Educational Epiphany ™ Districtwide PLC Protocol for Mathematics

Teacher/Teacher Team:

Grade/Course: Algebra 2 Date: Week of August 15, 2022

#	Planning Question	Teacher/Teacher	r Team Response
	Algebra 2 Coh	nerence Tool: Access the foundational standards to make connections to prev	viously taught skills during the lesson introduction.
1	Which state standard is your lesson progression addressing?	 Lesson: 1.1 Measuring Segments and Angles A2.F.IF.A.1 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.★ Embedded with A2.F.IF.A.1 is A2.N.Q.A.1 Scope and Clarification Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; and end behavior. i) Tasks have a real-world context. ii) Tasks may involve square root, cube root, polynomial, exponential, and logarithmic functions. 	 Lesson 1.2 – Transformation of Functions A2.F.IF.B.3 Graph functions expressed symbolically and show key features of the graph, by hand and using technology.★ Embedded with A2.F.BF.B.3 is A2.N.Q.A.1 Foundational Standards: A1.F.IF.A.1, A1.F.IF.C.7a, A1.A.APR.B.2, and A1.F.LE.A.1c A2.F.IF.B.3a Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. Scope and Clarification_A2.F.IF.B.3a: Tasks are limited to square root and cube root functions. The other functions are assessed in Algebra 1. Foundational Standards: None
		 A2.F.IF.A.2 Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph. ★ Embedded with A2.F.IF.A.2 is A2.N.Q.A.1 <u>Scope and Clarification</u> i) Tasks have a real-world context. ii) Tasks may involve polynomial, exponential, and logarithmic functions. Foundational Standard: A1.F.IF.A.2 A2 E IE B 3 Graph functions expressed symbolically, and show 	 A2.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. Scope and Clarification Tasks may involve polynomial, exponential, and logarithmic functions. Tasks may involve recognizing even and odd functions.
		 AZ.F.IF.B.3 Graph functions expressed symbolically and show key features of the graph, by hand and using technology.★ Embedded with A2.F.BF.B.3 is A2.N.Q.A.1 A2.F.IF.B.3a Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. 	

		Scope and Clarification A2.F.IF.B.3a: Tasks are limited to square	
		root and cube root functions. The other functions are assessed in	
		Algebra 1.	
		Foundational Standards: None	
2	What mathematical concepts are embedded in the state standard?	 Understand that: The key features of a graph – including the domain, range, and intercepts – reveal the relationship between two quantities. Students find and interpret key features of linear, quadratic, absolute value, and constant functions, including the x- and y-intercepts, the positive and negative internals, and intervals where the function is increasing and decreasing. Students use the x-intercepts of a function to determine the zeros of a function, and they use set-builder and interval notation to state the domain and range. 	 A function of the form f(x) = a · f[b(x - h)] + k is transformed by changing the values of a, b, h, or k. Changing the value of h or k results in a horizontal or vertical translation, changing the sign of a or b results in a reflection across one of the axes, and changing the value of a or b results in a horizontal or vertical stretch or compression. Students interpret, graph, and write equations of transformations of functions. Functions in the form y = f(x - h) represent horizontal translations, functions in the form y = f(x) + k represents reflections across the x-axis, functions in the form y = f(-x) represent reflections across the y-axis, functions in the form y = f(bx) represent horizontal stretches or compressions, and functions in the form y = af(x) represent vertical stretches or compressions.
3	What teacher knowledge, reminders, and misconceptions are assumed in the standard?	 Knowledge: The lesson emphasizes a blend of conceptual understanding and application. Identify and interpret the key features of the graph of a function, including the domain, range, intercepts, and areas where the graph is increasing or decreasing. Identify intercepts of a function and interpret them in the context of a real-world problem, such as finding the distance that a car can travel before it runs out of gas. Students use stated mathematical assumptions about the minimum value of a function to construct an argument explaining why the function has no maximum value. Students demonstrate understanding of the meanings of mathematical symbols when they use information about the volume of a container and the rate at which it is being filled to describe the key features of the graph that models the situation. Reminders and Misconceptions: Students created, graphed, and identified key features of functions. While working problems involving square roots, students may only find one x-intercept. Have students check their work by substituting 0 for y and solving for x. Students may forget when to use a bracket and when to use a parenthesis in interval notation. Have students make flashcards to review. One side should have interval notation the other side 	 Knowledge: The lesson emphasizes a blend of conceptual understanding and application. Students apply their understanding of transformations either to graph a translation of a linear , quadratic, or absolute value function or to write an equation given a graph. Students write equations for linear and quadratic functions by understanding how changing the values of a, b, h, and k affect the key features of the graph of a function. Students use appropriate tools strategically to determine why the transformation g(x) = f(-x) affects the x-coordinate of each point. Reminders and Misconceptions: Students created, graphed, and identified the key features of graphs of linear, quadratic, and absolute value functions.

