Plainfield Public Schools
Mathematics
Unit Planning Organizer

Grade/Course	Algebra 1
Unit of Study	**Unit 1 :Representing Relationships Mathematically : Linear Equations and Inequalities**
Pacing	9 Weeks
Dates	September 13 - November 2 ,2016

Standards for Mathematical Practices
MP1. Make sense of problems and persevere in solving them.
MP2. Reason abstractly and quantitatively.
MP3. Construct viable arguments and critique the reasoning of others.
MP4. Model with mathematics.
MP5. Use appropriate tools strategically.
MP6. Attend to precision.
MP7. Look for and make use of structure.
MP8. Look for and express regularity in repeated reasoning.

I. Unit Vocabulary

UNIT STANDARDS
HS.A.SSE.A.1 Interpret expressions that represent a quantity in terms of its context.*   **HS.A.SSE.A.1.A Interpret parts of an expression, such as terms, factors, and coefficients**   **HS.A.CED.A.1 Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear** ~~and quadratic functions, and simple rational and exponential functions~~   **HS.A.CED.A.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.**   **HS.A.CED. A.3 Represent constraints by equations** or inequalities, and by systems of equations and/or inequalities, and **interpret solutions as viable or nonviable options in a modeling context.**   **HS.A.CED.A.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm's law V = IR to highlight resistance R**   **HS.A.REI.A.1. Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.**   **HS.A.REI.B.3 Solve linear equations** ~~and inequalities~~ **in one variable, including equations with coefficients represented by letters.**   **HS.S.ID.C.7. Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data.**   **S.ID.C.8. Compute (using technology) and interpret the correlation coefficient of a linear fit.**   **S.ID.C.9. Distinguish between correlation and causation.**   **Supporting Standards**

PPS Mathematics Curriculum Algebra 1

HSN.Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays HSN.Q.A.2 Define appropriate quantities for the purpose of descriptive modeling.

"Unwrapped" Skills (students need to be able to do)	"Unwrapped" Concepts (students need to know)	DOK Levels
FOCUS STANDARD **HSA.SSE.A.1 Interpret expressions that represent a quantity in terms of its context.***		
Interpret	expression,	2

"Unwrapped" Skills (students need to be able to do)	"Unwrapped" Concepts (students need to know)	DOK Levels
FOCUS STANDARD **HSA.CED.A.1 Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear** and quadratic functions, and simple rational and exponential functions		
Create	Equation(linear)	4

"Unwrapped" Skills (students need to be able to do)	"Unwrapped" Concepts (students need to know)	DOK Levels
FOCUS STANDARD **HSA.CED.A.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.**		
Create	equations	4

"Unwrapped" Skills (students need to be able to do)	"Unwrapped" Concepts (students need to know)	DOK Levels
FOCUS STANDARD **HSA.CED.A.3 Represent constraints by equations** or inequalities, and by systems of equations and/or inequalities, and **interpret solutions as viable or nonviable options in a modeling context.**		
Represent	equations	3

"Unwrapped" Skills (students need to be able to do)	"Unwrapped" Concepts (students need to know)	DOK Levels
FOCUS STANDARD **HSA.CED.A.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.** For example, rearrange Ohm's law V = IR to highlight resistance R		
Rearrange	Equations	3

"Unwrapped" Skills (students need to be able to do)	"Unwrapped" Concepts (students need to know)	DOK Levels
FOCUS STANDARD **A.REI.B.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.**		
Solve	Linear equations	2

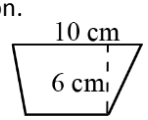
"Unwrapped" Skills (students need to be able to do)	"Unwrapped" Concepts (students need to know)	DOK Levels
FOCUS STANDARD **HSA.REI.D.10 Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line)**		
Understand	Graph of an equation	1

"Unwrapped" Skills (students need to be able to do)	"Unwrapped" Concepts (students need to know)	DOK Levels
FOCUS STANDARD : **HSN.Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data display**		
Use **Choose** **Interpret**	unit graphs	2 1 3

