Woodland Park Mathematics Curriculum

Mathematics Curriculum Map

8th Grade

Curriculum Authors:
Supervisor of Mathematics: Ms. Bronwen Calderon
Director of Curriculum and Instruction: Mrs. Carmela Triglia

Course Philosophy and Description

In mathematics, students are engaged through multiple modalities that ensures learning a high quality curriculum and instruction which enables every student to reach their potential understanding. Student will be empowered to succeed with personalized resources that fits each student's interests and growth in the field of mathematics.

Woodland Park's philosophy in mathematics consists of providing hands on activities, differentiated instruction for conceptual mathematical understanding that supports the New Jersey State Learning Standards for grades k-8, and bridging the properties of mathematics to the make real world extensions. Students will learn to address a range of tasks focusing on the application of concepts, skills and understandings. Students will be asked to solve problems involving the key knowledge and skills for their grade level as identified by the NJSLS; express mathematical reasoning and construct a mathematical argument and apply concepts to solve model real world problems. The balanced mathematics instructional model will be used as the basis for all mathematics instruction.

NJSLS Mathematical Practices

Each grade level consists of mathematical standards that were created to balance the procedure and understanding of math topics. The Standards for Mathematical Content are a balanced combination of procedure and understanding. Expectations that begin with the word "understand" are often especially good opportunities to connect the practices to the content. Students who lack understanding of a topic may rely on procedures too heavily. These practices rest on important "proficiencies and processes" that are in alignment to the longstanding mathematical standards in education.

- **Mathematical Practice #1: Make sense of problems and preserver in solving them**. Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to the its solution.
- **Mathematical Practice # 2: Reason abstractly and quantitatively.** Mathematically proficient students make sense of quantities and their relationships in problem situations.
- **Mathematical Practice #3: Construct viable arguments and critique the reason for others**. Mathematically proficient students understand and use state assumptions, definitions, and previously established results in constructing arguments.
- **Mathematical Practice #4: Model with mathematics.** Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace.
- **Mathematical Practice #5: Use appropriate tools strategically**. Mathematically proficient students consider the available tools when solving a mathematical problem.
- **Mathematical Practice # 6: Attend to precision**. Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others.
- **Mathematical Practice # 7: Look for and make use of structure**. Mathematically proficient students look closely to discern a pattern or structure.
- **Mathematical Practice #8: Look for and express regularity in repeated reasoning**. Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts.

Woodland Park Grade Level Overview (as per NJSLS Framework)

In Kindergarten, instructional time should focus on two critical areas: (1) representing and comparing whole numbers, initially with sets of objects; (2) describing shapes and space. More learning time in Kindergarten should be devoted to number than to other topics.

In Grade 1, instructional time should focus on four critical areas: (1) developing understanding of addition, subtraction, and strategies for addition and subtraction within 20; (2) developing understanding of whole number relationships and place value, including grouping in tens and ones; (3) developing understanding of linear measurement and measuring lengths as iterating length units; and (4) reasoning about attributes of, and composing and decomposing geometric shapes.

In Grade 2, instructional time should focus on four critical areas: (1) extending understanding of base-ten notation; (2) building fluency with addition and subtraction; (3) using standard units of measure; and (4) describing and analyzing shapes.

In Grade 3, instructional time should focus on four critical areas: (1) developing understanding of multiplication and division and strategies for multiplication and division within 100; (2) developing understanding of fractions, especially unit fractions (fractions with numerator 1); (3) developing understanding of the structure of rectangular arrays and of area; and (4) describing and analyzing two-dimensional shapes.

In Grade 4, instructional time should focus on three critical areas: (1) developing understanding and fluency with multi-digit multiplication, and developing understanding of dividing to find quotients involving multi-digit dividends; (2) developing an understanding of fraction equivalence, addition and subtraction of fractions with like denominators, and multiplication of fractions by whole numbers; (3) understanding that geometric figures can be analyzed and classified based on their properties, such as having parallel sides, perpendicular sides, particular angle measures, and symmetry.

In Grade 5, instructional time should focus on three critical areas: (1) developing fluency with addition and subtraction of fractions, and developing understanding of the multiplication of fractions and of division of fractions in limited cases (unit fractions divided by whole numbers and whole numbers divided by unit fractions); (2) extending division to 2-digit divisors, integrating decimal fractions into the place value system and developing understanding of operations with decimals to hundredths, and developing fluency with whole number and decimal operations; and (3) developing understanding of volume.

In Grade 6, instructional time should focus on four critical areas: (1) connecting ratio and rate to whole number multiplication and division and using concepts of ratio and rate to solve problems; (2) completing understanding of division of fractions and extending the notion of number to the system of rational numbers, which includes negative numbers; (3) writing, interpreting, and using expressions and equations; and (4) developing understanding of statistical thinking.

In Grade 7, instructional time should focus on four critical areas: (1) developing understanding of and applying proportional relationships; (2) developing understanding of operations with rational numbers and working with expressions and linear equations; (3) solving problems involving scale drawings and informal geometric constructions, and working with two- and three-dimensional shapes to solve problems involving area, surface area, and volume; and (4) drawing inferences about populations based on samples.

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.

8th Grade 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**
    a. (1) Students use linear equations and systems of linear equations to represent, analyze, and solve a variety of problems. Students recognize equations for proportions (y/x = m or y = mx) as special linear equations (y = mx + b), understanding that the constant of proportionality (m) is the slope, and the graphs are lines through the origin. They understand that the slope (m) of a line is a constant rate of change, so that if the input or x-coordinate changes by an amount A, the output or y-coordinate changes by the amount m·A. Students also use a linear equation to describe the association between two quantities in bivariate data (such as arm span vs. height for students in a classroom). At this grade, fitting the model, and assessing its fit to the data are done informally. Interpreting the model in the context of the data requires students to express a relationship between the two quantities in question and to interpret components of the relationship (such as slope and y-intercept) in terms of the situation.
    b. Students strategically choose and efficiently implement procedures to solve linear equations in one variable, understanding that when they use the properties of equality and the concept of logical equivalence, they maintain the solutions of the original equation. Students solve systems of two linear equations in two variables and relate the systems to pairs of lines in the plane; these intersect, are parallel, or are the same line. Students use linear equations, systems of linear equations, linear functions, and their understanding of slope of a line to analyze situations and solve problems.
2. **grasping the concept of a function and using functions to describe quantitative relationships**
    a. (2) Students grasp the concept of a function as a rule that assigns to each input exactly one output. They understand that functions describe situations where one quantity determines another. They can translate among representations and partial representations of functions (noting that tabular and graphical representations may be partial representations), and they describe how aspects of the function are reflected in the different representations
3. **analyzing two- and three-dimensional space and figures using distance, angle, similarity, and congruence, and understanding and applying the Pythagorean**
    a. (3) Students use ideas about distance and angles, how they behave under translations, rotations, reflections, and dilations, and ideas about congruence and similarity to describe and analyze two-dimensional figures and to solve problems. Students show that the sum of the angles in a triangle is the angle formed by a straight line, and that various configurations of lines give rise to

similar triangles because of the angles created when a transversal cuts parallel lines. Students understand the statement of the Pythagorean Theorem and its converse, and can explain why the Pythagorean Theorem holds, for example, by decomposing a square in two different ways. They apply the Pythagorean Theorem to find distances between points on the coordinate plane, to find lengths, and to analyze polygons. Students complete their work on volume by solving problems involving cones, cylinders, and spheres.

