NJDOE MODEL CURRICULUM

CONTENT AREA: Mathematics	Course: Algebra I	UNIT #: 2	UNIT NAME: Linear Relationships

	STUDENT LEARNING OBJECTIVES	CORRESPONDING CCSS	
1	Solve systems of linear equations in two variables graphically and algebraically. *Include solutions that have been found by replacing one equation by the sum of that equation and a multiple of the other.*	A.REI.5 A.REI.6	Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions. Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.
2	Find approximate solutions of linear equations by making a table of values, using technology to graph and successive approximations.	A.REI.11	Explain why the x-coordinates of the points where the graphs of the equations *y = f(x)* and y = g(x) intersect are the solutions of the equation f(x) = g(x); find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where *f(x)* and/or *g(x)* are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.
3	Graph equations, inequalities, and systems of inequalities in two variables and explain that the solution to an equation is all points along the curve, the solution to a system of linear functions is the point of intersection, and the solution to a system of inequalities is the intersection of the corresponding half-planes; describe constraints with linear equations and inequalities and systems of equations and/or inequalities to determine if solutions are viable or non-viable.	A.REI.10 A.REI.11 A.REI.12 A.CED.3	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). Explain why the x-coordinates of the points where the graphs of the equations *y = f(x)* and y = g(x) intersect are the solutions of the equation f(x) = g(x); find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where *f(x)* and/or *g(x)* are linear, polynomial, rational, absolute value, exponential, and logarithmic functions. Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes. Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or non-viable options in a modeling context. *For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.*

STUDENT LEARNING OBJECTIVES		CORRESPONDING CCSS	
4	Explain and interpret the definition of functions including domain and range and how they are related; correctly use function notation in a context and evaluate functions for inputs and their corresponding outputs.	F.IF.1 F.IF.2	Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If *f* is a function and *x* is an element of its domain, then *f(x)* denotes the output of *f* corresponding to the input *x*. The graph of *f* is the graph of the equation *y = f(x)*. Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.
5	Write a function for a geometric sequence defined recursively, whose domain is a subset of the integers.	F.IF.3	Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. *For example, the Fibonacci sequence is defined recursively by f(0) = f(1) = 1, f(n+1) = f(n) + f(n-1) for n ≥ 1.*
6	Graph functions by hand (in simple cases) and with technology (in complex cases) to describe linear relationships between two quantities and identify, describe, and compare domain and other key features in one or multiple representations.	F.IF.5 F.IF.7a F.IF.9	Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. *For example, if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.* Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases. a. Graph linear functions. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.*
7	Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).	F.IF.9	Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.*

Major **Supporting** **Additional** (identified by PARCC Model Content Frameworks)

Bold Type indicates grade level fluency requirements. *(Identified by PARCC Model Content Frameworks).*

Selected Opportunities for Connections to Mathematical Practices

1. **Make sense of problems and persevere in solving them. ***
2. **Reason abstractly and quantitatively.**

   SLO 4 Determine the relationship between domain and range of a function and explain the connection to the inputs and outputs.
3. Construct viable arguments and critique the reasoning of others.
4. **Model with mathematics. ***
5. Use appropriate tools strategically.
6. Attend to precision**.**
7. Look for and make use of structure.
8. **Look for and express regularity in repeated reasoning.**

   SLO 5 Describing the regularity in the way terms cancel can lead to a general formula for a geometric sequence.

*MP.1 and MP.4 are overarching practices relevant to Algebra 1. (PARCC Model Content Frameworks)

All of the content presented in this course has connections to the standards for mathematical practices.