		should represent the same interval on a number line. Students should focus on recognizing that a parenthesis in the interval notation corresponds to an open circle on the number line (or positive/negative infinity), and a bracket represents a closed circle.	
4	What objective(s) must be taught? In what order? Why?	 PBO: SWBAT graph the following functions, identify key features of the graph, and interpret the meaning of the key features in relationship to the context of the problem IOT solve a real-world problem. (square root function, cube root function, exponential function, polynomial function, logarithmic function) (A2.F.IF.A.1) SWBAT calculate and interpret the average rate of change when given an equation or table of a polynomial, exponential, or logarithmic function IOT understand the meaning in a contextual problem. (A2.F.IF.A.2) SWBAT estimate the average rate of change over a specified interval of a polynomial, exponential, or logarithmic function when given a graph IOT understand the meaning in a contextual problem. (A2.F.IF.A.2) SWBAT graph a square root, cube root, polynomial with degree greater than two, exponential, and logarithmic function by hand and using technology IOT explain the relationship that exists between a contextual problem and the key features of a graph. (A2.F.IF.B.3a) Lesson objectives: Identify key features of a graph of a function, including the intercepts, positive and negative intervals, and areas where the function is increasing or decreasing. Calculate and interpret the average rate of change of a function over a specified interval. 	 PBO: SWBAT graph a square root, cube root, polynomial with degree greater than two, exponential, and logarithmic function by hand and using technology IOT explain the relationship that exists between a contextual problem and the key features of a graph. (A2.F.IF.B.3a) SWBAT describe 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) IOT understand and explain the differences of the transformations to f(x). (A2.F.BF.B.3) SWBAT determine if the function is an odd function, even function, or neither, given a function defined by an expression IOT determine the graph the function. (A2.F.BF.B.3) SWBAT experiment with cases and illustrate an explanation of the effects on the graph using technology IOT understand the differences of the transformations. (A2.F.BF.B.3) SWBAT experiment function by identifying 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. Write an equation of a transformed function. Relate the domain of a function to its graph and the real-world situation it describes.
5	What academic	Academic Language:	Academic Language:
	language must be taught	 average rate of change – the slope of a line or curve on a given range 	compression - a transformation that decreases the distance between corresponding points of a graph
	models for students? How	calculate - to determine the amount or number of something	context – a situation used to describe a mathematical problem
	will the academic	mathematically	 cube root – one of three identical factors of a number that is the
	language be taught and	• context - a situation used to describe a mathematical problem	product of those factors
	assessed?	 cube root – one of three identical factors of a number that is the product of those factors 	degree – the amount, level, or extent to which something happens or is present
		degree – the amount, level, or extent to which something happens or is present	describe – give an account in words of (someone or something) that includes all the relevant characteristics
		 equation – a mathematical statement containing an equal sign to show that two expressions are equal 	 determine – to find out something using mathematical processes; to conclude after reasoning; to figure out

 estimate - an approximate calculation, uggment of the value, number, quantity, or extent of something exponential function - molinear function in which the independent value is an exponent in the equation, and can be written in the following forms, y = a0x, y = a(1+y), x = a(1+y), x = a(1+y), x = a(1+y), x = a(
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 exponent induction - symithetic function - invibility dues, and while during description of the same variable in a exponent in the equation, and can be written in the following forms; y = dx, y = 4(1, y), o y = 4(1 + y), and the car by description in which the independent value is a exponential function - a statement making something dear by description in which the independent value is a proportion in which every domain(input) value is parted with exactly one range(output) value. graph - to pick a pictorial diagram used to show a numerical relatorship using distinctive pots. Incess pictors, indexe dues and exponential function - a statement making something dear by description in which the independent value is an exponential function - a statement making something dear by description in the data by even in t	number, quantity, or extent or something	outlet cause
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 Phase is a substraint mean of the server domain (input) value is paired with exactly one range(output) value. graph - to plot, a pictorial diagram used to show a numerical relation in which ever domain (input) value is a compositive, or negative, relative maximums and minimum - there y end (1 + r) × = a(1 + r) × = a(1 + r) × r = a(1 + r)	whiten in the following forms, $y = abx$, $y = a(1+1)x$, or $y = a(1-1)x$	• explaint - make clear by describing
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 Instructional Practice 2: Instructional Practice 2: Strategies used to teach unfamiliar words will include: 30 – 30 – 30 (common math-related word parts in the text, problem, or objective) Point of Use Annotation of the Performance-Based Objective Word and Definition Walls Word Parts Instructional Definition Walls Instructional Practice 2: <li< th=""><th>polynomial function - a function of more than two algebraic</th><th>by the function or by context.</th></li<>	polynomial function - a function of more than two algebraic	by the function or by context.
