Cliffside Park Public Schools

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COURSE OF STUDY UNIT PLANNING GUIDE FOR:
Grade 8 Unit 2

Grade Level:
8th

Cliffside Park School District
Cliffside Park, NJ 07010
www.cliffsidepark.edu

Course Overview:

In Grade 8, instructional time should focus on three critical areas: (1) formulating and reasoning about expressions and equations, including modeling an association in bivariate data with a linear equation, and solving linear equations and systems of linear equations; (2) grasping the concept of a function and using functions to describe quantitative relationships; (3) analyzing two- and three-dimensional space and figures using distance, angle, similarity, and congruence, and understanding and applying the Pythagorean Theorem.

("Grade 8 » Introduction." *Grade 8» Introduction | Common Core State Standards Initiative*. Common Core State Standards Initiative, 2017. Web. 13 July 2017.)

Overview of Units:

1. Real Numbers and Linear Equations
2. Using Functions to Model Relationships and Investigating BiVariate Data
3. Systems of Linear Equations and Congruence and Similarity
4. Geometry: Pythagorean Theorem and Finding Volume and Surface Area

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Mathematics: Grade 8

Unit 2 Grade 8 Mathematics

Unit Name: Using Functions to Model Relationships (Topic 3, Topic 4)

Primary Resource: enVisionmath 2.0 Common Core 2017

Topic Name: **Topic 3**: Use Functions to Model Relationships
Topic Duration: Approximately 4 weeks

 Unit Durations: Approximately 13 weeks

TOPIC 3
Enduring Understandings:

- A relation is a set of ordered pairs.
- A function is a relation in which each input, or x-value, has exactly one output, ot y-value.
- Arrow diagrams and tables can be used to determine whether a relation is a function.
- Different representations such as equations, tables, and graphs can represent a function.
- The functions presented in different representations can be compared by looking at their properties: intial value and constant rate of change.
- A function that represents a linear relationship between two quantities can be represented in a qualitative graph that shows the behavior of the function in different intervals.
- You can use what you know about the behavior of a function in different intervals to sketch a qualitative graph of a function.

Topic 3
Essential Question:

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How can you use functions to model a linear relationship?

When is a relation a function?

What are different representations of functions?

How can you compare two functions?

How can you use a function to represent linear relationships?

How does a qualitative graph describe the relationship between two quantities?

How does the sketch of a graph of a function help describe its behavior?

Focus of Standards:

Student Outcomes: *What students will know.*	Skills *What students will be able to do.*	Assessments	Resources
- Identify whether a relation is a function. - Interpret a function. - Analyze and interpret the sketch of a graph of a function.	- Compare properties of linear functions in different representations. - Compare properties of linear functions in different representations. - Construct a linear function to model a relationship using an equation in the form $y = mx + b$. - Describe qualitatively the behavior of a function by analyzing its graph.	***Formative:*** - Diagnostic assessment - Topic Readiness Assessment ***Summative:*** - Topic Assessment - Topic Quiz ***Benchmark Tests:*** - Benchmark test given every 6-8 weeks.	**Texts:** *enVision 2.0 Common Core* **Digital:** - Student/Teacher eText - Videos - MathXL - IXL 3-Act Mathematical Modeling - Virtual Nerd App - BouncePages App - Math Tools

	Describe the graph of a function at each interval.	.	
	• Draw a qualitative graph of a function based on a verbal description.	***Alternative:***	**Classroom Math Materials**
		• Topic Performance Task	
		• Oral questioning	• Student Journal
		• Journaling	• Online text
		• Problems worked out partially	• Bounceapp
			• Digital toolkit
		• Using manipulatives to gauge understanding and develop reasoning skills	• Math Practices and Problem Solving Handbook
		• Using questioning strategies in TE.	
		• Creating scaffolding questions on test	
		• Online tests	
		• Questions tied to Real-World scenarios	
		• Projects	

VOCABULARY	

Tier 2 Relation, function, interval	**Tier 3** Constant rate of change, initial value, linear function, nonlinear function

NJSLS Math Standards	**NJSLS Math Practices**
8.F.A.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.	**MP.1** Make sense of problems and persevere in solving them **MP.2** Reason abstractly and quantitatively.