II. New Jersey Student Learning Standards for Mathematics : Explanation and Examples

Number and Quantity: Quantities (N-Q) **Reason qualitatively and use units to solve problems.**		
Standards *Students are expected to:*	*Mathematical Practices*	*Explanations and Examples*
HS.N-Q.A.1. Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.	*HS.MP.4.* Model with mathematics. *HS.MP.5.* Use appropriate tools strategically. *HS.MP.6.* Attend to precision.	Include word problems where quantities are given in different units, which must be converted to make sense of the problem. For example, a problem might have an object moving 12 feet per second and another at 5 miles per hour. To compare speeds, students convert 12 feet per second to miles per hour: $\frac{12\,ft}{sec} \bullet \frac{60\,sec}{min} \bullet \frac{60\,min}{hr} \bullet \frac{1mi}{5280\,ft} \approx \frac{8.182mi}{hr}$ which is more than 5 miles per hour. Graphical representations and data displays include, but are not limited to: line graphs, circle graphs, histograms, multi-line graphs, scatterplots, and multi-bar graphs.
HS.N-Q.A.2. Define appropriate quantities for the purpose of descriptive modeling.	*HS.MP.4.* Model with mathematics. *HS.MP.6.* Attend to precision.	**Examples:** ● What type of measurements would one use to determine their income and expenses for one month? ● How could one express the number of accidents in Arizona?

Algebra: Seeing Structure in Expressions (A-SSE) **Interpret the structure of expressions.**		
HS.A-SSE.A.1. Interpret expressions that represent a quantity in terms of its context. a. Interpret parts of an expression, such as terms, factors, and coefficients.	*HS.MP.1.* Make sense of problems and persevere in solving them. *HS.MP.2.* Reason abstractly and quantitatively. *HS.MP.4.* Model with mathematics. *HS.MP.7.* Look for and make use of structure.	Students should understand the vocabulary for the parts that make up the whole expression and be able to identify those parts and interpret their meaning in terms of a context.

Algebra: Creating Equations (A-CED) **Create equations that describe numbers or relationships.**		
Standards *Students are expected to:*	*Mathematical Practices*	*Explanations and Examples*
HS.A-CED.A.1. Create equations and inequalities in one variable and use them to solve problems. *Include equations arising from linear and quadratic functions, and simple rational and exponential functions.*	*HS.MP.2.* Reason abstractly and quantitatively. *HS.MP.4.* Model with mathematics. *HS.MP.5.* Use appropriate tools strategically.	Equations can represent real world and mathematical problems. Include equations and inequalities that arise when comparing the values of two different functions, such as one describing linear growth and one describing exponential growth. **Examples:** ● Given that the following trapezoid has area 54 cm^2, set up an equation to find the length of the base, and solve the equation.  ● Lava coming from the eruption of a volcano follows a parabolic path. The height *h* in feet of a piece of lava *t* seconds after it is ejected from the volcano is given by $h(t) = -t^2 + 16t + 936.h(t) = -t^2 + 16t + 936.$ After how many seconds does the lava reach its maximum height of 1000 feet?
HS.A-CED.A.2. Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.	*HS.MP.2.* Reason abstractly and quantitatively. *HS.MP.4.* Model with mathematics. *HS.MP.5.* Use appropriate tools strategically.	
HS.A-CED.A.3. 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	*HS.MP.2.* Reason abstractly and quantitatively. *HS.MP.4.* Model with mathematics.	**Example:** ● A club is selling hats and jackets as a fundraiser. Their budget is $1500 and they want to order at least 250 items. They must buy at least as many hats as they buy jackets. Each hat costs $5 and each jacket costs $8. o Write a system of inequalities to represent the situation.

modeling context. *For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.*	*HS.MP.5.* Use appropriate tools strategically.	o Graph the inequalities. o If the club buys 150 hats and 100 jackets, will the conditions be satisfied? o What is the maximum number of jackets they can buy and still meet the conditions?
HS.A-CED.A.4. Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. *For example, rearrange Ohm's law V = IR to highlight resistance R.*	*HS.MP.2.* Reason abstractly and quantitatively. *HS.MP.4.* Model with mathematics. *HS.MP.5*. Use appropriate tools strategically. *HS.MP.7.* Look for and make use of structure.	**Examples:** ● The Pythagorean Theorem expresses the relation between the legs a and b of a right triangle and its hypotenuse c with the equation $a^2 + b^2 = c^2$. o Why might the theorem need to be solved for c? o Solve the equation for c and write a problem situation where this form of the equation might be useful. o Solve $V = \frac{4}{3}\pi r^3$ for radius ***r.*** ● Motion can be described by the formula below, where *t* = time elapsed, *u*=initial velocity, *a* = acceleration, and *s* = distance traveled $s = ut + \frac{1}{2}at^2$ o Why might the equation need to be rewritten in terms of *a*? o Rewrite the equation in terms of *a*

