

NJDOE MODEL CURRICULUM PROJECT

CONTENT AREA: Mathematics

GRADE: 8

UNIT #: 4

UNIT NAME: Functions, Radicals & Geometry

STUDENT LEARNING OBJECTIVES		CORRESPONDING CCSS	
1	Define functions as a rule that assigns one output to each input and determine if data represented as a graph or in a table is a function.	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.
2	Compare two functions each represented in a different way (numerically, verbally, graphically, and algebraically) and draw conclusions about their properties (rate of change and intercepts).	8.F.2	Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). <i>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.</i>
3	Utilize equations, graphs, and tables to classify functions as linear or non-linear, recognizing that $y = mx + b$ is linear with a constant 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. <i>For example, the function $A = s^2$ giving the area of a square as a function of its side lengths is not linear because its graph contains the points (1, 1), (2, 4), and (3, 9) which are not on a straight line.</i>
4	Evaluate square roots and cubic roots of small perfect squares and cubes respectively and use square and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$ where p is a positive rational number. Identify $\sqrt{2}$ as irrational.	8.EE.2	Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$ where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that the square root of 2 is irrational.
5	Explain a proof of the Pythagorean Theorem and its converse.	8.G.6	Explain a proof of the Pythagorean Theorem and its converse.
6	Utilize the Pythagorean Theorem to determine unknown side lengths of right triangles in two and three dimensions to solve real-world and mathematical problems	8.G.7	Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two or three dimensions.
7	Use the Pythagorean Theorem to determine the distance between two points in the coordinate plane.	8.G.8	Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.

Major Content **Supporting Content** **Additional Content** (Identified by PARCC Model Content Frameworks). ***Bold type indicates grade level fluency requirements.*** (Identified by PARCC Model Content Frameworks).

Selected Opportunities for Connection to Mathematical Practices

1. Make sense of problems and persevere in solving them.
2. **Reason abstractly and quantitatively.**
SLO 2 Use functions that are represented in different ways to Identify and compare the rates of change and the intercepts of each.
3. **Construct viable arguments and critique the reasoning of others.**
SLO 5 Explain the difference between the Pythagorean Theorem and its converse. Listen to or read the explanations of others and pose questions that will clarify or improve the explanations.
4. **Model with mathematics.**
SLO 7 Use the coordinates of a figure represented on a coordinate plane to determine the length of a missing side.
5. Use appropriate tools strategically.
6. Attend to precision.
7. **Look for and make use of structure.**
SLO 2 Identify the rate of change and the intercepts of functions represented in different ways.
8. Look for and express regularity in repeated reasoning.

All of the content presented at this grade level has connections to the standards for mathematical practices.

Bold type identifies possible starting points for connections to the SLOs in this unit.

Greater Brunswick Charter School Curriculum

Grade level: 8		Subject: Math			Unit #: 4		
Day	Topic	SLO	Learning Objectives	Essential Questions	Suggested Student Activities		Possible Resources
					Whole Group	Small Group / Stations	
1	Readiness for unit		To determine the level of readiness of students	<i>Do I know enough to begin this unit?</i>	<i>The text is extraordinarily non-aligned with the content of Unit 4. Much of Unit 4 has been covered in Chapter 4 of the text. Chapter 5 of the text contains many lessons that are not on topic for Unit 4.</i>	<ul style="list-style-type: none"> • Vocabulary review • Independent practice • Intervention for strugglers • i-Ready 	Glencoe Math p368
2	Reasoning and Proofs	5	To complete various types of proofs	<i>How can I prove something is true?</i>	<i>You may want to walk through the sample and homework problems yourself to develop a list of properties, rules, theorems, and definitions students will need as tools to complete the proofs they are asked to do.</i>	<ul style="list-style-type: none"> • Lesson & Guided practice • Independent practice • Intervention/Enrichment • i-Ready 	Glencoe Math 5.2 p.379-384
3	Reasoning and Proofs	5	To complete various types of proofs	<i>How can I prove something is true?</i>	<i>They will not need the information in Lesson 1. However, if you wish to include it, it's an option. But you may get bogged down in needless content.</i>	<ul style="list-style-type: none"> • Detailed homework review • Independent practice • Intervention/Enrichment • i-Ready 	Glencoe Math 5.2 p.385-386
4	Reasoning and Proofs	5	To complete various types of proofs	<i>How can I prove something is true?</i>		<ul style="list-style-type: none"> • Detailed homework review • Independent practice • Intervention/Enrichment • i-Ready 	Selected proofs from this page marked "easy".
5	Pythagorean Theorem	6	To use the Pythagorean Theorem to determine the length of an unknown side of a right triangle.	<i>How can I know the length of a side of a triangle without measuring it?</i>	<i>Don't forget to highlight to converse.</i>	<ul style="list-style-type: none"> • Lesson & Guided practice • Independent practice • Intervention/Enrichment • i-Ready 	Glencoe Math 5.5 p.411-415