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8.F.A.2 Compare properties (e.g. rate of change, intercepts, domain and range) of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *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.* **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.F.B.5** Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally.	**MP.3** Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure. **MP.8** Look for and express regularity in repeated reasoning.

Unit Name: Using Functions to Model Relationships

Primary Resource: enVisionmath 2.0 Common Core 2017

Topic Name: **Topic 4**: Investigate Bivariate Data
Topic Duration: Approximately 3.5 weeks

 Unit Durations: Approximately 7 weeks

TOPIC 4
Enduring Understandings:

- A scatter plot is a graph on a coordinate plane that uses points to show the relationship between paired data.
- These points visually display any clusters, gaps or outliers.
- A trend line on a scatter plot approximates the linear function associated between the paired data.

- Scatter plots can show a linear or nonlinear association, or no association.
- Trend lines in linear models can help with making predictions about a set of data.
- By determining the equation of a linear model, predictions of an outcome can be made.
- Data can be displayed in a two-way frequency table, make it easier to analyze.
- Individual data categories be compared to all the data.
- Individual data can be compared to sub-categories to make evidence-based conjectures.
- Data can be organized in a two-way frequency table and then used to create a two-way relative frequency table.
- Relative frequency can be determined for the rows and the columns as well as for the whole table.

TOPIC 4
Essential Questions:

How can you represent the relationship between paired data and use the representation to make predictions?

How does the scatter plot show the relationship between paired data?

How do linear models help you make a prediction?

How does a two-way frequency table show the relationship between sets of paired data?

What is the advantage of a two-way relative frequency table for showing relationships between sets of paired data?

Focus of Standards:			
Student Outcomes: *What students will know.*	**Skills** *What students will be able to do.*	**Assessments**	**Resources**
- Utilize a scatter plot to identify and interpret the relationship between paired data. - Recognize whether the paired data has a linear association.	- Construct a scatter plot graph to model paired data - Draw a trend line to determine whether a linear association is positive or negative and strong or weak.	*Formative:* - Diagnostic assessment - Topic Readiness Assessment	**Texts:** *enVision 2.0 Common Core* **Digital:** Student/Teacher eText

A nonlinear association, or no association. ● Use the slope and y-intercept of a trend line to make predictions. ● Make predictions when no equation is figen by drawing trend lines and writing the equation of the linear model. ● Compare and make conjectures about data displayed in two-way frequency table.	● Organize paired data into a two-way frequency table. ● Construct two-way frequency tables and two-way relative frequency tables.	***Summative:*** ● Topic Assessment ● Topic Quiz ***Benchmark Tests:*** ● Benchmark test given every 6-8 weeks. ***Alternative:*** ● Topic Performance Task ● Oral questioning ● Journaling ● Problems worked out partially ● Using manipulatives to gauge understanding and develop reasoning skills ● Using questioning strategies in TE. ● Creating scaffolding questions on test ● Online tests ● Questions tied to Real-World scenarios ● Projects	● Videos ● MathXL ● IXL ● 3-Act Mathematical Modeling ● Virtual Nerd App ● BouncePages App ● Math Tools **Classroom Math Materials** ● Student Journal ● Online text ● Bounceapp ● Digital toolkit ● Math Practices and Problem Solving Handbook
VOCABULARY			
Tier 2 Gap, measurement, data, negative, cluster		**Tier 3** Scatter plot,positive association, negative association, outlier,	

	trend line, categorical data, relative frequency table
NJSLS Math Standards	**NJSLS Math Practices**
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 th **8.F.A.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. *For example, the function $A = s^2$ giving the area of a square as a function of its side length is not linear because its graph contains the points (1,1), (2,4) and (3,9), which are not on a straight line.* **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.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	**MP.1** Make sense of problems and persevere in solving them **MP.2** Reason abstractly and quantitatively. **MP.3** Construct viable arguments and critique the reasoning of others. **MP.4** Model with mathematics. **MP.5** Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure. **MP.8** Look for and express regularity in repeated reasoning.

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?*

Interdisciplinary Connections

NJSLS for ELA and Science are introduced, developed, and practiced in the context of learning math content and engaging in mathematical practices.