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

Day	Topic	SLO	Learning Objectives	Essential Questions	Suggested Student Activities		Possible Resources
					Whole Group	Small Group / Stations	
1	Solving multi-step equations and inequalities	2	To reinforce skills in manipulating and solving equations and inequalities	*What skills must I have to be successful in the next few weeks?*		• Lesson • Guided Practice • Independent Practice I-Ready	GlencoeAlg1 p.97-102, p298-303
2	Readiness check		To determine readiness for following content			• Lesson • Guided Practice • Independent Practice • I-Ready	GlencoeAlg1 p.333-334
3	Graphing systems of equations	1, 2, 6	To graph both equations in a system and identify the solution.	*Why is the point where the lines cross so important?*		• Lesson • Guided Practice • Independent Practice • I-Ready	GlencoeAlg1 p.335-338
4					If you have graphing calculators, include a couple problems from p.343	• Lesson • Guided Practice • Independent Practice • I-Ready	GlencoeAlg1 p.339-340
5	Substitution method	1, 2, 6	To match the graphical solution with this algebraic solution method	*If I don't want to take the time to graph both lines, how can I solve the system using my algebra skills?*		• Lesson • Guided Practice • Independent Practice • I-Ready	GlencoeAlg1 p.344-347
6			To create systems of equations from real world situations	*How can I solve more complex problems using a system of equations?*		• Lesson • Guided Practice • Independent Practice • I-Ready	GlencoeAlg1 p.347-348
7	Elimination method	1, 2, 6	To match the graphical solution with this algebraic solution method	*If I don't want to take the time to graph both lines, how can I solve the system using my algebra skills?*		• Lesson • Guided Practice • Independent Practice • I-Ready	GlencoeAlg1 p.350-354
8			To create systems of equations from real world situations	*How can I solve more complex problems using a system of equations?*		• Lesson • Guided Practice • Independent Practice • I-Ready	GlencoeAlg1 p.354-355

Day	Topic	SLO	Learning Objectives	Essential Questions	Suggested Student Activities		Possible Resources
					Whole Group	Small Group / Stations	
9	Elimination	1, 2, 6	To use multiples of one equation to add or subtract with the other to solve the system	*When should I use my skills in performing the same operation to both sides of an equation to help solve by elimination?*		• Lesson • Guided Practice • Independent Practice • I-Ready	GlencoeAlg1 p.357-361
10	Real world applications of systems of equations	1, 2, 6	To solve real world situations using a system of equations	*How does knowing this help me understand the world?*		• Lesson • Guided Practice • Independent Practice • I-Ready	GlencoeAlg1 p.364-369
11	Solving systems of equations by graphing, substitution, and elimination	1, 2, 6				• Differentiated intervention or Review practice • Independent Practice	GlencoeAlg1 p.363, 367, and selected pages as appropriate
12	Solving systems of equations by graphing, substitution, and elimination	1, 2, 6			Introducing the matrix method can be done before this assessment, but it is not an SLO and is not an intuitive method students will remember for long without a need to use it.	• Review • Assessment	
13	Systems of inequalities	3, 6	To accurately graph systems of inequalities to find the solution set	*How is solving inequalities almost just like solving equations?*	To shade the correct region, solve each inequality in terms of y, then shade in the direction of y's inequality, i.e. if y> then shade above the line, if y< then shade below	• Lesson • Guided Practice • Independent Practice • I-Ready	GlencoeAlg1 p.372-374
14				*How can I double check if my shading is correct?*		• Differentiated intervention as appropriate • Independent Practice • I-Ready	GlencoeAlg1 p.374-375

Day	Topic	SLO	Learning Objectives	Essential Questions	Suggested Student Activities		Possible Resources
					Whole Group	Small Group / Stations	
15	Solving systems of equations	1, 2, 3, 6				• Differentiated intervention as appropriate • Independent Practice • I-Ready	GlencoeAlg1 p.378-381
16	Solving systems of equations	1, 2, 3, 6				• Review • Assessment	
17	Exponents and exponential functions	4, 5, 6	To determine readiness for further content			• Lesson • Guided Practice • Independent Practice • I-Ready	GlencoeAlg1 p.389-390
18	Multiplication properties of exponents	4	To simplify exponents in a term	*If I know $d \cdot d \cdot d \cdot d = d^4$, why does that make it easier for me to simply complex terms?*		• Lesson • Guided Practice • Independent Practice • I-Ready	GlencoeAlg1 p.391-394
19						• Differentiated intervention as appropriate • Independent Practice • I-Ready	GlencoeAlg1 p.394-396
20	Division properties of exponents	4	To simplify exponents in a term	*If I know $\frac{a \cdot a \cdot a}{a \cdot a \cdot a \cdot a} = \frac{1}{a} = a^{3-4}$, then how do I know what a^{-1} means?*		• Lesson • Guided Practice • Independent Practice • I-Ready	GlencoeAlg1 p.398-403
21						• Differentiated intervention as appropriate • Independent Practice • I-Ready	GlencoeAlg1 p.403-404
22	Rational (fractional) exponents	4	To convert radicals to fractional exponents and simplify exponents in a term	*How can I represent radicals and roots as exponents?*		• Lesson • Guided Practice • Independent Practice • I-Ready	GlencoeAlg1 p.406-410