8th Grade Pacing Guide	
Mathematics Unit Titles:	
Unit 1: Exponents, Expressions, and Equations	**September-October**
Unit 2: Functions, Equations, and Solutions	**November - January**
Unit 3: Geometry: Pythagorean Theorem, Congruence and Similarity Transformations	**February - April**
Unit 4: Statistics and Probability: Scatterplots and Association	**May - June**

Overview of K-8 Mathematics Curriculum Pacing Guide

Titles of Units

	September	October	November	December	January	February	March	April	May	June
Grade K	Counting and Cardinality		Counting and Cardinality/ Operations and Algebraic Thinking			Measurement & Data			Geometry	
Grade 1	Addition and Subtraction within 10				Place Value/ Addition & Subtraction through 20		Place Value, Measurement, & Shapes		Reason with Shape and their Attributes	
Grade 2	Add and Subtract within 100 and Understand Place Value to 1000			Place Value Strategies for Addition and Subtraction		Measurement			Reason with Shapes and Represent Data	
Grade 3	Multiplication, Division and Concepts of Area			Modeling Multiplication, Division and Fractions			Fractions as Numbers and Measurement		Representing Data	
Grade 4	Place Value and Operations with Whole Numbers		Multi-digit Arithmetic and Fraction Equivalence			Building Fractions and Decimal Notation			Geometry and Measurement	
Grade 5	Understanding the Place Value System		Understanding Volume and Operations on Fractions			More Operations on Fractions			Coordinate Geometry and Classifying Figures	
Grade 6	Operations and Reasoning about Ratios		Equations, The Rational Number System and 2D Geometry			Equations, The Rational Number System and 2D Geometry			Variability, Distributions, and Relationships between Quantities	
Grade 7	Operations on Rational Numbers and Expressions			Equations, Ratios and Proportions			Drawing Inferences about Populations and Probability Models		Problem Solving with Geometry	
Grade 8	Exponents, Expressions, and Equations		Functions, Equations, and Solutions			Geometry: Pythagorean Theorem, Congruence and Similarity Transformations			Statistics and Probability: Scatterplots and Association	
Algebra	Solving Equations and Inequalities		Introduction to Functions	Linear Functions/ Inequalities and Systems/Exponential Functions			Polynomials/ Quadratic Functions and Equations		Quadratic Functions and Equations	

Content Area: Numerical Operations	Grade Level: Eighth
Unit 1: Exponents, Expressions, and Equations	Time Frame: September - October

Interdisciplinary Connections

ELA Connection:

Progress Indicators for Speaking and Listening

- SL.8.1. Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 8 topics, texts, and issues, building on others' ideas and expressing their own clearly.
    A. Come to discussions prepared, having read or researched material under study; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion.
    B. Follow rules for collegial discussions and decision-making, track progress toward specific goals and deadlines, and define individual roles as needed.
    C. Pose questions that connect the ideas of several speakers and respond to others' questions and comments with relevant evidence, observations, and ideas.
    D. Acknowledge new information expressed by others, and, when warranted, qualify or justify their own views in light of the evidence presented.
- SL. 8.2. Analyze the purpose of information presented in diverse media and formats (e.g., visually, quantitatively, orally) and evaluate the motives (e.g., social, commercial, political) behind its presentation.
- SL.8.3. Delineate a speaker's argument and specific claims, evaluating the soundness of the reasoning and the relevance and sufficiency of the evidence and identifying when irrelevant evidence is introduced.

Presentation of Knowledge and Ideas

- SL.8.4 Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation.
- SL.8.5 Integrate multimedia and visual displays in presentations to clarify information, strengthen claims and evidence, and add interest.
- SL.8.6. Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate.

Comprehension and Collaboration

- NJSLSA.SL1. Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.

Text Types and Purposes

- NJSLSA.W1. Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.
- NJSLSA.W2. Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.

NGSS Connection:
MS-PS1 Matter and Its Interactions

- MS-PS1-1. Develop models to describe the atomic composition of simple molecules and extended structures.
    - **Cross cutting concepts to NJSLS math standard(s):** 8.EE.A.3 Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other.

Career Ready Practices

CRP4. Communicate clearly and effectively and with reason.
Career-ready individuals communicate thoughts, ideas, and action plans with clarity, whether using written, verbal, and/or visual methods. They communicate in the workplace with clarity and purpose to make maximum use of their own and others' time. They are excellent writers; they master conventions, word choice, and organization, and use effective tone and presentation skills to articulate ideas. They are skilled at interacting with others; they are active listeners and speak clearly and with purpose. Career-ready individuals think about the audience for their communication and prepare accordingly to ensure the desired outcome.

CRP6. Demonstrate creativity and innovation.
Career-ready individuals regularly think of ideas that solve problems in new and different ways, and they contribute those ideas in a useful and productive manner to improve their organization. They can consider unconventional ideas and suggestions as solutions to issues, tasks or problems, and they discern which ideas and suggestions will add greatest value. They seek new methods, practices, and ideas from a variety of sources and seek to apply those ideas to their own workplace. They take action on their ideas and understand how to bring innovation to an organization.

CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
Career-ready individuals readily recognize problems in the workplace, understand the nature of the problem, and devise effective plans to solve the problem. They are aware of problems when they occur and take action quickly to address the problem; they thoughtfully investigate the root cause of the problem prior to introducing solutions. They carefully consider the options to solve the problem. Once a solution is agreed upon, they follow through to ensure the problem is solved, whether through their own actions or the actions of others.

9.1 Personal Financial Literacy: By the end of grade 8, students will be able to:

STRAND B: MONEY MANAGEMENT
9.1.8.B.2 Construct a simple personal savings and spending plan based on various sources of income.

STRAND C: CREDIT AND DEBT MANAGEMENT
9.1.8.C.1 Compare and contrast credit cards and debit cards and the advantages and disadvantages of using each.

9.2 Career Awareness, Exploration, and Preparation: By the end of grade 8, students will be able to:

STRAND B: CAREER EXPLORATION

- 9.2.8.B.3 Evaluate communication, collaboration, and leadership skills that can be developed through school, home, work, and extracurricular activities for use in a career.

Technology Standards (8.1 and 8.2)

8.1 Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.

A. Technology Operations and Concepts: *Students demonstrate a sound understanding of technology concepts, systems and operations.*

Understand and use technology systems.

8.1.8.A.1: Demonstrate knowledge of a real world problem using digital tools.

Select and use applications effectively and productively.

8.1.8.A.3: Use and/or develop a simulation that provides an environment to solve a real world problem or theory.

8.2 Technology Education, Engineering, Design, and Computational Thinking - Programming:
All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.

D. Abilities for a Technological World: *The designed world is the product of a design process that provides the means to convert resources into products and systems.*

Apply the design process.

8.2.8.D.1: Design and create a product that addresses a real world problem using a design process under specific constraints.

Use and maintain technological products and systems.

8.2.8.D.4: Research and publish the steps for using and maintaining a product or system and incorporate diagrams or images throughout to enhance user comprehension.

Unit 1: Exponents, Expressions, and Equations

Standards:

8.EE.A. Work with radicals and integer exponents.

- 8.EE.A.1. Know and apply the properties of integer exponents to generate equivalent numerical expressions. ***For example, $3^2 \times 3^{-5} = 3^{-3} = 1/3^3 = 1/27$.***

8.G.C. Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres.

- 8.G.C.9. Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.

8.EE.A. Work with radicals and integer exponents.

- 8.EE.A.3. Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other. ***For example, estimate the population of the United States as 3×10^8 and the population of the world as 7×10^9, and determine that the world population is more than 20 times larger.***
- 8.EE.A.4. Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology.

8.NS.A. Know that there are numbers that are not rational, and approximate them by rational numbers

- 8.NS.A.1. Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion; for rational numbers show that the decimal expansion repeats eventually, and convert a decimal expansion which repeats eventually into a rational number.
- 8.NS.A.2. Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g., π^2). ***For example, by truncating the decimal expansion of $\sqrt{2}$, show that $\sqrt{2}$ is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations.***

8.EE.B. Understand the connections between proportional relationships, lines, and linear equations

- 8.EE.B.5. Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. ***For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.***
- 8.EE.B.6. Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation $y = mx$ for a line through the origin and the equation $y = mx + b$ for a line intercepting the vertical axis at b.

Essential Questions:	**Enduring Understanding:**
• Why does one need to express a number in a form with integer exponents?	**Learning Goal 1**: Apply the properties of integer exponents to write equivalent numerical expressions; apply formulas to find the volume of a cone, a cylinder, or a sphere when solving real-world and mathematical problems.

• Why does one need to write numbers in scientific notation? • What is the advantage of performing operations on numbers expressed in scientific notation rather than numbers in standard form? • Why is there a need to represent relationships between variables in more than one way? • When is a relationship between two variables proportional? • How does thinking of a unit rate as the slope of a line help to solve problems? • Why does one need to distinguish between rational and irrational numbers? • How does one locate irrational numbers on a number line?	**Learning Goal 2***:* Estimate and express the values of very large or very small numbers with numbers expressed in the form of a single digit times an integer power of 10. Compare numbers expressed in this form, expressing how many times larger or smaller one is than the other. **Learning Goal 3**: Perform operations using numbers expressed in scientific notation, including problems where both decimals and scientific notation are used. In real-world problem-solving situations, choose units of appropriate size for measurement of very small and very large quantities and interpret scientific notation generated when technology has been used for calculations. **Learning Goal 4**: Represent a rational number with its decimal expansion, showing that it eventually repeats, and convert such decimal expansions into rational numbers. **Learning Goal 5**: Use rational numbers to approximate irrational numbers, locate irrational numbers on a number line, and estimate the value of expressions containing irrational numbers. **Learning Goal 6**: Graph proportional relationships, interpreting slope as unit rate, and compare two proportional relationships, each represented in different ways. **Learning Goal 7**: Derive the equation of a line ($y = mx$ for a line through the origin and the equation $y = mx + b$ for a line intercepting the vertical axis at b) and use similar triangles to explain why the slope (m) is the same between any two points on a non-vertical line in the coordinate plane.
Knowledge and Skills: **Concept 1**: Exponents as simplified representation of repeated multiplication. **Concept 2**: Very large and very small quantities can be approximated with numbers expressed in the form of a single digit times an integer power of 10. **Concept 3**: Numbers that are not rational are irrational.	**Demonstration of Learning:** ***Students are able to: (TLWBAT/SWBAT):*** **Objective 1**: apply properties of exponents to numerical expressions. **Objective 2:** generate equivalent numerical expressions using positive and negative integer exponents. **Objective 3**: find volume of cones, cylinders and spheres using to solve real world problems.