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6	Pythagorean Theorem	6	To use the Pythagorean Theorem to determine the length of an unknown side of a right triangle.	<i>How can I know the length of a side of a triangle without measuring it?</i>		<ul style="list-style-type: none"> Detailed homework review Independent practice Intervention/Enrichment i-Ready 	Glencoe Math 5.5 p.416-417
7	Proof of the Pythagorean Theorem	5	To be able to replicate the proof of the theorem.	<i>How do I know the Pythagorean Theorem works every time?</i>		<ul style="list-style-type: none"> Lesson & Guided practice Independent practice Intervention/Enrichment i-Ready 	Glencoe Math p.419-422 A proof of the Theorem that is highlighted in the model curriculum.
8	Pythagorean Theorem	6	To use the Pythagorean Theorem to solve real world applications	<i>How is this useful to me in real life?</i>		<ul style="list-style-type: none"> Lesson & Guided practice Independent practice Intervention/Enrichment i-Ready 	Glencoe Math 5.5 p.423-427
9	Pythagorean Theorem	6	To use the Pythagorean Theorem to solve real world applications	<i>How is this useful to me in real life?</i>		<ul style="list-style-type: none"> Lesson & Guided practice Independent practice Intervention/Enrichment i-Ready 	Glencoe Math 5.5 p.428-430
10	Distance on a coordinate plane	7	To use the Pythagorean Theorem to find the distance between two points in a plane.	<i>How does this prove the shortest distance between two points is a straight line?</i>		<ul style="list-style-type: none"> Lesson & Guided practice Independent practice Intervention/Enrichment i-Ready 	Glencoe Math 5.6 p.431-436
11	Distance between two points	7	To use the Pythagorean Theorem to find the distance between two points in a plane.	<i>How can the Pythagorean Theorem help me in real life?</i>		<ul style="list-style-type: none"> Lesson & Guided practice Independent practice Intervention/Enrichment i-Ready 	Glencoe Math 5.6 p.437-440
12	Proofs Pythagorean Theorem	5, 6, 7	To review content to this point			<ul style="list-style-type: none"> Independent practice Intervention for strugglers i-Ready 	<ul style="list-style-type: none"> Practice Problems More problems Distance between points and more Proofs practice
13	Proofs Pythagorean Theorem	5, 6, 7				<ul style="list-style-type: none"> Review Assessment 	

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14	Square Roots	4	To evaluate square roots	<i>If x^2 gives a perfect square, how do I find the square root of a number?</i>	<i>The focus is on notating and evaluating square and cube roots, not finding the value of irrational roots.</i>	<ul style="list-style-type: none"> • Lesson & Guided practice • Independent practice • Intervention/Enrichment • i-Ready 	Khan Academy lesson sequence Practice needs to be no more difficult than this sheet Some more lesson content and practice
15	Cube Roots	4	To evaluate cube roots	<i>If x^3 gives a perfect square, how do I find the cube root of a number?</i>		<ul style="list-style-type: none"> • Lesson & Guided practice • Independent practice • Intervention/Enrichment • i-Ready 	Khan Academy practice Practice with perfect cubes Some more practice
16	Root function graphs	4	To graph the square root and cube root functions	<i>What do the square root and cube root functions look like when I make a table and plot the points on a plane?</i>	<i>This is just a reintroduction to different types of functions.</i>	<ul style="list-style-type: none"> • Lesson & Guided practice • Independent practice • Intervention/Enrichment • i-Ready 	Just graph $y=\sqrt{x}$ using perfect squares for x and $y=\sqrt[3]{x}$ using perfect cubes for x. Then show $y=x^2$ and $y=x^3$ and show how the pairs are related on the plane.
17	Square and cube roots	4	To review finding square and cube roots of numbers.			<ul style="list-style-type: none"> • Independent practice • Intervention for strugglers • i-Ready 	Use any problems for the sheets previously linked above.
18	Square and cube roots	4				<ul style="list-style-type: none"> • Review • Assessment 	
18	Functions	1, 2, 3	To identify a function or not a function	<i>Which of those equations is going to give me a function?</i>	<i>The text provides no new material for this study. Re-using some pages will be useful. Additional content is offered under Resources.</i>	<ul style="list-style-type: none"> • Lesson & Guided practice • Independent practice • Intervention/Enrichment • i-Ready 	Glencoe Math