Algebra: Reasoning with Equations and Inequalities (A-REI) **Represent and solve equations and inequalities graphically.**		
Standards *Students are expected to:*	*Mathematical Practices*	*Explanations and Examples*
HS.A-REI.B.3. Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.	*HS.MP.2.* Reason abstractly and quantitatively. *HS.MP.7.* Look for and make use of structure. *HS.MP.8.* Look for and express regularity in repeated reasoning.	**Examples:** • $-\frac{7}{3}y-8=111$ • *3x > 9* • *ax + 7 = 12* • $\frac{3+x}{7}=\frac{x-9}{4}$ • Solve for *x*: 2/3*x* + 9 < 18
HS.A-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).	*HS.MP.2.* Reason abstractly and quantitatively. *HS.MP.4.* Model with mathematics.	**Example:** • Which of the following points is on the circle with equation $(x-1)^2+(y+2)^2=5(x-1)^2+(y+2)^2=5$? (a) (1, -2) (b) (2, 2) (c) (3, -1) (d) (3, 4)

III . Essential Questions……. Corresponding Big Ideas

Essential Questions	Corresponding Big Ideas
How can expressions be used to model real-world problems?	The mathematical emphasis modeling problem situations using expressions
How can a reason mathematically ?	Expression are powerful tools for exploring, reasoning about representing situations
How are relationships represented mathematically ?	Two or more expressions may be equivalent, even when their symbolic forms differ. A relatively small number of symbolic transformations can be applied to expressions to yield equivalent expressions.
How are solutions or solution set mean in the context of the problem situation?	Variables have many different meanings, depending on context and purpose. Using variables permits writing expressions whose values are not known or vary under different circumstances. Using variables permits representing varying quantities.
How can mathematical properties be correctly applied in order to solve literal equations and formulas for a given variable?	This use of variables is particularly important in studying relationships between varying quantities. The equals sign can indicate that two expressions are equivalent. It is often important to find the value(s) of a variable for which two expressions represent the same quantity. Finding the value(s) of a variable for which two expressions represent

	the same quantity is known as solving an equation. The equals sign can be used in defining or giving a name to an expression or function rule. Sources: Lloyd, G., Herbel-Eisenmann, B., & Star, J.R. (2011). Developing essential understanding of expressions, equations, and functions for teaching mathematics in grades 6-8. Reston, VA: The National Council of Teachers of Mathematics, Inc.

IV. Student Learning Objectives

Learning Goals	Skills / Concepts	***PARCC Instructional Clarification Mathematics Assessment Test Specifications***	Mathematical Practices
Solve multi-step problems, using units to guide the solution, interpreting units consistently in formulas and choosing an appropriate level of accuracy on measurement quantities. Develop descriptive models by defining appropriate quantities. N.Q.A.1, N.Q.A.2, N.Q.A.3	Concept(s): • Units are associated with variables in expressions and equations in context. • Quantities may be used to model attributes of real world situations. • Measurement tools have an inherent amount of uncertainty in measurement. **Students are able to**: • Use units to understand real world problems. • Use units to guide the solution of multi-step real world problems (e.g. dimensional analysis). • Choose and interpret units while using formulas to solve problems. • Identify and define appropriate quantities for descriptive modeling. • Choose a level of accuracy		MP.1 MP 2 MP.4 MP.5

	when reporting measurement quantities.		
Interpret terms, factors, coefficients, and other parts of expressions in terms of a context. A.SSE.A.1 A.SSE.A.1a,	Students are able to: • Identify different parts of an expression, including terms, factors and constants. • Explain the meaning of parts of an expression in context.		
Solve linear equations and inequalities in one variable (including literal equations); justify each step in the process A.REI.B.3, A.REI.A.1. A.CED.A.4.	Concept(s). • Literal equations can be rearranged using the properties of equality. **Students are able to.** • Solve linear equations with coefficients represented by letters in one variable. • Use the properties of equality to justify steps in solving linear equations. • Solve linear inequalities in one variable. • Rearrange linear formulas and literal equations, isolating a specific variable.	▪	MP 2 MP.6 MP.7
Create linear equations and inequalities in one	Concept(s): • Equations and inequalities describe relationships.		MP 2. MP.4. MP.7