Concept 4: Every number has a decimal expansion. **Concept 5**: Rational approximation of irrational numbers **Concept 6:** Quantitative relationships can be represented in different ways.	**Objective 4**: estimate very large and very small quantities with numbers expressed in the form of a single digit times an integer power of 10. **Objective 5**: compare numbers written in the form of a single digit times an integer power of 10 and express how many times as much one is than the other. **Objective 6**: multiply and divide numbers expressed in scientific notation, including problems in which one number is in decimal form and one is in scientific notation. **Objective 7**: add and subtract numbers expressed in scientific notation, including problems in which one number is in decimal form and one is in scientific notation. **Objective 8**: use scientific notation and choose units of appropriate size for measurements of very large or very small quantities. **Objective 9**: interpret scientific notation that has been generated by technology (e.g. recognize 4.1E-2 and 4.1e-2 as 4.1×10^{-2}). **Objective 10**: compare decimal expansions of rational and irrational numbers. **Objective 11**: represent a rational number with its decimal expansion, showing that it repeats eventually. **Objective 12**: convert a decimal expansion (which repeats eventually) into a rational number. **Objective 13**: compare irrational numbers by replacing each with its rational approximation. Estimate the value of expressions containing irrational numbers. **Objective 14**: locate rational approximations on a number line. **Objective 15**: graph proportional relationships. Interpret unit rate as the slope of a graph. **Objective 16**: compare two different proportional relationships that are represented indifferent ways (table of values, equation, graph, verbal description).

	Objective 17: Show, using similar triangles, and explain why the slope, *m*, is the same between any two distinct points on a non-vertical line. **Objective 18**: derive, from two points, the equation *y* = *mx* for a line through the origin. **Objective 19**: derive, from two points, the equation *y* = *mx* + *b* for a line intercepting the vertical axis at *b.*	
Core Instructional and Supplemental Materials: Carter, John A., Ph.D., Cuevas, Gilbert Ph.D., Day, Roger Ph.D., Malloy, Carol Ph.D.. *McGraw-Hill Education: Course 3 grade 8*. McGraw-Hill Education, 2016. • "Model the Math" activities in Teacher Edition for each lesson • "Literature Connection" found in Teacher Edition for each lesson • "Real-World Problem Solving Reader" • RTI Differentiated Instruction / ELL Support for each chapter • Laptops • Math centers/stations • Video tutorials for anticipatory set/guided visuals • Anchor charts created by teachers • Reference sheets created by teachers • Vocabulary Activities/Math Word Wall • Problem of the day(s)/Weeks	**Technology Integration**: • www.ixl.com • www.softschools.com • www.mathisfun.com • www.jmathpage.com • www.illuminations.nctm.org • www.k5mathteachingresources.com • www.k-5learning.com • www.smartexchange.com(interactive smartboard tools) • www.buzzmath.com • www.math-drills.com • www.splashmath.com • https://www.education.com • https://www.khanacademy.org/ • https://www.desmos.com/ • www.aaamath.com • www.xtramath.com • https://www.illustrativemathematics.org/ • http://www.nctm.org/ • http://nlvm.usu.edu/ • http://illuminations.nctm.org/ • https://www.explorelearning.com/	**Illustrative Mathematics** 8.EE.A.1 Extending the Definitions of Exponents 8.G.C.9 A Canister of Tennis Balls 8.EE.A.3 Ant and Elephant 8.EE.A.4 Giantburgers 8.NS.A.1 Converting Decimal Representations of Rational Numbers to Fraction Representations 8.NS.A.2 Irrational Numbers on the Number Line 8.EE.B.5 Who Has the Best Job? 8.EE.B.6 Slopes Between Points on a Line

Suggested Activities: Real world activity maze	Rational vs. Irrational? matching game FACEing Math activity	Think Tac Toe Boards Create expressions given real world problems

Formative/Summative/Benchmark Assessments:

Diagnostic Assessment (as Pre-Assessment): Assesses a student's strengths, weaknesses, knowledge, and skills prior to instruction.

- STAR 360**,** iXL, Pre-assessments per grade level
- Summer packet review
- Daily Problem of the Day
- Diagnostic Pre-Chapter Assessment "Am I Ready" for each chapter

Formative Assessments: Assesses a student's performance during instruction, and usually occurs regularly throughout the instruction process.

- Writing Prompts, Journals, and Portfolios, Do-Now(s), Exit Tickets, iXL (performance assessments), Hands on Labs, Projects, Menu Choice boards, Anticipatory Sets, Problem of the Week

Summative Assessments: Measures a student's achievement at the end of instruction.

- Diagnostic Quizzes, Activities, Tasks, Challenge Problems, Unit Tests, Chapter Tests, End of Unit Writing Submissions, End of Unit Projects, Benchmark Assessments, midterms and finals (if applicable per grade level)
- Assessment Masters – Diagnostic Test for each unit Chapter Test – on level (2A)
- STAR 360 benchmark assessments

Criterion-Referenced Assessment: Measures a student's performance against a goal, specific objective, or standard.

Norm-Referenced Assessment: Compares a student's performance against other students (a national group or other "norm")

- Alternate Assessments

Interim/Benchmark Assessment

Evaluates student performance at periodic intervals, frequently at the end of a grading period. Can predict student performance on end-of-the-year summative assessments.

Unit 1: Differentiation/Accommodations/Modifications

	Content Curriculum, standards	**Process** How students make sense or understand information being taught	**Product** Evidence of Learning
G&T	❖ Compacting ❖ Flexible grouping ❖ Independent study/set own learning goals ❖ Interest/station groups ❖ Varying levels of resources and materials ❖ Use of technology	❖ Tiered Assignments ❖ Leveled questions- written responses, think-pair-share, multiple choice, open ended… ❖ Centers/Stations ❖ Use of technology ❖ Journals/Logs	❖ Choice boards ❖ Podcast/blog ❖ Debate ❖ Design and conduct experiments ❖ Formulate & defend theory ❖ Design a game ❖ Rubrics
ELL	❖ Compacting ❖ Flexible grouping ❖ Controlled choice ❖ Multi-sensory learning-auditory, visual, kinesthetic, tactile ❖ Pre-teach vocabulary ❖ Vocabulary lists ❖ Visuals/Modeling ❖ Varying levels of resources and materials ❖ Use of technology	❖ Tiered Assignments ❖ Leveled questions- written responses, think-pair-share, choice, open ended… ❖ Centers/Stations ❖ Scaffolding ❖ Chunking ❖ E-Dictionaries, bilingual dictionaries ❖ Extended time ❖ Differentiated instructional outcomes ❖ Use of technology ❖ Frequent checks for understanding	❖ Rubrics ❖ Simple to complex ❖ Group tasks ❖ Quizzes, tests with various types of questions ❖ Generate charts or diagrams to show what was learned ❖ Act out or role play
At Risk	❖ Compacting ❖ Flexible grouping ❖ Controlled choice ❖ Multi-sensory learning-auditory, visual, kinesthetic, tactile ❖ Pre-teach vocabulary ❖ Vocabulary lists ❖ Visuals/Modeling Varying levels of resources and materials ❖ Use of technology	❖ Tiered Assignments ❖ Leveled questions- written responses, think-pair-share, multiple choice, open ended… ❖ Centers/Stations ❖ Scaffolding ❖ Chunking ❖ Extended time ❖ Differentiated instructional outcomes ❖ Use of technology ❖ Partner work ❖ Frequent checks for understanding	❖ Rubrics ❖ Simple to complex ❖ Group tasks ❖ Quizzes, tests ❖ Oral Assessments ❖ Generate charts or diagrams to show what was learned ❖ Act out or role play
IEP/504	❖ Compacting ❖ Flexible grouping ❖ Controlled choice ❖ Multi-sensory learning-auditory, visual, kinesthetic, tactile ❖ Pre-teach vocabulary ❖ Visuals/Modeling Varying levels of resources and materials	❖ Tiered Assignments ❖ Leveled questions- written responses, think-pair-share, multiple choice, open ended… ❖ Centers/Stations ❖ Scaffolding ❖ Extended time ❖ Differentiated instructional outcomes ❖ Preferential Seating	❖ Rubrics ❖ Simple to complex ❖ Group tasks ❖ Quizzes, tests ❖ Oral Assessments ❖ Generate charts or diagrams to show what was learned ❖ Act out or role play