ELA

ELA-Literacy.RST.6-8.3 Follow precisely a multistep procedure when carrying out experiments, taking measurements, or performing technical tasks

ELA-Literacy.RST.6-8.4.Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics.

ELA-Literacy.RST.6-8.3 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).

ELA-Literacy.SL.6.1 Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 6 topics, texts, and issues, building on others' ideas and expressing their own clearly.

Science

MS-ETS1-1 Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.

MS-ETS1-2 Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.

MS-ETS1-3 Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.

MS-ETS1-4 Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

MS-LS2-1 Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.
MS-LS2-4 Construct an argument supported by empirical evidence that changes to physical or biological components of an ecosystem affect populations.
MS-ESS3-3 Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.*
MS-ESS3-4 Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.

NJSLS: 21st Century Life and Careers

Key Subjects and 21st Century: Themes Mastery of key subjects and 21st century themes is essential to student success. Key subjects include English, reading or language arts, world languages, arts, mathematics, economics, science, geography, history, government and civics. In addition, schools must promote an understanding of academic content at much higher levels by weaving 21st century interdisciplinary themes into key subjects:

• Global Awareness
• Financial, Economic, Business and Entrepreneurial Literacy

9.1.8.E.8 Compare the value of goods and services from different sellers when purchasing large quantities and small quantities.
9.2.8.B.5 Analyze labor market trends using state and federal labor market information and other resources available online.
9.1.8.B.7 Construct a budget to save for long-term, short-term, and charitable goals
9.1.8.C.2 Compare and contrast credit cards and debit cards and the advantages and disadvantages of using each.
9.1.8.C.5 Calculate the cost of borrowing various amounts of money using different types of credit (e.g., credit cards, installment loans, and mortgages) and compare the interest rates associated with each.

Career Ready Practices: Today's students need to develop thinking skills, content knowledge, and social and emotional competencies to navigate complex life and work environments.

CRP2. Apply appropriate academic and technical skills.
CRP4. Communicate clearly and effectively and with reason.
CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
CRP11. Use technology to enhance productivity

Unit 2   **GREEN** Major Cluster **BLUE** Supporting **YELLOW** Additional Clusters * Benchmark   ★ Modeling (+) Advanced Concept

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NJSLS Technology Standards

8.1.8.A.4 Graph and calculate data within a spreadsheet and present a summary of the results
8.1.8.C.1 Collaborate to develop and publish work that provides perspectives in a global problem for discussions with learners from other countries
8.1.8.F.1 Explore a local issue, by using digital tools to collect and analyze data to identify and make an informed decision.

Additional Resources:
www.ixl.com
Khan Academy Grade 7
Illustrative Mathematics Grade 7

Integrated Differentiation/Accommodations/Modifications for Math 8 Unit 2 *(Alternate Modes of Instruction and Support)*		
Modifications to Support Gifted and Talented Students	**Modifications to Support English Language Learners**	**Modifications to Support Our Learners (Students with IEPs/504s and At-Risk Learners)**
Integrate Higher Order Thinking Skills (HOTS) through questioning and extension projects specific to rational numbers, additive inverse, and properties of rational numbers.

Provide menu of challenge activities for when the child finishes the lesson early (integrate technology when possible).

College/Career Readiness skill enhancement - G & T students can research professions related to the Rational Numbers.

Have the student teach the lesson - peer tutoring (research-based strategy)
Accelerate pace for students who are advanced in concepts.

Use inquiry-based, discovery learning approaches that emphasize open-ended problems with solving problems with Rational Numbers.

Allow students to design their own ways to find the answers to complex questions. | **Concept/Idea Map** - teacher models note-taking on the modeling associated with functions, linear functions, Scatter plots..

Contextualize language for the following key vocabulary terms: **Relation, function, interval, Constant rate of change, initial value, linear function, nonlinear function, Gap, measurement, data, negative, cluster, Scatter plot, positive association, negative association, outlier, trend line, categorical data, relative frequency table,**

Visuals and illustrations
Using a number line to add and subtract integers.
Using integer tiles to represent positive and negative numbers.
Using Fraction Tiles to represent adding, subtracting, multiplying and dividing fractions.