variable and use them in contextual situations to solve problems. Justify each step in the process and the solution. A.CED.A.1 A.REI.A.1,	• Equations can represent real-world and mathematical problems. **Students are able to:** • Identify and describe relationships between quantities in word problems. • Create linear equations in one variable. • Create linear inequalities in one variable. • Use equations and inequalities to solve real world problems. • explain each step in the solution process.		
Represent data on a scatter plot, describe how the variables are related and use technology to fit a function to data. Interpret the slope, intercept, and correlation coefficient of a data set of a linear model; distinguish between correlation and	Concept(s): • Scatter plots represent the relationship between two variables. • Scatter plots can be used to determine the nature of the association between the variables. • Linear models may be developed by fitting a linear function to approximately linear data. • The correlation coefficient represents the strength of a		MP.1 MP 2 MP.4 MP.5 MP.6.

causation. S.ID.C.7,S.ID.C.8,S.ID.C.9	linear association. **Students are able to:** • Distinguish linear models representing approximately linear data from linear. Equations representing "perfectly" linear relationships. • Create a scatter plot and sketch a line of best fit. • Fit a linear function to data using technology. • Solve problems using prediction equations. • Interpret the slope and the intercepts of the linear model in context. • Determine the correlation coefficient for the linear model using technology. • determine the direction and strength of the linear association between two variables		
Explain why the solutions of the equation f(x) = g(x) are the x-coordinates of the points where the graphs of the	Concept(s): • y = f(x), y=g(x) represent a system of equations. • Systems of equations can be solved graphically (8.EE.C.8). **Students are able to:** • explain the relationship between	▪	MP.1 MP.3 MP.5

linear equations y=f(x) and y=g(x) intersect. **** function notation is not introduced here** Find approximate solutions of f(x) = g(x), where f(x) and g(x) are linear functions, by making a table of values, using technology to graph and finding successive approximations. A.REI.D.11	the x-coordinate of a point of intersection and the solution to the equation f(x) = g(x) for linear equations y = f(x) and y = g(x). • find approximate solutions to the system by making a table of values, graphing, and finding successive approximations.		

V. Unit Vocabulary

Unit Vocabulary Terms	
Algebraic expression	Univariate
Numerical expression	Bivariate
Equivalent expression	Categorical
Evaluate	Correlation coefficient
Integers	Inverse variation
Rational number	Residual
Irrational number	Scatterplot
Variable	Best of line fit
Distributive property	Slope
Inequality	Standard deviation
Absolute value'	Variance
Coefficient	
Constant	
Like terms	
Additive inverse	
Multiplicative inverse	
Additive property of equality	
Division property of equality	
Formula	
Identity	
Inverse operation	
Multiplication property of equality	
Subtraction property of equality	
Equivalent inequalities	
Solution of an inequality	

VI. Differentiations/Modifications Teaching Strategies

Research Based Effective Teaching Strategies	Modifications (how do I differentiate instruction?)	Special Education	Strategies for English Language Learners
Task /Activities that solidifies mathematical concepts Use questioning techniques to facilitate learning Reinforcing Effort, Providing Recognition Practice , reinforce and connect to other ideas within mathematics Promotes linguistic and nonlinguistic representations Cooperative Learning Setting Objectives, Providing Feedback Varied opportunities for students to communicate mathematically Use technological and /or physical tools	**Modifications** Before or after school tutorial program Leveled rubrics Increased intervention Small groups Change in pace Calculators Extended time Alternative assessments Tiered activities/products Color coded notes Use of movements Use any form of technology *Play a song with a fast tempo (measured in beats per minutes) for 10 second and then for 20 second .Ask students to count the number of beats each time. Help students understand that the n number of beats played is the*	Change in pace Calculators Alternative assessments Accommodations as per IEP Modifications as per IEP Use graphic organizer to clarify mathematical functions for students with processing and organizing difficulties'. Constant review of math concepts to strengthen understanding of prior concepts for difficulties recalling facts. Use self-regulations strategies for student to monitor and assess their thinking and performance for difficultly attending to task Cooperative learning (small group, teaming, peer assisted tutoring) to foster communication and strengthen confidence. Use technology and/or hands on devices to: clarify abstract concepts and process	*Whiteboards* *Small Group / Triads* *Word Walls* *Partially Completed Solution* *Gestures* *Native Language Supports* *Pictures / Photos* *Partner Work* *Work Banks* *Teacher Modeling* *Math Journals* *Manipulatives* *Peer Coach* Write the name and examples of each property in unit 1 on the board. Have students who are fluent in languages express properties and their meaning

