

Unit 6: Functions

(14 Days of Instruction and Assessment)

Content Standards: A coherent set of standards that not only stress conceptual understanding of key ideas, but also continually return to organizing principles such as the properties of operations to structure those ideas.		
● 8.F.1 - Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output.1 ● 8.F.2 - Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change. ● 8.F.3 - Interpret the equation $y = mx + b$ as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. For example, the function $A = s^2$ giving the area of a square as a function of its side length is not linear because its graph contains the points (1,1), (2,4) and (3,9), which are not on a straight line. ● 8.F.4 - Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values. ● 8.F.5 - Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally.		
Practice Standards: The mathematical practices represent a picture of what it looks like for students to understand and do mathematics in the classroom and should be integrated into every mathematics lesson for all students.		
Students will have opportunities to: ● SMP1 - Make sense of problems and persevere in solving them ● SMP2 - Reason abstractly and quantitatively ● SMP3 - Construct viable arguments and critique the reasoning of others ● SMP4 - Model with Mathematics ● SMP5 - Use appropriate tools strategically ● SMP6 - Attend to precision ● SMP7 - Look for and make use of structure ● SMP8 - Look for and express regularity in reasoning		
Concepts from Previous Units	Big Ideas, Concepts, & Strategies for Current Unit	Connections to Upcoming Concepts
Sixth Grade ● Write an equation in two variables, identifying the independent and dependent variables ● Analyze the relationship between two variables using graphs and tables Seventh Grade ● Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions ● Represent proportional relationships with equations	Eighth Grade ● Understand the definition of a function ● Compare and write functions represented in different ways (words, tables, graphs) ● Understand that $y=mx+b$ is a linear function and recognize nonlinear functions ● Interpret the rate of change and initial value of a function	Ninth Grade ● Need to gather this

Vocab.	Teacher Edition Vocabulary: Function, Inputs, Outputs, Coordinate Plane, Linear Function, Independent Variable, Dependent Variable, Slope, y-intercept, $y=mx+b$, Other Vocabulary: Discounts, Simple Interest, Compound Interest, Supply/Suppliers, Demand/Consumers, Surplus/Shortage, Intersect, Equilibrium
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			A Day Vocabulary, Tasks to Support Learning for ALL, Guiding Questions & Supplements to Extend Learning:			B Day Opportunities for Number Sense, Practice and Tiered Supports, and/or to Analyze Student Work	
Lesson	Learning Objectives	Student Objectives	Vocabulary and Tools	Implement Task for ALL Students from Big Ideas Curricular Resource	Supplemental Task As another option, for extra practice, as a day 2 task, or for students who need an extension	Implement Number Sense Routine Alternating Days	Select Practice Opportunity: Distributed Practice
6.1	Learning 8.F.1 - Define relations and functions - Determine whether relations are functions - Describe patterns in mapping diagrams	6.1 Relations and Functions Essential Question: <i>How can you show the relationship between two data sets?</i>	Vocabulary in the Launch Tools: Vocabulary in the Summarize:	Task A: Guiding Questions: Summarize	Task B:	Number Sense Routine could focus on: Evaluate functions Use resources in text to have students mentally evaluate functions OR Graphing Stories	PJ: Fair Game Review Practice Pages

