasoning using clear and appropriate mathematical language.	
	Meaning	
	Understanding(s)	Essential Question(s)
	<i>Students will understand that...</i> U1 Mathematicians can describe patterns, relations, and/or functions to access strategies to solve problems. U2 Mathematicians represent and analyze mathematical situations and structures using algebraic symbols to communicate thinking. U3 Mathematicians use models to represent and make meaning of quantitative relationships. U4 Mathematicians analyze change and make predictions in various contexts.	<i>Students will keep considering...</i> Q1 How can I break a problem down into manageable parts? Q2 How do you express and describe a pattern and use it to make predictions and solve a problem? Q3 How can change be described? Q4 Does this solution make sense?
	Acquisition of Knowledge and Skill	
	Knowledge	Skill(s)
	<i>Students will know...</i> K1 the distance and midpoint formulas K2 what a linear function is and its different representations--verbally, graphically, numerically, and algebraically	<i>Students will be skilled at...</i> S1 graphing two variable equations and inequalities S2 writing linear equations in slope-intercept, point-slope, and standard forms

Stage 1: Desired Results - Key Understandings

- 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. Include recognizing even and odd functions from their graphs and algebraic expressions for them. (CCSS.MATH.CONTENT.HSF.BF.B.3)
- Solve an equation of the form $f(x) = c$ for a simple function f that has an inverse and write an expression for the inverse. For example, $f(x) = 2x^3$ or $f(x) = (x+1)/(x-1)$ for $x \neq 1$. (CCSS.MATH.CONTENT.HSF.BF.B.4.A)
- Reason abstractly and quantitatively. (CCSS.MATH.MP.2)
- Construct viable arguments and critique the reasoning of others. (CCSS.MATH.MP.3)
- Model with mathematics. (CCSS.MATH.MP.4)
- Attend to precision. (CCSS.MATH.MP.6)

Madison Public Schools Profile of a Graduate

- Analyzing: Examining information/data/ evidence from multiple sources to identify possible underlying assumptions, patterns, and relationships in order to make inferences. (POG.1.2)
- Product Creation: Effectively use a medium to communicate important information. (POG.3.2)

K3 input, output can be swapped to find inverses through graphs, tables and algebraically
K4 what are parent functions and their different representations--verbally, graphically, numerically, and algebraically
K5 how parameters in functions transform graphically and point to point.
K6 for a relation to be a function, each input has one output
K7 Vocabulary: domain, range, input, output, constraint, relation, function, inverse function, interval notation, inequalities, piecewise, parent functions

S3 identifying the slope (unit rate of change) and y-intercept
S4 given a graph, writing the equation
S5 given a problem statement, writing the equation (and solve if appropriate)
S6 determining the domain and range from a graph
S7 determining solutions from a graph
S8 evaluating functions given the input or output
S9 graphing piecewise functions from the equations and determining the equations from a piecewise graph.
S10 determining inverse functions from graphs, tables, and algebraically
S11 composing a new function by $f(g(x))$ and $g(f(x))$