 found by substituting and evaluating the number x problem – a question that needs a solution relationship – the way in which two or more concepts are connected set – builder notation - square root – one of two identical factors of a number that is the product of those factors. table – numbers or quantities arranged in rows and columns understand – comprehend; grasp the intended meaning of; infer something from information received zero of the function - Strategies used to teach unfamiliar words will include: 30 – 30 – 30 (common math-related word parts in the text, problem, or objective) Point of Use Annotation of the Performance-Based Objective Universal Language of Literacy Word Parts 	terms that for each real number x in the domain, f(x) is the value	 logarithmic function – the inverse of an exponential function
 problem – a question that needs a solution relationship – the way in which two or more concepts are connected set – builder notation - square root – one of two identical factors of a number that is the product of those factors. table – numbers or quantities arranged in rows and columns understand – comprehend; grasp the intended meaning of; infer something from information received zero of the function - Instructional Practice 2: Strategies used to teach unfamiliar words will include: 30 – 30 – 30 (common math-related word parts in the text, problem, or objective) Point of Use Annotation of the Performance-Based Objective Word and Definition Walls Word Parts 	found by substituting and evaluating the number x	 odd function – is symmetric to the origin, and the input and
 relationship – the way in which two or more concepts are connected set – builder notation - square root – one of two identical factors of a number that is the product of those factors. table – numbers or quantities arranged in rows and columns understand – comprehend; grasp the intended meaning of; infer something from information received zero of the function - Instructional Practice 2: Strategies used to teach unfamiliar words will include: 30 – 30 – 30 (common math-related word parts in the text, problem, or objective) Point of Use Annotation of the Performance-Based Objective Word Parts word Parts 	 problem – a question that needs a solution 	output values are both opposites; $f(-x) = -f(x)$
 are connected set - builder notation - square root - one of two identical factors of a number that is the product of those factors. table - numbers or quantities arranged in rows and columns understand - comprehend; grasp the intended meaning of; infer something from information received zero of the function - Instructional Practice 2: Strategies used to teach unfamiliar words will include: 30 - 30 - 30 (common math-related word parts in the text, problem, or objective) Point of Use Annotation of the Performance-Based Objective Word and Definition Walls Word Parts 	 relationship – the way in which two or more concepts 	 polynomial - an expression of more than two algebraic terms,
 set - builder notation - square root - one of two identical factors of a number that is the product of those factors. table - numbers or quantities arranged in rows and columns understand - comprehend; grasp the intended meaning of; infer something from information received zero of the function - Instructional Practice 2: Strategies used to teach unfamiliar words will include: 30 - 30 - 30 (common math-related word parts in the text, problem, or objective) Point of Use Annotation of the Performance-Based Objective Universal Language of Literacy Word and Definition Walls Word Parts 	are connected	especially the sum of several terms that contain different powers
 square root – one of two identical factors of a number that is the product of those factors. table – numbers or quantities arranged in rows and columns understand – comprehend; grasp the intended meaning of; infer something from information received zero of the function - Instructional Practice 2: Strategies used to teach unfamiliar words will include: 30 – 30 – 30 (common math-related word parts in the text, problem, or objective) Point of Use Annotation of the Performance-Based Objective Universal Language of Literacy Word and Definition Walls Word Parts 	 set – builder notation - 	of the same variable(s)
 reflection - a transformation of a lighter that creates a mirror image or "flips" over a line understand - comprehend; grasp the intended meaning of; infer something from information received zero of the function - Instructional Practice 2: Strategies used to teach unfamiliar words will include: 30 - 30 - 30 (common math-related word parts in the text, problem, or objective) Point of Use Annotation of the Performance-Based Objective Universal Language of Literacy Word and Definition Walls Word Parts 	 square root – one of two identical factors of a number that is the 	• problem – a question that needs a solution
