Plainfield Public Schools
Mathematics
Unit Planning Organizer

Grade/Course	Grade 8
Unit of Study	**Unit 4 : Equations , Statistics**
Pacing	7 Instructional weeks

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.

Hyperlinks are noted underlined in italics

Unit Standards
8.EE.C.8.C Solve real-world and mathematical problems leading to two linear equations in two variables. For example, given coordinates for two pairs of points, determine whether the line through the first pair of points intersects the line through the second pair. **8.F.B.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.SP.A.1 Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.** **8.SP.A.2 Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit (e.g. line of best fit) by judging the closeness of the data points to the line.** **8.SP.A.3 Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. For example, in a linear model for a biology experiment, interpret a slope of 1.5 cm/hr as meaning that an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height.** **8.SP.A.4 Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables. *For example, collect data from students in your class on whether or not they have a curfew on school nights and whether or not they have assigned chores at home. Is there evidence that those who have a curfew also tend to have chores?*** *Hyperlinks are noted underlined in italics*

"Unwrapped" Skills (students need to be able to do)	"Unwrapped" Concepts (students need to know)	DOK Levels
Focus Standard **8.F.B.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.**		
Construct	function	2

"Unwrapped" Skills (students need to be able to do)	"Unwrapped" Concepts (students need to know)	DOK Levels
Supporting Standard **8.SP.A.1 Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association**		
Construct Interpret	Bivariate measurement data	2 1

"Unwrapped" Skills (students need to be able to do)	"Unwrapped" Concepts (students need to know)	DOK Levels
Supporting Standard **8.SP.A.2 Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit (e.g. line of best fit) by judging the closeness of the data points to the line**		
Know	Quantitative variables	1

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"Unwrapped" Skills (students need to be able to do)	"Unwrapped" Concepts (students need to know)	DOK Levels
Supporting Standard **8.SP.A.3 Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. For example, in a linear model for a biology experiment, interpret a slope of 1.5 cm/hr as meaning that an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height**		
Use	Bivariate measurement data	2

"Unwrapped" Skills (students need to be able to do)	"Unwrapped" Concepts (students need to know)	DOK Levels
Supporting Standard **8.SP.A.4 Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables. *For example, collect data from students in your class on whether or not they have a curfew on school nights and whether or not they have assigned chores at home. Is there evidence that those who have a curfew also tend to have chores?***		
Understand Construct Interpret	Categorical data	1 2 3

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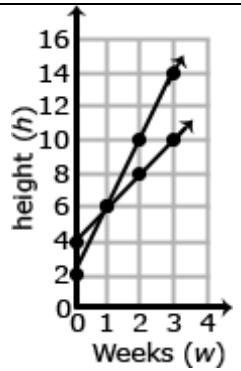
II New Jersey Student Learning Standards ……..Explanation and Examples