	❖ Use of technology ❖ Provide word boxes ❖ Use of a calculator ❖ Present fewer multiple choice answers ❖ Acknowledge alternate responses such as pictures and/or verbal instead of written ❖ Teacher may scribe for student ❖ Oral assessment instead of written	❖ Use of technology ❖ Small group/one-to-one instruction ❖ Teach information processing strategies ❖ Chunking ❖ Frequent checks for understanding ❖ Access to teacher created notes ❖ Use of visual and multisensory formats ❖ Use of assistive technology ❖ Use of prompts ❖ Vocabulary walls and anchor charts available ❖ Provide a Study Guide ❖ Graphic organizers ❖ Teacher modeling or anchor charts on board ❖ Provide multi-level reading material ❖ Chunk learning into smaller segments ❖ Small group instruction	

Instructional Routines for Core Instructional Delivery

Collaborative Problem Solving Connect Previous Knowledge to New Learning Making Thinking Visible Develop and Demonstrate Mathematical Practices Inquiry-Oriented and Exploratory Approach Multiple Solution Paths and Strategies	Use of Multiple Representations Explain the Rationale of your Math Work Quick Writes Pair/Trio Sharing Turn and Talk Charting Gallery Walks Small Group and Whole Class Discussions Student Modeling	Analyze Student Work Identify Student's Mathematical Understanding Identify Student's Mathematical Misunderstandings Interviews Role Playing Diagrams, Charts, Tables, and Graphs Anticipate Likely and Possible Student Responses Collect Different Student Approaches	Multiple Response Strategies Asking Assessing and Advancing Questions Revoicing Marking Recapping Challenging Pressing for Accuracy and Reasoning Maintain the Cognitive Demand

Content Area: Numerical Operations	Grade Level: Eighth
Unit 2: Functions, Equations, and Solutions	Time Frame: November - January

Interdisciplinary Connections

ELA Connection:

Speaking and Listening

- SL.8.1. Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 8 topics, texts, and issues, building on others' ideas and expressing their own clearly.
    - E. Come to discussions prepared, having read or researched material under study; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion.
    - F. Follow rules for collegial discussions and decision-making, track progress toward specific goals and deadlines, and define individual roles as needed.
    - G. Pose questions that connect the ideas of several speakers and respond to others' questions and comments with relevant evidence, observations, and ideas.
    - H. Acknowledge new information expressed by others, and, when warranted, qualify or justify their own views in light of the evidence presented.
- SL. 8.2. Analyze the purpose of information presented in diverse media and formats (e.g., visually, quantitatively, orally) and evaluate the motives (e.g., social, commercial, political) behind its presentation.
- SL.8.3. Delineate a speaker's argument and specific claims, evaluating the soundness of the reasoning and the relevance and sufficiency of the evidence and identifying when irrelevant evidence is introduced.

Presentation of Knowledge and Ideas

- SL.8.4 Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation.
- SL.8.5 Integrate multimedia and visual displays in presentations to clarify information, strengthen claims and evidence, and add interest.
- SL.8.6. Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate.

Comprehension and Collaboration

- NJSLSA.SL1. Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.

Text Types and Purposes

- NJSLSA.W1. Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.
- NJSLSA.W2. Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.

Career Ready Practices

CRP4. Communicate clearly and effectively and with reason.
Career-ready individuals communicate thoughts, ideas, and action plans with clarity, whether using written, verbal, and/or visual methods. They communicate in the workplace with clarity and purpose to make maximum use of their own and others' time. They are excellent writers; they master conventions, word choice, and organization, and use effective tone and presentation skills to articulate ideas. They are skilled at interacting with others; they are active listeners and speak clearly and with purpose. Career-ready individuals think about the audience for their communication and prepare accordingly to ensure the desired outcome.

CRP7. Employ valid and reliable research strategies.
Career-ready individuals are discerning in accepting and using new information to make decisions, change practices or inform strategies. They use reliable research process to search for new information. They evaluate the validity of sources when considering the use and adoption of external information or practices in their workplace situation.

CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
Career-ready individuals readily recognize problems in the workplace, understand the nature of the problem, and devise effective plans to solve the problem. They are aware of problems when they occur and take action quickly to address the problem; they thoughtfully investigate the root cause of the problem prior to introducing solutions. They carefully consider the options to solve the problem. Once a solution is agreed upon, they follow through to ensure the problem is solved, whether through their own actions or the actions of others.

CRP11. Use technology to enhance productivity.
Career-ready individuals find and maximize the productive value of existing and new technology to accomplish workplace tasks and solve workplace problems. They are flexible and adaptive in acquiring new technology. They are proficient with ubiquitous technology applications. They understand the inherent risks-personal and organizational-of technology applications, and they take actions to prevent or mitigate these risks.

CRP12. Work productively in teams while using cultural global competence.
Career-ready individuals positively contribute to every team, whether formal or informal. They apply an awareness of cultural difference to avoid barriers to productive and positive interaction. They find ways to increase the engagement and contribution of all team members. They plan and facilitate effective team meetings.

9.1 Personal Financial Literacy: By the end of grade 8, students will be able to:

STRAND A: INCOME AND CAREERS
9.1.8.A.6 Explain how income affects spending decisions.

STRAND B: MONEY MANAGEMENT
9.1.8.B.5 Explain the effect of the economy on personal income, individual and family security, and consumer decisions.

9.2 Career Awareness, Exploration, and Preparation: By the end of grade 8, students will be able to:

STRAND B: CAREER EXPLORATION

- 9.2.8.B.3 Evaluate communication, collaboration, and leadership skills that can be developed through school, home, work, and extracurricular activities for use in a career.

Technology Standards (8.1 and 8.2)

8.1 Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.

B. Technology Operations and Concepts: *Students demonstrate a sound understanding of technology concepts, systems and operations.*

Understand and use technology systems.

8.1.8.A.1: Demonstrate knowledge of a real world problem using digital tools.

Select and use applications effectively and productively.

8.1.8.A.3: Use and/or develop a simulation that provides an environment to solve a real world problem or theory.

Unit 2: Functions, Equations, and Solutions

Standards:

8.F.A. Define, evaluate, and compare functions

- 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.
- 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.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. Use functions to model relationships between quantities

- 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.

8.EE.C. Analyze and solve linear equations and pairs of simultaneous linear equations

- 8.EE.C.7. Solve linear equations in one variable.
  - 8EE.C.7a. Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form $x = a$, $a = a$, or $a = b$ results (where a and b are different numbers).
  - 8.EE.C.7b. Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.
- 8.EE.C.8. Analyze and solve pairs of simultaneous linear equations.
  - 8.EE.C.8a. 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.
  - 8.EE.C.8b. 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.***
  - 8.EE.C.8c. 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.***

Essential Questions:	**Enduring Understanding:**
• How does one interpret the number of solutions to linear equations in one variable? • What applications require solving simultaneous linear equations? • Why does one need to define a function? • When should functions be evaluated and compared? • How does knowing the algebraic properties of a function help to graph that function? • What applications could be represented by variables that are not related by a linear function? • Why would one use functions to model relationships between quantities? • What are the distinguishing characteristics of a graph of a function?	**Learning Goal 1**: Define a function 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. **Learning Goal 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). **Learning Goal 3**: Classify functions as linear or non-linear by analyzing equations, graphs, and tables of values; interpret the equation $y = mx + b$ as defining a linear function. **Learning Goal 4**: 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. **Learning Goal 5**: Sketch a graph of a function from a qualitative description and give a qualitative description of a graph of a function. **Learning Goal 6**: Apply the distributive property and collect like terms to solve linear equations in one variable that contain rational numbers as coefficients. Use an equivalent equation of the form $x = a$, $a = a$, or $a = b$ (where a and b are different numbers) to describe the number of solutions. **Learning Goal 7**: Solve systems of linear equations in two variables algebraically and by inspection. Estimate solutions by graphing, explain that points of intersection satisfy both equations simultaneously, and interpret solutions in context.
Knowledge and Skills: **Concept 1**: A function is a rule. **Concept 2**: If a rule is a function, then for each input there is exactly one output.	**Demonstration of Learning:** ***Students are able to: (TLWBAT/SWBAT):*** **Objective 1**: use function language. Describe a function as providing a single output for each input. **Objective 2:** determine whether non-numerical relationships are functions. Describe a function as a set of ordered pairs.