21st Century Learning Skills : Teamwork and Collaboration Initiative and Leadership Curiosity and Imagination Innovation and Creativity Critical thinking and Problem Solving Flexibility and Adaptability Effective Oral and Written Communication Accessing and Analyzing Information	*dependent variable because it is affected by the length of time the song is played. The length of the time is the independent variable because it is unaffected by the number of beats played* **Extension:** *Have each pair of students draw a side view of one of their sets of stairs. Then have them use a line to represent the slope, connecting the outer edge of each stair. Have them label the rise and run of one stair, and the total rise and run of several stairs? How do the ratios compare?* *Many communities have constructed ramps so that buildings comply with the Americans with Disabilities Act. Have students research the specs for accessible ramps.*	for: 1. Difficulty interpreting pictures and diagram. 2.Difficulties with oral communications 3. Difficulty correctly identifying symbols of numeral 4.Difficulty maintaining attentions Simplify and reduces strategies / Goal structure to enhance motivation, foster independence and self-direction for: 1.Difficulty attending to task 2. Difficulty with following a sequence of steps to solution. 3.Difficulty processing and organizing Scaffolding math idea/concepts by guided practice and questioning strategies' to clarify and enhance understanding of math big ideas for: 1.Difficulty with process and organization 2.difficulty with oral and written communication Teacher models strategies' and think out aloud strategies to specify step by step process for: 1Difficulties processing and organization 2. Difficulty attending to tasks. Use bold numbers and/or words to draw students' attention to important information. Provide students with friendly numbers in order to focus on the mathematical	

		concept rather than operations of the problem. Have students note and explain the differences between the use of the symbol (-) for subtraction sentences and for identifying negative numbers. Help make connections between everyday situations and the use of positive numbers, negative numbers, or zero by making posters depicting different scenarios, example a lemonade stand. Include illustrations and paragraph explaining the situation. Show coins and paper money to illustrate the problem. Represent a loss with (-) and a profit or gain with (+). Then have students solve problems about the scenario.	

Instructional Resources and Materials

<table>
<tr><th colspan="3">Instructional Resources and Materials</th></tr>
<tr><th>Formative Assessment</th><th colspan="2">Print</th></tr>
<tr><td rowspan="3">Short constructed responses
Extended responses
Checks for Understanding
Exit tickets
Teacher observation
Projects
Timed Practice Test – Multiple Choice & Open-Ended Questions
<u>Performance Task</u>

<u>A.SSE.A.1 Kitchen Floor Tiles</u>

<u>Summative Assessment</u>:

<u>Algebra 1 End of Unit Assessment for Interpreting mathematically</u></td><td colspan="2">Pearson Algebra 1 with Foundation 2011(middle school): Chapter 2 with transitional skills from chapter 1
McDougal Littell: Algebra 1 (2011) (High School): Chapter 1: Expressions, Equations and Functions
Chapter 2: Properties of Real Numbers</td></tr>
<tr><td colspan="2">Technology</td></tr>
<tr><td>*<u>NJ CORE</u>
<u>Annenberg Learning : Insight into Algebra 1</u>
<u>Mathematics Assessment Projects</u>
<u>Get the Math</u>
<u>Achieve the Core</u>
<u>Webmath.com</u>
<u>sosmath.com</u>
<u>Mathplanet.com</u>
<u>Interactive Mathematics.com</u>
<u>Illustrative Mathematics</u>
<u>Inside Mathmatics.org</u>
<u>Asia Pacific Economic Cooperation : :Lesson Study Videos</u>
<u>Genderchip.org</u>
<u>Interactive Geometry</u>
<u>Mathematical Association of America</u>
<u>National Council of Teachers of Mathematics</u>
<u>learner.org</u>
<u>Math Forum : Teacher Place</u>
<u>Shmoop /common core math</u></td><td>Resources for Students
<u>Khan Academy</u>
<u>Math world : Wolfram.com</u>
<u>Webmath.com</u>
<u>sosmath.com</u>
<u>Mathplanet.com</u>
<u>Interactive Mathematics.com</u>
<u>Mathexpression.com.algebra</u>
<u>Math Words for Advance Algebra & Pre-Calculus</u>
<u>Math TV</u>
<u>Virtual Nerd : Algebra 1</u></td></tr>
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