<table>
<tr>
<td>8.EE.C.8. Analyze and solve pairs of simultaneous linear equations.
a. Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously.
b. Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection. For example, 3x + 2y = 5 and 3x + 2y = 6 have no solution because 3x + 2y cannot simultaneously be 5 and 6.
c. Solve real-world and mathematical problems leading to two linear equations in two variables. For example, given coordinates for two pairs of points, determine whether the line through the first pair of points intersects the line through the second pair.</td>
<td>8.MP.1. Make sense of problems and persevere in solving them.
8.MP.2. Reason abstractly and quantitatively.
8.MP.3. Construct viable arguments and critique the reasoning of others.
8.MP.4. Model with mathematics.
8.MP.5. Use appropriate tools strategically.
8.MP.6. Attend to precision.
8.MP.7. Look for and make use of structure.
8.MP.8. Look for and express regularity in repeated reasoning.</td>
<td>Systems of linear equations can also have one solution, infinitely many solutions or no solutions. Students will discover these cases as they graph systems of linear equations and solve them algebraically.
A system of linear equations whose graphs meet at one point (intersecting lines) has only one solution, the ordered pair representing the point of intersection. A system of linear equations whose graphs do not meet (parallel lines) has no solutions and the slopes of these lines are the same. A system of linear equations whose graphs are coincident (the same line) has infinitely many solutions, the set of ordered pairs representing all the points on the line.
By making connections between algebraic and graphical solutions and the context of the system of linear equations, students are able to make sense of their solutions. Students need opportunities to work with equations and context that include whole number and/or decimals/fractions.
Examples:
● Find x and y using elimination and then using substitution.
o $3x + 4y = 7$
o $-2x + 8y = 10$
● Plant A and Plant B are on different watering schedules. This affects their rate of growth. Compare the growth of the two plants to determine when their heights will be the same.
Let W = number of weeks
Let H = height of the plant after W weeks
<table>
<tr><th colspan="3">Plant A</th></tr>
<tr><th>W</th><th>H</th><th></th></tr>
<tr><td>0</td><td>4</td><td>(0,4)</td></tr>
<tr><td>1</td><td>6</td><td>(1,6)</td></tr>
<tr><td>2</td><td>8</td><td>(2,8)</td></tr>
<tr><td>3</td><td>10</td><td>(3,10)</td></tr>
</table>
<table>
<tr><th colspan="3">Plant B</th></tr>
<tr><th>W</th><th>H</th><th></th></tr>
<tr><td>0</td><td>2</td><td>(0,2)</td></tr>
<tr><td>1</td><td>6</td><td>(1,6)</td></tr>
<tr><td>2</td><td>10</td><td>(2,10)</td></tr>
<tr><td>3</td><td>14</td><td>(3,14)</td></tr>
</table>
● Given each set of coordinates, graph their corresponding lines.
Solution:</td>
</tr>
</table>

Hyperlinks are noted underlined in italics

		 ● Write an equation that represent the growth rate of Plant A and Plant B. Solution: Plant A $H = 2W + 4$ Plant B $H = 4W + 2$ ● At which week will the plants have the same height? Solution: The plants have the same height after one week. Plant A: $H = 2W + 4$ Plant B: $H = 4W + 2$ Plant A: $H = 2(1) + 4$ Plant B: $H = 4(1) + 2$ Plant A: $H = 6$ Plant B: $H = 6$ After one week, the height of Plant A and Plant B are both 6 inches.

Hyperlinks are noted underlined in italics

<table>
<tr><th colspan="3">Functions (F) Use functions to model relationships between quantities.</th></tr>
<tr><th><u>Standards</u>
Students are expected to:</th><th><u>Mathematical Practices</u></th><th><u>Explanations and Examples</u></th></tr>
<tr>
<td>8.F.B.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.</td>
<td>8.MP.1. Make sense of problems and persevere in solving them.

8.MP.2. Reason abstractly and quantitatively.

8.MP.3. Construct viable arguments and critique the reasoning of others.

8.MP.4. Model with mathematics.

8.MP.5. Use appropriate tools strategically.

8.MP.6. Attend to precision.

8.MP.7. Look for and make use of structure.

8.MP.8. Look for and express regularity in repeated reasoning.</td>
<td>Examples:

• The table below shows the cost of renting a car. The company charges $45 a day for the car as well as charging a one-time $25 fee for the car's navigation system (GPS). Write an expression for the cost in dollars, c, as a function of the number of days, d.

Students might write the equation $c = 45d + 25$ using the verbal description or by first making a table.

<table>
<tr><td>Days (d)</td><td>Cost (c) in dollars</td></tr>
<tr><td>1</td><td>70</td></tr>
<tr><td>2</td><td>115</td></tr>
<tr><td>3</td><td>160</td></tr>
<tr><td>4</td><td>205</td></tr>
</table>
Students should recognize that the rate of change is 45 (the cost of renting the car) and that initial cost (the first day charge) also includes paying for the navigation system. Classroom discussion about one time fees vs. recurrent fees will help students model contextual situations.