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19	Review of functions	1, 3	To reaffirm the definition of a function as opposed to a relation and determine whether a function is linear or not.	<i>How do I tell if a function is linear?</i>	<i>Use the square and cube root functions as examples of non-linear, non-functions.</i>	<ul style="list-style-type: none"> Lesson & Guided practice Independent practice Intervention/Enrichment i-Ready 	Glencoe Math 4.3, 4.7, 4.8 p. 287-291, 327-332, 336, 339-341 <ul style="list-style-type: none"> KhanAcademy series on functions Types of functions graphed More examples of types of functions graphed A quiz on identifying types of graphs A worksheet for this
20	Review properties of functions	2	To reaffirm the list of properties functions may have and constructing them from situations.	<i>How can I see the slope and intercepts (roots) of functions?</i>		<ul style="list-style-type: none"> Lesson & Guided practice Independent practice Intervention/Enrichment i-Ready 	Glencoe Math 4.5, 4.6 p.309, 315-317, 319, 323-325 <ul style="list-style-type: none"> A lot of options available from this worksheet KhanAcademy- further down the list-a lot of content on function properties like max, min, slope, roots, domain
21	Review qualitative graphs	2	To re-examine qualitative graphs to ensure understanding of their definition and why they are used.	<i>How can I use a graph to show the interaction of factors when I don't have numbers or an equation available to me?</i>	<i>Remember they are called qualitative because they can't be quantitative since they don't have numbers (quantities) associated with them.</i>	<ul style="list-style-type: none"> Lesson & Guided practice Independent practice Intervention/Enrichment i-Ready 	Glencoe Math 4.9 p.347-354 <ul style="list-style-type: none"> Dry but decent video on qualitative graphs also many more in right margin of video. These might be good practice, but couldn't get audio to work Learnzillion lesson

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22	Functions	1, 2, 3	To review all elements of function study	<i>Do I know this stuff now?</i>		<ul style="list-style-type: none"> Independent practice Intervention for strugglers i-Ready 	Various portions of materials linked above
23	Functions	1, 2, 3				<ul style="list-style-type: none"> Review Assessment 	

Word Wall Candidates

Converse	Deductive Reasoning	Inductive Reasoning	Formal Proof	Informal Proof
Paragraph Proof	Two-Column Proof	Theorem	Distance Formula	Hypotenuse
Pythagorean Theorem	Square root	Cube Root	Function	Qualitative graph
Quadratic function	Absolute Value function	Reciprocal function	Logarithmic function	Exponential function
Tertiary function	Step function			

Authentic Application

Your goal: Create a scenario that requires a qualitative graph to explain it visually.

Your role: Member of a team.

Your audience: The members of the class.

The situation: Your team is to use a scenario that has actually happened in one of your lives in the past 12 months to develop a story that can be depicted in a qualitative graph that can be constructed by an audience of classmates listening to the story. The story must have an independent variable, a dependent variable, and a logical sequence that enables listeners to construct a qualitative graph from the events as they occur.

Your Product: The qualitative graphs drawn by your listening audience. The better and clearer their graphs are able to be drawn, the better is your product.

Success Criteria: Scoring rubric:

	4 points	3 points	2 points	1 point
Variables	More than one independent variables and more than one dependent variables	One independent variable and one dependent variable	A variable is missing	There are no discernable variables
Story	The scenario is provided in a logical sequence that is able to be followed.	The scenario has minor errors that don't follow logically.	The scenario has multiple errors that impact the understanding of the variable relationships.	The story is not understandable or not realistic.
Graphs	90% of student graphs are understandable and consistent with each other.	75% of student graphs are understandable and consistent with each other.	50% of student graphs are understandable and consistent with each other.	Few of the student graphs are understandable and consistent with each other.