 table – numbers or quantities arranged in rows and columns understand – comprehend; grasp the intended meaning of; infer something from information received zero of the function - Instructional Practice 2: Strategies used to teach unfamiliar words will include: 30 – 30 – 30 (common math-related word parts in the text, problem, or objective) Point of Use Annotation of the Performance-Based Objective Universal Language of Literacy Word and Definition Walls Word Parts 	product of those factors.	• reflection - a transformation of a figure that creates a million
 understand – comprehend; grasp the intended meaning of; infer something from information received zero of the function - Instructional Practice 2: Strategies used to teach unfamiliar words will include: 30 – 30 – 30 (common math-related word parts in the text, problem, or objective) Point of Use Annotation of the Performance-Based Objective Universal Language of Literacy Word and Definition Walls Word Parts 	 table – numbers or quantities arranged in rows and columns 	inage of hips over a line
 something from information received zero of the function - Instructional Practice 2: Strategies used to teach unfamiliar words will include: 30 - 30 - 30 (common math-related word parts in the text, problem, or objective) Point of Use Annotation of the Performance-Based Objective Universal Language of Literacy Word and Definition Walls Word Parts 	• understand – comprehend; grasp the intended meaning of; infer	are connected
 zero of the function - Instructional Practice 2: Strategies used to teach unfamiliar words will include: 30 – 30 – 30 (common math-related word parts in the text, problem, or objective) Point of Use Annotation of the Performance-Based Objective Universal Language of Literacy Word and Definition Walls Word Parts zero of the function - sequate root – one of two identical radius of a number that is the product of those factors. stretch - a transformation that increases the distance between corresponding points of a graph transformation – the mapping, or movement, of all points of a figure in a plane according to a common operation translation - a transformation that slides each point of a figure the same distance in the same direction understand – comprehend; grasp the intended meaning of; infer something from information received 	something from information received	 square root – one of two identical factors of a number that is the
 Instructional Practice 2: Strategies used to teach unfamiliar words will include: 30 – 30 – 30 (common math-related word parts in the text, problem, or objective) Point of Use Annotation of the Performance-Based Objective Universal Language of Literacy Word and Definition Walls Word Parts Stretch - a transformation that increases the distance between corresponding points of a graph transformation – the mapping, or movement, of all points of a figure in a plane according to a common operation translation - a transformation that slides each point of a figure the same distance in the same direction understand – comprehend; grasp the intended meaning of; infer something from information received 	• zero of the function -	product of those factors.
 Strategies used to teach unfamiliar words will include: 30 – 30 – 30 (common math-related word parts in the text, problem, or objective) Point of Use Annotation of the Performance-Based Objective Universal Language of Literacy Word and Definition Walls Word Parts 	Instructional Practice 2:	• stretch - a transformation that increases the distance between
 30 – 30 – 30 (common math-related word parts in the text, problem, or objective) Point of Use Annotation of the Performance-Based Objective Universal Language of Literacy Word and Definition Walls Word Parts transformation – the mapping, or movement, of all points of a figure in a plane according to a common operation transformation – the mapping, or movement, of all points of a figure in a plane according to a common operation transformation – the mapping, or movement, of all points of a figure in a plane according to a common operation translation - a transformation that slides each point of a figure the same distance in the same direction understand – comprehend; grasp the intended meaning of; infer something from information received 	Strategies used to teach unfamiliar words will include:	corresponding points of a graph