• When scuba divers come back to the surface of the water, they need to be careful not to ascend too quickly. Divers should not come to the surface more quickly than a rate of 0.75 ft per second. If the divers start at a depth of 100 feet, the equation $d = 0.75t - 100$ shows the relationship between the time of the ascent in seconds (t) and the distance from the surface in feet (d).

○ Will they be at the surface in 5 minutes? How long will it take the divers to surface from their dive?

○ Make a table of values showing several times and the corresponding distance of the divers from the surface. Explain what your table shows. How do the values in the table relate to your equation?</td>
</tr>
</table>

<u>Hyperlinks are noted underlined in italics</u>

III. Essential Questions …….. Enduring Understanding /Corresponding Big Ideas

Essential Questions	Corresponding Big Ideas
What is a function? What kinds of relationships can proportions represent?	Functions provide a tool for describing how variables change together. In a proportional relationship, the ratio of two quantities remain constant as the corresponding values of the quantities change
How can patterns of change between variables be represented and analyzed?	One important way of describing functions is by identifying the rate at which the variables change together. It is useful to group functions into families with similar patterns of change because these functions, and the situations that they model, share certain general characteristics.
What does the slope or the rate of change of a line mean and how is it represented?	Functions can be represented in multiple ways—in algebraic symbols, graphs, verbal descriptions, tables, and so on—and these representations, and the links among them, are useful in analyzing patterns of change.
What is an equal sign? How does it represent an expression (s)?	The equals sign can be used in defining or giving a name to an expression or function rule. 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.
How do we solve for linear equations?	
How can we determine if two or more expressions are equivalent?	Functions can be represented in various ways, including through algebraic means, graphs, words and descriptions, and tables. Some representation of a function may be more useful than other, depending on context Links between algebraic and graphical representations of functions are especially important in studying relationship and change.
How can systems of linear equations and inequalities be used to solve problems? Can systems of equations model real-world situations?	**Source**: *Cooney, T. J., Beckmann, S., & Lloyd, G.M. (2010). Developing essential understanding of functions grades 9-12. Reston, VA: The National Council of Teachers of Mathematics, Inc.*

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How can you used an equation to answer particular questions about a function and the situation it represents? How can two different contexts be represented by the same context? How can you determine the pattern of change of a function from a table of data of function? How can you use algebra to represent and prove a conjecture about numbers ?	*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.*

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V. Student Learning Objectives

Student Learning Objectives	Concept/ Skill	***Instructional Clarification Mathematics Assessment Test Specifications***	Mathematical Practices
Model a linear relationship by constructing a function from two (x, y) values. Interpret the rate of change and initial value of the linear function in terms of the situation it models, and in terms of its graph or a table of values 8.F.B.4.	**Concept(s):** • As with equations, two (x, y) values can be used to construct a function. **Students are able to:** • construct a function in order to model a linear relationship. • interpret the rate of change and initial value of a linear function in context.	Tasks may or may not have a context.	MP.2 MP.4
Construct and interpret scatter plots for bivariate measurement data and describe visual patterns of association (clusters, outliers, positive or negative association, linear association and nonlinear association, strong, weak, and no association). 8.SP.A.1.	**Concept(s):** • Association in data (bivariate measurement data) **Students are able to:** • construct and interpret scatter plots. • analyze patterns of association between the two quantities represented in a scatter plot. • describe clustering, outliers, positive or negative association, linear or non-linear association when explaining patterns of		MP.3 MP.5 MP.7