Concept 3: Functions (quantitative relationships) can be represented in different ways. **Concept 4**: Functions have properties; properties of linear functions. **Concept 5**: A linear function is defined by the equation *y = mx + b.* **Concept 6:** The graph of a linear function is a straight line. **Concept 7:** As with equations, two (x,y) values can be used to construct a function. **Concept 8:** Linear equations may have an infinite number of solutions. **Concept 9:** Linear equations may have no solution or a single solution. **Concept 10:** Simultaneous linear equations may have an infinite number of solutions. **Concept 11:** Simultaneous linear equations may have no solution or a single solution. **Concept 12:** Solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs.	**Objective 3**: read inputs and outputs from a graph. Describe the ordered pairs as containing an input, and the corresponding output. **Objective 4**: analyze functions represented algebraically, as a table of values, and as a graph. **Objective 5**: interpret functions represented by a verbal description. **Objective 6**: given two functions, each represented in a different way, compare their properties. **Objective 7**: analyze tables of values, graphs, and equations in order to classify a function as linear or non-linear. **Objective 8**: determine if equations presented in forms other than y = mx + b (for example 3y – 2x = 7) define a linear function. **Objective 9**: give examples of equations that are non-linear functions. Show that a function is not linear using pairs of points. **Objective 10**: determine the rate of change and initial value of a function from a description of a relationship. **Objective 11**: determine the rate of change and initial value of a function from two (*x*, *y*) values by reading from a table of values. **Objective 12**: determine the rate of change and initial value of a function from two (*x*, *y*) values by reading these from a graph. **Objective 13**: construct a function in order to model a linear relationship. Analyze a graph. **Objective 14**: interpret the rate of change and initial value of a linear function in context. **Objective 15**: provide qualitative descriptions of graphs (e.g. where increasing or decreasing, linear or non-linear). Analyze a graph.

	Objective 16: given a verbal description, sketch a graph of a function based on the qualitative features described. Analyze a graph. **Objective 17**: give examples of linear equations in one variable with one solution *(x = a),* infinitely many solutions *(a = a),* or no solutions *(a = b.)* Analyze a graph. **Objective 18**: transform a given equation, using the properties of equality, into simpler forms. **Objective 19**: transform a given equation until an equivalent equation of the form *x = a*, *a = a*, or *a = b* results *(a and b are different numbers).* **Objective 20**: solve linear equations that have fractional coefficients; include equations requiring use of the distributive property and collecting like terms. **Objective 21**: solve systems of two linear equations in two variables algebraically. Estimate solutions of a linear system of two equations by graphing. **Objective 22**: solve simple cases of a linear system of two equations by inspection. **Objective 23**: solve real-world and mathematical problems leading to two linear equations in two variables.	
Core Instructional and Supplemental Materials: Carter, John A., Ph.D., Cuevas, Gilbert Ph.D., Day, Roger Ph.D., Malloy, Carol Ph.D.. *McGraw-Hill Education: Course 3 grade 8*. McGraw-Hill Education, 2016. • "Model the Math" activities in Teacher Edition for each lesson • "Literature Connection" found in Teacher Edition for each lesson • "Real-World Problem Solving Reader" • RTI Differentiated Instruction / ELL Support for each chapter • Laptops • Math centers/stations	**Technology Integration**: • www.ixl.com • www.softschools.com • www.mathisfun.com • www.jmathpage.com • www.illuminations.nctm.org • www.k5mathteachingresources.com • www.k-5learning.com • www.smartexchange.com(interactive smartboard tools) • www.buzzmath.com • www.math-drills.com • www.splashmath.com	**Illustrative Mathematics** 8.F.A.1 Function Rules 8.F.A.2 Battery Charging 8.F.A.3 Introduction to Linear Functions 8.F.B.4 Chicken and Steak, Variation 1 8.F.B.4 Baseball Cards 8.EE.C.7 The Sign of Solutions

• Video tutorials for anticipatory set/guided visuals • Anchor charts created by teachers • Reference sheets created by teachers • Vocabulary Activities/Math Word Wall • Problem of the day(s)/Weeks	• https://www.education.com • https://www.khanacademy.org/ • https://www.desmos.com/ • www.aaamath.com • www.xtramath.com • https://www.illustrativemathematics.org/ • http://www.nctm.org/ • http://nlvm.usu.edu/ • http://illuminations.nctm.org/ • https://www.explorelearning.com/	8.EE.C.7 Coupon versus discount 8.EE.C.8a Intersection of Two Lines 8.EE.C.8 How Many Solutions
Suggested Activities:	Kahoot Game	Function Machine

Formative/Summative/Benchmark Assessments:

Diagnostic Assessment (as Pre-Assessment): Assesses a student's strengths, weaknesses, knowledge, and skills prior to instruction.

- STAR 360**,** iXL, Pre-assessments per grade level
- Summer packet review
- Daily Problem of the Day
- Diagnostic Pre-Chapter Assessment "Am I Ready" for each chapter

Formative Assessments: Assesses a student's performance during instruction, and usually occurs regularly throughout the instruction process.

- Writing Prompts, Journals, and Portfolios, Do-Now(s), Exit Tickets, iXL (performance assessments), Hands on Labs, Projects, Menu Choice boards, Anticipatory Sets, Problem of the Week

Summative Assessments: Measures a student's achievement at the end of instruction.

- Diagnostic Quizzes, Activities, Tasks, Challenge Problems, Unit Tests, Chapter Tests, End of Unit Writing Submissions, End of Unit Projects, Benchmark Assessments, midterms and finals (if applicable per grade level)
- Assessment Masters – Diagnostic Test for each unit Chapter Test – on level (2A)
- STAR 360 benchmark assessments

Criterion-Referenced Assessment: Measures a student's performance against a goal, specific objective, or standard.

Norm-Referenced Assessment: Compares a student's performance against other students (a national group or other "norm")

- Alternate Assessments

Interim/Benchmark Assessment

Evaluates student performance at periodic intervals, frequently at the end of a grading period. Can predict student performance on end-of-the-year summative assessments.

Unit 2: Differentiation/Accommodations/Modifications

	Content Curriculum, standards	**Process** How students make sense or understand information being taught	**Product** Evidence of Learning
G&T	❖ Compacting ❖ Flexible grouping ❖ Independent study/set own learning goals ❖ Interest/station groups ❖ Varying levels of resources and materials ❖ Use of technology	❖ Tiered Assignments ❖ Leveled questions- written responses, think-pair-share, multiple choice, open ended… ❖ Centers/Stations ❖ Use of technology ❖ Journals/Logs	❖ Choice boards ❖ Podcast/blog ❖ Debate ❖ Design and conduct experiments ❖ Formulate & defend theory ❖ Design a game ❖ Rubrics
ELL	❖ Compacting ❖ Flexible grouping ❖ Controlled choice ❖ Multi-sensory learning-auditory, visual, kinesthetic, tactile ❖ Pre-teach vocabulary ❖ Vocabulary lists ❖ Visuals/Modeling ❖ Varying levels of resources and materials ❖ Use of technology	❖ Tiered Assignments ❖ Leveled questions- written responses, think-pair-share, choice, open ended… ❖ Centers/Stations ❖ Scaffolding ❖ Chunking ❖ E-Dictionaries, bilingual dictionaries ❖ Extended time ❖ Differentiated instructional outcomes ❖ Use of technology ❖ Frequent checks for understanding	❖ Rubrics ❖ Simple to complex ❖ Group tasks ❖ Quizzes, tests with various types of questions ❖ Generate charts or diagrams to show what was learned ❖ Act out or role play
At Risk	❖ Compacting ❖ Flexible grouping ❖ Controlled choice ❖ Multi-sensory learning-auditory, visual, kinesthetic, tactile ❖ Pre-teach vocabulary ❖ Vocabulary lists ❖ Visuals/Modeling Varying levels of resources and materials ❖ Use of technology	❖ Tiered Assignments ❖ Leveled questions- written responses, think-pair-share, multiple choice, open ended… ❖ Centers/Stations ❖ Scaffolding ❖ Chunking ❖ Extended time ❖ Differentiated instructional outcomes ❖ Use of technology ❖ Partner work ❖ Frequent checks for understanding	❖ Rubrics ❖ Simple to complex ❖ Group tasks ❖ Quizzes, tests ❖ Oral Assessments ❖ Generate charts or diagrams to show what was learned ❖ Act out or role play
IEP/504	❖ Compacting ❖ Flexible grouping ❖ Controlled choice ❖ Multi-sensory learning-auditory, visual, kinesthetic, tactile ❖ Pre-teach vocabulary ❖ Visuals/Modeling Varying levels of resources and materials	❖ Tiered Assignments ❖ Leveled questions- written responses, think-pair-share, multiple choice, open ended… ❖ Centers/Stations ❖ Scaffolding ❖ Extended time ❖ Differentiated instructional outcomes ❖ Preferential Seating	❖ Rubrics ❖ Simple to complex ❖ Group tasks ❖ Quizzes, tests ❖ Oral Assessments ❖ Generate charts or diagrams to show what was learned ❖ Act out or role play