Word/picture bank available for students' reference; as well as Spanish | Review student individual educational plan and/or 504 plan for instructional, assessment, and environmental supports.

Allow student to use calculator to simplify algebraic expressions with rational numbers.

Teach students how to check the accuracy of the solution that was derived from use of a calculator.

Provide manipulatives to aid in operations with rational numbers. (integer tiles and fraction tiles).

Teach students how to check the accuracy of the solution that was derived from use of the calculator or other method.

Provide number lines to help students with adding or subtracting integers.

Use integer tiles to perform operations with rational numbers.

Utilize graphic organizer or partially completed template for students to simplify expressions.. |

GREEN Major Cluster **BLUE** Supporting **YELLOW** Additional Clusters * Benchmark   ★ Modeling (+) Advanced Concept

	translation through Google or their textbooks. **Wait Time Two** - extend basic "Wait Time" - after the 1st student responds to a question, the teacher waits an additional 5 - 7 seconds before calling on another student to ask a question about scatter plots, correlations and lines of best fit; **Native Language Supports:** Working with peer, online assistive technology, translation device, bilingual dictionary. Teach the text backward - **frontload** the concepts and vocabulary needed for learning the material and activating prior knowledge about absolute values, properties of mathematics and integers. Use a **word square** to teach target academic vocabulary for the unit.	Provide study guides that are partially completed by teacher, allowing the student to fill in missing information during instruction in order to aid in obtaining information pertaining to modeling linear functions and solving linear systems. Utilize visual aids such as charts or graphs connected to rational numbers. By utilizing individual student assessment results, the teacher will provide small group or remedial instruction to review essential questions/big ideas of rational numbers, properties of numbers, operations with rational numbers, and operations with fractions. Provide wait time to allow students to process orally presented information and questions relating to each topic. Access to word/picture banks to develop an understanding and use content-specific vocabulary, such as those listed under **Contextualize language.** Allow for Student Choice: Students should be permitted to demonstrate understanding of content through illustrations, computer projects, oral response, creative presentations or demonstration, etc. Support comprehension of unknown vocabulary, by providing examples of Note-taking, highlighting, underlining, etc. Students should be allowed given copies of grade level material or text so they can highlight or underline pertinent information.

GREEN Major Cluster **BLUE** Supporting **YELLOW** Additional Clusters * Benchmark ★ Modeling (+) Advanced Concept

		Text to speech/Oral reading
		Provide students with flexible seating options while working independently, depending on need or preference.
		Math-specific vocabulary and literary terms should be pre-taught before teaching relevant concepts.
		Allow extra time to complete in class written assignments.
		Provide students with a sample problem or list of steps or procedures for multi-step solutions to problems. Allow student to reference these procedures when solving independently.
		Reduce the number of assigned problems within each topic..
		Provide models or templates to teach the structure of how to solve problems systematically.
		If necessary, provide additional set of materials or online access so that students can utilize resources at school and home.
		Provide study guide for students to review before Unit 1 quizzes and tests.
		Modify tests to address big ideas/essential questions of the unit..
		Provide instructional adaptations and interventions in the general education classroom.
		● Differentiated Intervention (enVision 2.0)

GREEN Major Cluster **BLUE** Supporting **YELLOW** Additional Clusters * Benchmark ★ Modeling (+) Advanced Concept

		○ Reteach ○ Additional Vocabulary Support ○ Build Mathematical Literacy ○ Math tools and Games ● MATHXL ● IXL Intensive individual intervention: ● RtI in enVision 2.0

Sources

New Jersey Student Learning Standards (2016) http://www.state.nj.us/education/cccs/2016/math/standards.pdf

New Jersey Student Learning Standards: Technology (2014) - http://www.state.nj.us/education/cccs/2014/tech/8.pdf

New Jersey Student Learning Standards: ELA (2014) - https://www.state.nj.us/education/cccs/2016/ela/g03.pdf

New Jersey Science and Engineering Practices - https://www.state.nj.us/education/cccs/2016/science/

NJ Career Ready Practices (2014) - https://www.state.nj.us/education/cccs/2014/career/CareerReadyPractices.pdf

Pearson enVision 2.0 (2016) https://www.pearsonrealize.com/index.html#/