Day	Topic	SLO	Learning Objectives	Essential Questions	Suggested Student Activities		Possible Resources
					Whole Group	Small Group / Stations	
23	Solving equations with variable exponents	4	To solve simple equations containing a variable in the exponent	*How can I move a variable out of an exponent so I can solve the equation?*		• Lesson • Guided Practice • Independent Practice • I-Ready	GlencoeAlg1 p.411-412
24	Simplifying terms with complex exponents	4				• Differentiated intervention as appropriate • Independent Practice • I-Ready	GlencoeAlg1 p.413, 421
25	Simplifying terms with complex exponents	4				• Review • Assessment	
26	Exponential functions	4, 6	To identify exponential behavior in a function and graph exponential functions	*How can I see exponential behavior in a function from the points it creates?*	This is not a bad place to reinforce some translation concepts in which students graph the basic exponential term then move the graph by the amount of a constant or extend it by the scope of the coefficient.	• Lesson • Guided Practice • Independent Practice • I-Ready	GlencoeAlg1 p.424-428
27	Exponential growth and decay	4, 6	To apply skills in solving exponential functions to real world growth and decay examples	*When do exponential functions show up in the real world?*		• Lesson • Guided Practice • Independent Practice • I-Ready	GlencoeAlg1 p.432-435
28						• Differentiated intervention as appropriate • Independent Practice • I-Ready	GlencoeAlg1 p.435-436
29	Geometric sequences	4, 5, 6	To identify and create geometric sequences	*How to geometric sequences look like exponential functions*		• Lesson • Guided Practice • Independent Practice • I-Ready	GlencoeAlg1 p.438-441

Day	Topic	SLO	Learning Objectives	Essential Questions	Suggested Student Activities		Possible Resources
					Whole Group	Small Group / Stations	
30	• Geometric sequences • Recursive formulas	4, 5, 6	To identify and create geometric sequences To write a recursive formula given a set of values in a sequence	*How to geometric sequences look like exponential functions*	Suggestion: define recursive formulas for everyone but have only those not needing intervention on prior skills engage in the practice	• Differentiated intervention as appropriate • Independent Practice • I-Ready	GlencoeAlg1 p.442-443 GlencoeAlg1 p.445-448
31	• Exponential functions • Geometric sequences	4, 5, 6				• Differentiated intervention as appropriate • Independent Practice • I-Ready	GlencoeAlg1 p.452-454
32	• Exponential functions • Geometric sequences					• Review • Assessment	
33	• Systems of equations • Exponential functions • Geometric sequences					• Lesson • Guided Practice • Independent Practice • I-Ready	GlencoeAlg1 selected pages as appropriate

<u>Word Wall Candidates</u>

System of . . .	Consistent	Independent	Dependent	Inconsistent
Substitution method	Elimination method	Monomial	Zero exponent	Negative exponent
Rational exponent	Cube root	Exponential equation	Exponential growth/decay	Geometric sequence
Recursive formula				

Authentic Application

Your Goal: Use mathematics to make comparisons to help you identify the best pricing for cell phones and plans.

Your Role: A cell phone broker providing the best plans for your customers

Your Audience: Your customers

The Situation:

Step 1: Plan Comparison and Selections

1. Record the price comparison between talk plans for a cell phone from some of the top cell phone companies. (AT&T, Verizon, T-Mobile, Sprint, etc).
2. Pick only 3 similar plans to compare (any type of plan is acceptable). You must select plans that each have a DIFFERENT PRICE. Record data on your recording template.

Step 2: Cell Phone Purchase

1. You may only select a phone with 32 GB of storage..
2. Record your option on the recording template.

Step 3: Comparisons Using Algebra

1. Organize your data in a table. Be sure to define your variables.
2. Write an algebraic equation for each company that illustrated the cost of the plans and the cost of the phones.
3. Make the comparisons between the companies by solving systems of equations algebraically.

Step 4: Comparisons Graphing

1. Make the comparisons between the companies by solving systems of equations graphically.
2. Write a title, x label, y label, and write your name for source
3. Select 3 groups and 8 items
4. Label each group as the cell phone company it represents
5. Fill in the data from your table

The Product: Once you have graphed and used algebra to compare the companies, analyze the relationships by answering the questions that are posed on your recording template.

Success Criteria:This is how your work will be evaluated.

	Beginning	Developing	Qualified	Exemplary
		Information recorded on the recording	All information is accurately	All information is accurately