6.2	Learning 8.F.1 - Write functions rules - Use input-output tables to represent functions - Use graphs to represent functions	6.2 Representations of Functions Essential Question: <i>How can you represent a function in different ways?</i>	Vocabulary in the Launch Function Discounts Inputs Outputs Coordinate plane Linear function Tools: Graph Paper Calculator Vocabulary in the Summarize: Independent Variable Dependent Variable	Task A: Selected Exercises: #35 Airboat Tours Guiding Questions: <i>How would you determine the cost for one hour? . . . 2 hours?</i> <i>What if you want to go for longer?</i> <i>What could you create to help you track the cost?</i> <i>Which is a better deal? How could you describe to your parents what is the better deal?</i> <i>How could you show it to your parents so they understand which is the better deal?</i> Summarize <i>What is the better deal? What does it depend on?</i> <i>What were the functions you wrote?</i> <i>Why does it make sense to write the functions in that way?</i> <i>What are the graphs for the functions?</i> <i>How are the graphs related to the functions?</i> <i>How does the graph help you answer which is the better deal?</i>	Task B: Selected Exercises: #34 Sale Guiding Questions: <i>Is there a way to determine a 10% discount?</i> <i>If you know the 10% discount, can that help you determine the 40% discount?</i> <i>What is the difference in meaning between the amount of discount and the sale price?</i> <i>How could you write an equation/function that shows how to determine the amount of discount no matter what the regular price is?</i> <i>What labels will you need on your graph?</i> Summarize <i>What equation/function did you write to model the discount?</i> <i>What does the graph of the function look like?</i> <i>What comparison can you make between the function notation and the graph?</i> <i>What are the different ways you can find the discount and sale price for the bookshelf?</i>		PJ: Activity 3 and 4 PJ: Practice 6.2 #3-5 EX: #14, 18, 23, 24, 25, 33
6.3	Learning 8.F.2, 8.F.3, 8.F.4 Understand that the	6.3 Linear Functions Essential Question: <i>How can you use a function to</i>	Vocabulary in the Launch Coordinate Plane Linear Function	Task A: Selected Exercises: #14 Race Guiding Questions:	Task B: Selected Exercises: #13 Battery Guiding Questions:		PJ: Activity 1 PJ: Activity 2 PJ: Practice 6.3 EX: #6, 8, 10, 11, 12

	equation $y=mx+b$ defines a linear function 2. Write linear functions using graphs or tables 3. Compare linear functions	describe a linear pattern?	Tools: Vocabulary in the Summarize: Slope Y-Intercept $y=mx+b$	How would you determine the rate that you run? How could you write a function that represents your running pace? Does your function work when you compare it against the table for your run? What does the function that represents your friend's running mean? How would you determine the rate that your friend runs? How would you represent these functions in a graph? What is the dependent variable? The independent? Summarize What were the different rates of the runners? How are those represented in the task? What do you notice about the two graphs? How does that relate to the functions? To the running rates? If the race is long enough, will you beat your friend? How long does it have to be and how do you know?	What percent power is left in the battery after one hour? What is the rate at which the battery loses power each hour? How can you use that to write a function that relates percent battery power to time? What is the independent and dependent variable? Summarize What linear function matches the graph? Is there any different way to write the function? How does the function you wrote match the graph? Describe how the function or graph represents the power remaining in the laptop battery?		
	Mid-Unit Assessment:						
6.4	Learning 8.F.3 1. Identify linear and nonlinear functions from tables or graphs	6.4 Comparing Linear and Nonlinear Functions Essential Question: <i>How can you recognize when a pattern in real life is linear?</i>	Vocabulary in the Launch Linear Function Simple Interest Compound Interest Tools:	Task A: Activity2: Comparing Linear and Nonlinear Functions Guiding Questions: What do you notice in the graphs or the table that is similar?...different?	Task B: Example 4: Real Life Application Guiding Questions: What do you notice in the graphs or the table that is similar?...different? For the simple interest, what do you		PJ: Activity 1 PJ: Practice 6.4 EX: #3-6, 15, 17, 19-21