	❖ Use of technology ❖ Provide word boxes ❖ Use of a calculator ❖ Present fewer multiple choice answers ❖ Acknowledge alternate responses such as pictures and/or verbal instead of written ❖ Teacher may scribe for student ❖ Oral assessment instead of written	❖ Use of technology ❖ Small group/one-to-one instruction ❖ Teach information processing strategies ❖ Chunking ❖ Frequent checks for understanding ❖ Access to teacher created notes ❖ Use of visual and multisensory formats ❖ Use of assistive technology ❖ Use of prompts ❖ Vocabulary walls and anchor charts available ❖ Provide a Study Guide ❖ Graphic organizers ❖ Teacher modeling or anchor charts on board ❖ Provide multi-level reading material ❖ Chunk learning into smaller segments ❖ Small group instruction	

Instructional Routines for Core Instructional Delivery

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Content Area: Numerical Operations	Grade Level: Eighth
Unit 3: Geometry: Pythagorean Theorem, Congruence and Similarity Transformations	**Time Frame: February - April**

Interdisciplinary Connections

ELA Connection

Speaking and Listening

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    I. Come to discussions prepared, having read or researched material under study; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion.
    J. Follow rules for collegial discussions and decision-making, track progress toward specific goals and deadlines, and define individual roles as needed.
    K. Pose questions that connect the ideas of several speakers and respond to others' questions and comments with relevant evidence, observations, and ideas.
    L. Acknowledge new information expressed by others, and, when warranted, qualify or justify their own views in light of the evidence presented.
- SL. 8.2. Analyze the purpose of information presented in diverse media and formats (e.g., visually, quantitatively, orally) and evaluate the motives (e.g., social, commercial, political) behind its presentation.
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- SL.8.4 Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation.
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- NJSLSA.SL1. Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.

Text Types and Purposes

- NJSLSA.W1. Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.
- NJSLSA.W2. Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.

NGSS Connection:

MS-PS3 Energy

- MS-PS3-1. Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object
    - **Cross cutting concepts to NJSLS math standard(s):** 8.EE.A.1 Know and apply the properties of integer exponents to generate equivalent numerical expressions.
    - **Cross cutting concepts to NJSLS math standard(s):** 8.EE.A.2 Use square root and cube root symbols to represent solutions to equations of the form x2 = p and x3 = p, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that √2 is irrational.
    - **Cross cutting concepts to NJSLS math standard(s):** 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.
- MS-PS3-5. Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.
    - **Cross cutting concepts to NJSLS math standard(s):** 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.

MS-PS4 Waves and Their Applications in Technologies for Information Transfer

- MS-PS4-1. Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave.
    - **Cross cutting concepts to NJSLS math standard(s):** 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.

MS-PS4 Waves and Their Applications in Technologies for Information Transfer

- MS-PS4-1. Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave.
    - **Cross cutting concepts to NJSLS math standard(s):** 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.

Career Ready Practices

CRP2. Apply appropriate academic and technical skills.

Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive. They make connections between abstract concepts with real-world applications, and they make correct insights about when it is appropriate to apply the use of an academic skill in a workplace situation.

CRP4. Communicate clearly and effectively and with reason.
Career-ready individuals communicate thoughts, ideas, and action plans with clarity, whether using written, verbal, and/or visual methods. They communicate in the workplace with clarity and purpose to make maximum use of their own and others' time. They are excellent writers; they master conventions, word choice, and organization, and use effective tone and presentation skills to articulate ideas. They are skilled at interacting with others; they are active listeners and speak clearly and with purpose. Career-ready individuals think about the audience for their communication and prepare accordingly to ensure the desired outcome.

CRP6. Demonstrate creativity and innovation.
Career-ready individuals regularly think of ideas that solve problems in new and different ways, and they contribute those ideas in a useful and productive manner to improve their organization. They can consider unconventional ideas and suggestions as solutions to issues, tasks or problems, and they discern which ideas and suggestions will add greatest value. They seek new methods, practices, and ideas from a variety of sources and seek to apply those ideas to their own workplace. They take action on their ideas and understand how to bring innovation to an organization.

CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
Career-ready individuals readily recognize problems in the workplace, understand the nature of the problem, and devise effective plans to solve the problem. They are aware of problems when they occur and take action quickly to address the problem; they thoughtfully investigate the root cause of the problem prior to introducing solutions. They carefully consider the options to solve the problem. Once a solution is agreed upon, they follow through to ensure the problem is solved, whether through their own actions or the actions of others.

9.1 Personal Financial Literacy: By the end of grade 8, students will be able to:

STRAND A: INCOME AND CAREERS
9.1.8.A.3 Differentiate among ways that workers can improve earning power through the acquisition of new knowledge and skills.
9.1.8.A.4 Relate earning power to quality of life across cultures.

9.2 Career Awareness, Exploration, and Preparation: By the end of grade 8, students will be able to:

STRAND B: CAREER EXPLORATION

- 9.2.8.B.3 Evaluate communication, collaboration, and leadership skills that can be developed through school, home, work, and extracurricular activities for use in a career.

Technology Standards (8.1 and 8.2)

8.1 Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.

C. Technology Operations and Concepts: *Students demonstrate a sound understanding of technology concepts, systems and operations.*

Understand and use technology systems.

8.1.8.A.1: Demonstrate knowledge of a real world problem using digital tools.

Select and use applications effectively and productively.

8.1.8.A.3: Use and/or develop a simulation that provides an environment to solve a real world problem or theory.

8.2 Technology Education, Engineering, Design, and Computational Thinking - Programming:
All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.

D. Abilities for a Technological World: *The designed world is the product of a design process that provides the means to convert resources into products and systems.*

Apply the design process.

8.2.8.D.1: Design and create a product that addresses a real world problem using a design process under specific constraints.

Use and maintain technological products and systems.

8.2.8.D.4: Research and publish the steps for using and maintaining a product or system and incorporate diagrams or images throughout to enhance user comprehension.

Unit 3: Geometry: Pythagorean Theorem, Congruence and Similarity Transformations

Standards:

8.EE.A. Work with radicals and integer exponents

- 8.EE.A.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 $\sqrt{2}$ is irrational.

8.G.C. Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres.

- 8.G.C.9. Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.

8.G.B. Understand and apply the Pythagorean Theorem.

- 8.G.B.6. Explain a proof of the Pythagorean Theorem and its converse.
- 8.G.B.7. Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.
- 8.G.B.8. Apply the Pythagorean Theorem to find the distance between two points in a coordinate system

8.G.A. Understand congruence and similarity using physical models, transparencies, or geometry software.

- 8.G.A.1. Verify experimentally the properties of rotations, reflections, and translations:
  - 8.G.A.1a. Lines are transformed to lines, and line segments to line segments of the same length.
  - 8.G.A.1b. Angles are transformed to angles of the same measure.
  - 8.G.A.1c. Parallel lines are transformed to parallel lines.
- 8.G.A.2. Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them.
- 8.G.A.3. Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.
- 8.G.A.4. Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them.
- 8.G.A.5 Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. ***For example, arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so.***

Essential Questions:	**Enduring Understanding:**
• Why does one need to perform transformations on figures?	**Learning Goal 1**: 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 √2 as irrational.

• How does knowing two figures are congruent or similar help one to solve problems? • How can one use the Pythagorean Theorem to solve real-world and mathematical problems? • How can one use volume to solve real-world and mathematical problems? • What is the relationship, if any, between volume of cones, cylinders, and spheres?	**Learning Goal 2***:* Apply the formula for the volume of a cone, a cylinder, or a sphere to find a single unknown dimension when solving real-world and mathematical problems. **Learning Goal 3**: Explain a proof of the Pythagorean Theorem and its converse. **Learning Goal 4**: Apply the Pythagorean Theorem to determine unknown side lengths of right triangles in two and three dimensional cases when solving real-world and mathematical problems. **Learning Goal 5**: Use the Pythagorean Theorem to determine the distance between two points in the coordinate plane. **Learning Goal 6**: Explain and model the properties of rotations, reflections, and translations with physical representations and/or geometry software using pre-images and resultant images of lines, line segments, and angles. **Learning Goal 7**: Describe and perform a sequence of rotations, reflections, and/or translations on a two dimensional figure in order to prove that two figures are congruent. **Learning Goal 8**: Use the coordinate plane to locate images or pre-images of two-dimensional figures and determine the coordinates of a resultant image after applying dilations, rotations, reflections, and translations. **Learning Goal 9**: Apply an effective sequence of transformations to determine that figures are similar when corresponding angles are congruent and corresponding sides are proportional. Write similarity statements based on such transformations. **Learning Goal 10:** Give informal arguments to justify facts about the exterior angles of a triangle, the sum of the measures of the interior angles of a triangle, the angle-angle relationship used to determine similar triangles, and the angles created when parallel lines are cut by a transversal.
Knowledge and Skills: **Concept 1**: Square root and cube roots; perfect squares and perfect cubes	**Demonstration of Learning:** ***Students are able to: (TLWBAT/SWBAT):*** **Objective 1**: give the value of square roots of small perfect squares.

