Unit D - *Functions*

Overview

The focus of Unit D is for students to learn what is a mathematical function and its importance in problem solving. Students will also explore and learn to use the concept of function notation. Even though function notation is awkward to learn and seems more cumbersome, it is a great tool that allows mathematicians to communicate more clearly. Students will learn to work flexibly between all representations of a relation or function (table, list, equation, graph, and mapping diagram).

21st Century Capacities: Synthesizing

Stage 1 - Desired Results

ESTABLISHED GOALS/ STANDARDS	*Transfer:*
MP1 Make sense sense of problems and persevere in solving them **MP2** Reason abstractly and quantitatively **MP6** Attend to precision **MP7** Look for and make use of structure CCSS.MATH.CONTENT.HSA.SSE.A.1.B Interpret complicated expressions by viewing one or more of their parts as a single entity. CCSS.MATH.CONTENT.HSA.SSE.A.2 Use the structure of an expression to identify ways to rewrite it. CCSS.MATH.CONTENT.HSA.SSE.B.3 Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.[*] CCSS.MATH.CONTENT.HSA.APR.A.1 Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials. CCSS.MATH.CONTENT.HSA.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).	*Students will be able to independently use their learning in new situations to...* 1. Manipulate equations/expressions or objects to create order and establish relationships. 2. Draw conclusions about graphs, shapes, equations, or objects. (Synthesizing)

	Meaning:	
	UNDERSTANDINGS: *Students will understand that:*	ESSENTIAL QUESTIONS: *Students will explore & address these recurring questions:*
	1. Mathematicians use symbols and notations to make it easier to express themselves. 2. Mathematicians flexibly use different tools, strategies, and operations to build conceptual knowledge or solve problems.	A. How can I use symbols to communicate? B. What does the function/graph tell me?

	Acquisition:	
CCSS.MATH.CONTENT.HSF.IF.B.5 Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. CCSS.MATH.CONTENT.HSF.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.[*] CCSS.MATH.CONTENT.HSF.IF.C.9 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). CCSS.MATH.CONTENT.HSF.BF.A.1 Write a function that describes a relationship between two quantities.[*] CCSS.MATH.CONTENT.HSF.BF.A.1.B Combine standard function types using arithmetic operations. CCSS.MATH.CONTENT.HSF.BF.A.1.C (+) Compose functions. CCSS.MATH.CONTENT.HSF.BF.B.3 Identify the effect on the graph of replacing $f(x)$ by $f(x) + k$, $kf(x)$, $f(kx)$, 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.4 Find inverse functions. CCSS.MATH.CONTENT.HSF.BF.B.4.A 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. CCSS.MATH.CONTENT.HSF.BF.B.4.B (+) Verify by composition that one function is the inverse of another. CCSS.MATH.CONTENT.HSF.BF.B.4.C (+) Read values of an inverse function from a graph or a table, given that the function has an inverse.	*Students will know…* 1. A function and its inverse are reflections over the x = y line 2. A composition can verify an inverse function 3. Components of a function can be used to visualize the function 4. Vocabulary: composition, inverse, transformation, domain, range, relation, function, composition	*Students will be skilled at…* 1. Identifying the domain and range of a function 2. Identifying if a relation is a functions 3. Finding the value of f(x) for a specific x value 4. Adding, subtracting, multiplying and dividing functions 5. Finding the composition of two functions 6. Finding the inverse of a function 7. Graphing transformations of $f(x) = x^2$ and f(x) = |x| with vertical and/or horizontal shifts and/or vertical flips