 problem, or objective) Point of Use Annotation of the Performance-Based Objective Universal Language of Literacy Word and Definition Walls Word Parts figure in a plane according to a common operation translation - a transformation that slides each point of a figure the same distance in the same direction understand – comprehend; grasp the intended meaning of; infer something from information received 	 30 – 30 – 30 (common math-related word parts in the text) 	 transformation – the mapping, or movement, of all points of a
 Point of Use Annotation of the Performance-Based Objective Universal Language of Literacy Word and Definition Walls Word Parts 	problem, or objective)	figure in a plane according to a common operation
 Universal Language of Literacy Word and Definition Walls Word Parts Same distance in the same direction understand – comprehend; grasp the intended meaning of; infer something from information received 	Point of Use Annotation of the Performance-Based Objective	• translation - a transformation that slides each point of a figure the
 Word and Definition Walls Word Parts Understand – comprehend; grasp the intended meaning of; infer something from information received 	Universal Language of Literacy	same distance in the same direction
Word Parts Something from information received	Word and Definition Walls	• understand – comprehend; grasp the intended meaning of; infer
	Word Parts	something from information received

		Context Clues	
		Point of Use Annotation of the Text (in Real-Time)	Instructional Practice 2: Strategies used to teach unfamiliar words will include:
			• $30 - 30 - 30$ (common math-related word parts in the text
			problem, or objective)
			 Point of Use Annotation of the Performance-Based Objective
			Universal Language of Literacy
			Word and Definition Walls
			Word Parts
			Context Clues
			 Point of Use Annotation of the Text (in Real-Time)
6	What practice problems	Station Rotation Model Suggestions	Station Rotation Model Suggestions
0	are you planning to use	Teacher-Led Station: Teachers can work with students on additional We	Teacher-Led Station: Teachers can work with students on additional We
	for the I Do, We Do, You	Do problems.	Do problems.
	Do in Pairs, and You Do	 Additional Examples – TE pg. 5, pg. 7, pg. 8 	 Additional Examples – TE pg. 13, pg. 16, pg. 19
	Without Assistance?	 <u>1-1 Reteach to Build Understanding</u> 	 <u>1-2 Reteach to Build Understanding</u>
	What did you learn from	Online Station Chudente can watch and engage with Virtual Nerd Video	Online Station, Students can watch and angage with Virtual Nord Video
	working the problems in	lessons. Students will initially tell what they think the answer to the question	lessons. Students will initially tell what they think the answer to the question
	advance of using them in	is or their opinion regarding an issue, and/or their thoughts based on a	is or their opinion regarding an issue, and/or their thoughts based on a
	class with students?	prompt. Then the students will watch the video to decide as to whether their	prompt. Then the students will watch the video to decide as to whether their
		original assertion was accurate, justified, etc.	original assertion was accurate, justified, etc.
		• <u>1-1: Virtual Nerd™: How Do You Write a Set in Interval Notation?</u>	• <u>1-2: Virtual Nerd™: How Do You Reflect a Function?</u>
		Offline Station: Students would complete problems and exercises selected	 1-2: Virtual Nerd[™]: How do You Graph a Translation of a
		for the You Do in Pairs part of the lesson.	Function?
		 Lesson Performance Task #33 – Pg. 12 	
		<u>1-1 Additional Practice</u>	Offline Station: Students would complete problems and exercises selected
		<u>1-1 Mathematical Literacy and Vocabulary</u>	for the You Do in Pairs part of the lesson.
		<u>1-1 Enrichment</u>	 Lesson Performance Task #38 – Pg. 22 1.2 Additional Drastica
			<u>1-2 Auditional Practice</u> <u>1 2 Methomatical Literacy and Vecebulary</u>
			 <u>1-2 Inditernatical Literacy and Vocabulary</u> <u>1-2 Enrichment</u>
7	What manipulatives	Reference: Interactive Manipulatives	Reference: Interactive Manipulatives
/	might be integrated into	Didax Virtual Manipulatives	Didax Virtual Manipulatives
	the aradual release of	Savvas Math Tools	Savvas Math Tools
	responsibility (I Do, We	 Realize Desmos (Graphing Calculator) 	 Realize Desmos (Graphing Calculator)
	Do, You Do in Pairs, You	Realize Desmos (Scientific Calculator)	Realize Desmos (Scientific Calculator)
	Do Without Assistance)?		
	What did you learn from		
	using the manipulatives		
	in advance of using them		
	in class with students?		
8	What graphic	Reference:	Reference:
	organizer(s) might	<u>Graphic Organizer Templates</u>	<u>Graphic Organizer Templates</u>
	support students'	 Google Drawing Graphic Organizers 	Google Drawing Graphic Organizers

conceptual understanding of the process outlined by the performance-based chipetiva(2)?	<u>Teacher Vision</u>	<u>Teacher Vision</u>
odjective(s) ?		