	2. Compare linear and nonlinear functions		Vocabulary in the Summarize: Linear Function Non-Linear Function Constant Rate	<i>For the parachute jumper, what do you know that can help you write a function? Can you test your function to see if it's correct? What does linear function mean? Do you think it's possible to write a linear function for the bowling ball? [If a student does write a linear function for the bowling ball] Can you test the function you wrote against the information for the bowling ball?</i> Summarize <i>What function did you write for the parachute jumper? Did you find a linear function to match the bowling ball? Did you test it? Why do you think a linear function can't be written for the bowling ball? Do you think there is some type of function that can be written for the bowling ball?</i>	<i>know that can help you write a function? Can you test your function to see if it's correct? What does linear function mean? Do you think it's possible to write a linear function for Account B? [If a student does write a linear function to account B] Can you test the function you wrote against the information for Account B?</i> Summarize <i>What function did you write for Account A? Did you find a linear function to match account B? Did you test it? Why do you think a linear function can't be written for Account B? Do you think there is some type of function that can be written for Account B?</i>		
6.5	Learning 8.F.5 1. Analyze the relationship between two quantities using graphs 2. Sketch graphs to represent the relationship between two quantities	6.5 Analyzing and Sketching Graphs Essential Question: <i>How can you use a graph to represent relationships between quantities without using numbers?</i>	Vocabulary in the Launch Supply/Suppliers Demand/Consumers Surplus/Shortage Intersect Equilibrium Tools:	Task A: <u>Activities: Situations and Graphs</u> Guiding Questions: <i>What is the meaning of this (find a place to point) point on the graph? What does it mean in terms of the variables on the x- and y-axis? What changes here (point to another segment) on the graph? What is a situation when this might happen?</i>	Task B: <u>Selected Exercise: #19 Economics</u> Guiding Questions: <i>In the graph, what do you notice about the supply curve. . . the demand curve. . . how they relate to each other? As demand increases, what could you say about supply? What about as supply increases? Can you imagine why that might be?</i>		PJ: Activity 2 PJ: Activity3 PJ: Activity 4 EX: #7, 9, 10, 12, 20-23

			Vocabulary in the Summarize:	Summarize <i>What can you say about the different portions of the graph? . . . when the graph is increasing. . . decreasing. . . flat?</i> <i>How would you describe the graph in these different portions?</i> <i>Does the label on the axes change the interpretation of a graph? If the label were changed what would change about the situation?</i>	<i>Can you think of an item that is in demand and use it to write your interpretation of the curves?</i> <i>What do you think would happen if supply was zero?. . . if demand was zero?</i> <i>What do you think would happen if supply/demand greatly increased?</i> Summarize <i>What can you say about supply and demand based on what you noticed in the graphs?</i> <i>Did you think of a product where you have seen supply and demand work this way?</i> <i>What did you say was the meaning of the equilibrium point?</i>		
	End of Unit Assessment:						
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Sentence Stems for Secondary Mathematics:		
Domains	Language Objective(s):	Sentence Stem(s):

Speaking	1. I can orally describe the steps I took to solve the problem. 2. I can orally describe my reasoning. 3. I can defend my strategy. 4. I can restate someone else’s thinking in my own words. 5. I can compare strategies.	• I need more time to think please. • I would like to add _____. • I think what you said is _____. • This is my strategy _____. • I agree/disagree with _____ because _____. • I would _____ instead. • This makes me think _____. • The evidence I have is _____. • What if _____? • How can that be _____? • Could you have _____? • How did you _____? • Why did you _____?
Reading	1. I can find important information in a word problem. 2. I can summarize the purpose of the word problem.	• The problem is asking me to find _____. • The purpose of the problem is _____.
Writing	1. I can write to explain my reasoning. 2. I can explain why my strategy works. 3. I can record drawings and equations to show my work.	• The problem is asking me to find _____. First I, _____ Next, _____. Finally I found out that _____. My strategy works because _____. • The problem is asking me to find _____. In the beginning _____. But then, _____. At the end, _____. My strategy works because _____. • These are the steps I took to find _____. First, _____. Second, _____. Third, _____. I got _____ as my solution. I solved the problem this way because _____. • The problem is asking me to determine _____. I used the _____ strategy. To solve this problem first I _____. Then, I _____. Next, _____. After that, I _____. Finally I found out that _____. I noticed _____. My strategy works because _____.