Concept 2: Inverse relationship between powers and square roots	**Objective 2:** solve equations of the form $x^2 = p$, where p is a positive rational number. Use the square root symbol to represent solutions to equations of the form $x^2 = p$.
Concept 3: Pythagorean Theorem	**Objective 3:** give the value of cube roots of small perfect cubes. Solve equations of the form $x^3 = p$, where p is a positive rational number.
Concept 4: If the square of one side of a triangle is equal to the sum of the squares of the other two sides, then the triangle is a right triangle (Pythagorean theorem converse).	**Objective 4:** use the cube root symbol to represent solutions to equations of the form $x^3 = p$.
Concept 5: A property of rigid motion transformations (rotation, reflection, and translation) is that the measure of a two-dimensional object under the transformation remains unchanged.	**Objective 5:** show or explain that $\sqrt{2}$ is an irrational number.
Concept 6: A two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations.	**Objective 6:** use volume formulas to find a single unknown dimension of cones, cylinders and spheres when solving real world problems.
Concept 7: A two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations.	**Objective 7**: given a proof of the Pythagorean theorem, explain the proof. Given a proof of the converse of the Pythagorean theorem, explain the proof.
Concept 8: Congruent figures are also similar.	**Objective 8:** determine side lengths of right triangles by applying the Pythagorean Theorem to solve real world and mathematical problems involving two dimensional spaces.
	Objective 9: determine side lengths of right triangles by applying the Pythagorean Theorem to solve real world and mathematical problems involving three dimensional spaces.
	Objective 10: determine the distance between two points in a coordinate plane by drawing a right triangle and applying the Pythagorean Theorem.
	Objective 11: show and explain that performing rotations, reflections, and translations on lines results in a line.
	Objective 12: show and explain that performing rotations, reflections, and translations on parallel lines results in parallel lines.
	Objective 13: show and explain that performing rotations, reflections, and translations on line segments results in a line segment and does not alter the length of the line segment.

	Objective 14: show and explain that performing rotations, reflections, and translations on angles results in an angle and does not alter the measure of the angle. **Objective 15:** explain that a property of rigid motion transformations (rotation, reflection, and translation) is that the measure of a two-dimensional object under the transformation remains unchanged. **Objective 16**: given two congruent figures, describe a transformation or sequence of transformations that shows the congruence between them. **Objective 17**: describe, using coordinates, the resulting two-dimensional figure after applying dilations with scale factor greater than, less than, and equal to 1. **Objective 18**: describe, using coordinates, the resulting two-dimensional figure after applying translation, rotation, and reflection. **Objective 19**: describe a transformation or sequence of transformations that show the similarity between them given two similar two-dimensional figures. **Objective 20**: give informal arguments to establish facts about the angle sum of triangles. Give informal arguments to establish facts about exterior angles of triangles. Give informal arguments to establish the angle-angle criterion for similarity of triangles. **Objective 21**: give informal arguments to establish facts about the angles created when parallel lines are cut by a transversal.	
Core Instructional and Supplemental Materials: Carter, John A., Ph.D., Cuevas, Gilbert Ph.D., Day, Roger Ph.D., Malloy, Carol Ph.D.. *McGraw-Hill Education: Course 3 grade 8*. McGraw-Hill Education, 2016. • "Model the Math" activities in Teacher Edition for each lesson • "Literature Connection" found in Teacher Edition for each lesson • "Real-World Problem Solving Reader"	**Technology Integration**: • www.ixl.com • www.softschools.com • www.mathisfun.com • www.jmathpage.com • www.illuminations.nctm.org • www.k5mathteachingresources.com • www.k-5learning.com	**Illustrative Mathematics** *8.G.B.6 Converse of the Pythagorean Theorem* 8.G.B.7 Running on the Football Field 8.G.B.8 Finding isosceles triangles 8.G.A.1 Reflections, Rotations, and Translations

• RTI Differentiated Instruction / ELL Support for each chapter • Laptops • Math centers/stations • Video tutorials for anticipatory set/guided visuals • Anchor charts created by teachers • Reference sheets created by teachers • Vocabulary Activities/Math Word Wall • Problem of the day(s)/Weeks	• www.smartexchange.com(interactive smartboard tools) • www.buzzmath.com • www.math-drills.com • www.splashmath.com • https://www.education.com • https://www.khanacademy.org/ • https://www.desmos.com/ • www.aaamath.com • www.xtramath.com • https://www.illustrativemathematics.org/ • http://www.nctm.org/ • http://nlvm.usu.edu/ • http://illuminations.nctm.org/ • https://www.explorelearning.com/	8.G.A.2 Congruent Triangles 8.G.A.3 Effects of Dilations on Length, Area, and Angles 8.G.A.4 Are They Similar 8.G.A.5 Street Intersections 8.G.A.5 Similar Triangles II 8.G.A.5 Triangle's Interior Angles
Suggested Activities:	Kahoot Activity	FACEing Math Think Tac Toe Boards

Formative/Summative/Benchmark Assessments:

Diagnostic Assessment (as Pre-Assessment): Assesses a student's strengths, weaknesses, knowledge, and skills prior to instruction.

- STAR 360**,** iXL, Pre-assessments per grade level
- Summer packet review
- Daily Problem of the Day
- Diagnostic Pre-Chapter Assessment "Am I Ready" for each chapter

Formative Assessments: Assesses a student's performance during instruction, and usually occurs regularly throughout the instruction process.

- Writing Prompts, Journals, and Portfolios, Do-Now(s), Exit Tickets, iXL (performance assessments), Hands on Labs, Projects, Menu Choice boards, Anticipatory Sets, Problem of the Week

Summative Assessments: Measures a student's achievement at the end of instruction.

- Diagnostic Quizzes, Activities, Tasks, Challenge Problems, Unit Tests, Chapter Tests, End of Unit Writing Submissions, End of Unit Projects, Benchmark Assessments, midterms and finals (if applicable per grade level)
- Assessment Masters – Diagnostic Test for each unit Chapter Test – on level (2A)

- STAR 360 benchmark assessments

Criterion-Referenced Assessment: Measures a student's performance against a goal, specific objective, or standard.

Norm-Referenced Assessment: Compares a student's performance against other students (a national group or other "norm")

- Alternate Assessments

Interim/Benchmark Assessment

Evaluates student performance at periodic intervals, frequently at the end of a grading period. Can predict student performance on end-of-the-year summative assessments.