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	association in a scatter plot.		
For scatter plots that suggest a linear association, informally fit a straight line and informally assess the model's fit. 8.SP.A.2	**Concept(s):** • Straight lines are used to model *approximately* linear relationships between quantitative variables. **Students are able to:** • informally fit a line (of best fit) to a scatter plot that suggests a linear association. • informally assess the model's fit by judging the closeness of the data points to the line (line of best fit).		MP.2 MP.5 MP.7
Use a linear model (equation) representing measurement data to solve problems, interpreting the slope and intercept in the context of the situation. 8.SP.A.3	**Concept(s):** No new concept(s) introduced **Students are able to**: • given the equation for a linear model (line of best fit), interpret the slope and intercept. • given the equation for a linear model, solve problems in the context of measurement data.		MP.2 MP.4 MP.6 MP.7
Construct two-way frequency tables and two-way relative frequency tables, and describe possible associations between two variables. 8.SP.A.4	**Concept(s):** • Categorical data: patterns of association can also be observed in bivariate categorical data through analyzing two-way tables containing frequencies or relative frequencies. **Students are able to:** • construct and interpret a two-	An equal number of tasks require students to: ➢ Answer basic comprehension questions about a two-way table, or; ➢ To compute marginal sums or marginal percentages, or; ➢ To interpret patterns or association.	MP.2 MP.4 MP.5 MP.7

	way frequency table containing data on two categorical variables. • construct and interpret a two-way relative frequency table containing data on two categorical variables. • describe any association between the two categorical variables using relative frequencies calculated for rows or columns.		

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VII. Differentiating/Modifications Strategies

Research Based Effective Teaching Strategies	Modifications (how do I differentiate instruction?)	Strategies for Special Needs Learners	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 **Extension** *See Connected Math Classroom Differentiating Gifted Students*	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	*Whiteboards* *Small Group / Triads* *Word Walls* *Partially Completed Solution* *Gestures* *Native Language Supports* *Pictures / Photos* *Partner Work* *Work Banks* *Teacher Modeling* *Math Journals* *See Connected Math Program* *Classroom Differentiating* *English Language Learners* **Recognize Latin pre-fixes and roots to help comprehend sophisticated vocabulary Encourage students to look at the similarity between new word and

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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		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 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 guided	

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		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 1. Difficulties processing and organization 2. Difficulty attending to tasks. *See Connected Math Program ,Classroom Differentiating Special Needs*	

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VIII. Instructional Resources

<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 Tasks:</u>

<u>8.F.B.4 Delivering the Mail</u>
<u>8.EE.C.8 Kimi and Jordan</u>

Additional Performance Tasks for class use:

<u>8.SP.A.1 Texting and Grades 1</u>
<u>8.SP.A.2 Animal Brains</u>
<u>8.SP.A.3 US Airports</u>
<u>8.SP.A.4 What's Your Favorite Subject</u>
<u>8.SP.A.4 Music and Sports</u>

Project:

<u>Teach 21 Problem Based Learning Project : Cash for Clunkers</u></td><td colspan="2">Connected Math Program Grade 8 Unit: Thinking with Mathematical Models: Linear and Inverse Variation; Investigation 4 & 5
<u>Scope and Sequence for CMP 3 Thinking with Mathematical Models</u>
Connected Math Program Grade 8 Unit: Say It with Symbols; Investigation 3,4,5
<u>Scope and Sequence for CMP 3 Say it With Symbols</u>
Connected Math Program Grade 8 Unit: It’s in the System</td></tr>
<tr><td colspan="2">Additional Print and digital Resources</td></tr>
<tr><td>Resources for teachers
<u>Connected Math Project (Michigan State University)</u>
<u>My Pearson Training : Connected Math Program</u>
<u>Annenberg Learning : Insight into Algebra 1</u>
<u>National Council of Teachers of Mathematics Mathematics Assessment Projects</u>
<u>Achieve the Core</u>
<u>Illustrative Mathematics</u>
<u>Mathematics Assessment Projects</u>
<u>Get the Math</u>
<u>Webmath.com</u>
<u>sosmath.com</u>
<u>Mathplanet.com</u>
<u>Interactive Mathematics.com</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>learner.org</u></td><td>Resources for Students
<u>My Math Universe.com</u>
<u>Math is Fun website</u>
<u>Khan Academy</u>
<u>Figure This.org website</u>
<u>Virtual Nerd website</u>
<u>Math Snacks websites</u>

<u>Internet 4 Classroom website</u>
<u>A Maths Dictionary for kids</u></td></tr>
</table>

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	Math Forum : Teacher Place	

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