Unit 3: Differentiation/Accommodations/Modifications

	Content Curriculum, standards	**Process** How students make sense or understand information being taught	**Product** Evidence of Learning
G&T	❖ Compacting ❖ Flexible grouping ❖ Independent study/set own learning goals ❖ Interest/station groups ❖ Varying levels of resources and materials ❖ Use of technology	❖ Tiered Assignments ❖ Leveled questions- written responses, think-pair-share, multiple choice, open ended… ❖ Centers/Stations ❖ Use of technology ❖ Journals/Logs	❖ Choice boards ❖ Podcast/blog ❖ Debate ❖ Design and conduct experiments ❖ Formulate & defend theory ❖ Design a game ❖ Rubrics
ELL	❖ Compacting ❖ Flexible grouping ❖ Controlled choice ❖ Multi-sensory learning-auditory, visual, kinesthetic, tactile ❖ Pre-teach vocabulary ❖ Vocabulary lists ❖ Visuals/Modeling ❖ Varying levels of resources and materials ❖ Use of technology	❖ Tiered Assignments ❖ Leveled questions- written responses, think-pair-share, choice, open ended… ❖ Centers/Stations ❖ Scaffolding ❖ Chunking ❖ E-Dictionaries, bilingual dictionaries ❖ Extended time ❖ Differentiated instructional outcomes ❖ Use of technology ❖ Frequent checks for understanding	❖ Rubrics ❖ Simple to complex ❖ Group tasks ❖ Quizzes, tests with various types of questions ❖ Generate charts or diagrams to show what was learned ❖ Act out or role play
At Risk	❖ Compacting ❖ Flexible grouping ❖ Controlled choice ❖ Multi-sensory learning-auditory, visual, kinesthetic, tactile ❖ Pre-teach vocabulary ❖ Vocabulary lists ❖ Visuals/Modeling Varying levels of resources and materials ❖ Use of technology	❖ Tiered Assignments ❖ Leveled questions- written responses, think-pair-share, multiple choice, open ended… ❖ Centers/Stations ❖ Scaffolding ❖ Chunking ❖ Extended time ❖ Differentiated instructional outcomes ❖ Use of technology ❖ Partner work ❖ Frequent checks for understanding	❖ Rubrics ❖ Simple to complex ❖ Group tasks ❖ Quizzes, tests ❖ Oral Assessments ❖ Generate charts or diagrams to show what was learned ❖ Act out or role play
IEP/504	❖ Compacting ❖ Flexible grouping ❖ Controlled choice ❖ Multi-sensory learning-auditory, visual, kinesthetic, tactile ❖ Pre-teach vocabulary ❖ Visuals/Modeling Varying levels of resources and materials	❖ Tiered Assignments ❖ Leveled questions- written responses, think-pair-share, multiple choice, open ended… ❖ Centers/Stations ❖ Scaffolding ❖ Extended time ❖ Differentiated instructional outcomes ❖ Preferential Seating	❖ Rubrics ❖ Simple to complex ❖ Group tasks ❖ Quizzes, tests ❖ Oral Assessments ❖ Generate charts or diagrams to show what was learned ❖ Act out or role play

	❖ Use of technology ❖ Provide word boxes ❖ Use of a calculator ❖ Present fewer multiple choice answers ❖ Acknowledge alternate responses such as pictures and/or verbal instead of written ❖ Teacher may scribe for student ❖ Oral assessment instead of written	❖ Use of technology ❖ Small group/one-to-one instruction ❖ Teach information processing strategies ❖ Chunking ❖ Frequent checks for understanding ❖ Access to teacher created notes ❖ Use of visual and multisensory formats ❖ Use of assistive technology ❖ Use of prompts ❖ Vocabulary walls and anchor charts available ❖ Provide a Study Guide ❖ Graphic organizers ❖ Teacher modeling or anchor charts on board ❖ Provide multi-level reading material ❖ Chunk learning into smaller segments ❖ Small group instruction	

Instructional Routines for Core Instructional Delivery

Collaborative Problem Solving Connect Previous Knowledge to New Learning Making Thinking Visible Develop and Demonstrate Mathematical Practices Inquiry-Oriented and Exploratory Approach Multiple Solution Paths and Strategies	Use of Multiple Representations Explain the Rationale of your Math Work Quick Writes Pair/Trio Sharing Turn and Talk Charting Gallery Walks Small Group and Whole Class Discussions Student Modeling	Analyze Student Work Identify Student's Mathematical Understanding Identify Student's Mathematical Misunderstandings Interviews Role Playing Diagrams, Charts, Tables, and Graphs Anticipate Likely and Possible Student Responses Collect Different Student Approaches	Multiple Response Strategies Asking Assessing and Advancing Questions Revoicing Marking Recapping Challenging Pressing for Accuracy and Reasoning Maintain the Cognitive Demand

Content Area: Numerical Operations	Grade Level: Eighth
Unit 4: Statistics and Probability: Scatterplots and Association	Time Frame: May- June

Interdisciplinary Connections

ELA Connection:

Speaking and Listening

- SL.8.1. Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 8 topics, texts, and issues, building on others' ideas and expressing their own clearly.
    - M. Come to discussions prepared, having read or researched material under study; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion.
    - N. Follow rules for collegial discussions and decision-making, track progress toward specific goals and deadlines, and define individual roles as needed.
    - O. Pose questions that connect the ideas of several speakers and respond to others' questions and comments with relevant evidence, observations, and ideas.
    - P. Acknowledge new information expressed by others, and, when warranted, qualify or justify their own views in light of the evidence presented.
- SL. 8.2. Analyze the purpose of information presented in diverse media and formats (e.g., visually, quantitatively, orally) and evaluate the motives (e.g., social, commercial, political) behind its presentation.
- SL.8.3. Delineate a speaker's argument and specific claims, evaluating the soundness of the reasoning and the relevance and sufficiency of the evidence and identifying when irrelevant evidence is introduced.

Presentation of Knowledge and Ideas

- SL.8.4 Present claims and findings, emphasizing salient points in a focused, coherent manner with relevant evidence, sound valid reasoning, and well-chosen details; use appropriate eye contact, adequate volume, and clear pronunciation.
- SL.8.5 Integrate multimedia and visual displays in presentations to clarify information, strengthen claims and evidence, and add interest.
- SL.8.6. Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate.

Comprehension and Collaboration

- NJSLSA.SL1. Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.

Text Types and Purposes

- NJSLSA.W1. Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.
- NJSLSA.W2. Write informative/explanatory texts to examine and convey complex ideas and information clearly and accurately through the effective selection, organization, and analysis of content.

Career Ready Practices

CRP6. Demonstrate creativity and innovation.
Career-ready individuals regularly think of ideas that solve problems in new and different ways, and they contribute those ideas in a useful and productive manner to improve their organization. They can consider unconventional ideas and suggestions as solutions to issues, tasks or problems, and they discern which ideas and suggestions will add greatest value. They seek new methods, practices, and ideas from a variety of sources and seek to apply those ideas to their own workplace. They take action on their ideas and understand how to bring innovation to an organization.

CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
Career-ready individuals readily recognize problems in the workplace, understand the nature of the problem, and devise effective plans to solve the problem. They are aware of problems when they occur and take action quickly to address the problem; they thoughtfully investigate the root cause of the problem prior to introducing solutions. They carefully consider the options to solve the problem. Once a solution is agreed upon, they follow through to ensure the problem is solved, whether through their own actions or the actions of others.

CRP11. Use technology to enhance productivity.
Career-ready individuals find and maximize the productive value of existing and new technology to accomplish workplace tasks and solve workplace problems. They are flexible and adaptive in acquiring new technology. They are proficient with ubiquitous technology applications. They understand the inherent risks-personal and organizational-of technology applications, and they take actions to prevent or mitigate these risks.

9.1 Personal Financial Literacy: By the end of grade 8, students will be able to:

STRAND A: INCOME AND CAREERS
9.1.8.A.6 Explain how income affects spending decisions.

9.2 Career Awareness, Exploration, and Preparation: By the end of grade 8, students will be able to:

STRAND B: CAREER EXPLORATION

- 9.2.8.B.3 Evaluate communication, collaboration, and leadership skills that can be developed through school, home, work, and extracurricular activities for use in a career.

Technology Standards (8.1 and 8.2)

8.1 Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.

D. Technology Operations and Concepts: *Students demonstrate a sound understanding of technology concepts, systems and operations.*

Understand and use technology systems.

8.1.8.A.1: Demonstrate knowledge of a real world problem using digital tools.

Select and use applications effectively and productively.

8.1.8.A.3: Use and/or develop a simulation that provides an environment to solve a real world problem or theory.

8.2 Technology Education, Engineering, Design, and Computational Thinking - Programming:
All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.

D. Abilities for a Technological World: *The designed world is the product of a design process that provides the means to convert resources into products and systems.*

Apply the design process.

8.2.8.D.1: Design and create a product that addresses a real world problem using a design process under specific constraints.

Use and maintain technological products and systems.

8.2.8.D.4: Research and publish the steps for using and maintaining a product or system and incorporate diagrams or images throughout to enhance user comprehension.

Unit 4: Statistics and Probability: Scatterplots and Association

Standards:

8.SP.A. Investigate patterns of association in bivariate data.

- 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?***

8.F.B. Use functions to model relationships between quantities.

- 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.G.B. Understand and apply the Pythagorean Theorem.

- 8.G.B.7. Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.
- 8.G.B.8. Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.

8.EE.C. Analyze and solve linear equations and pairs of simultaneous linear equations.

- 8.EE.C.8. Analyze and solve pairs of simultaneous linear equations.
  - 8.EE.C.8c. 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.***

Essential Questions:	**Enduring Understanding:**
• Why is it important to describe patterns of an association between two quantities? • When is a scatter plot used to determine if there is an association between two quantities? • When is a two-way table used to determine if there is an association between two variables?	**<u>Learning Goal 1</u>**: 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). **<u>Learning Goal 2</u>***:* For scatter plots that suggest a linear association, informally fit a straight line and informally assess the model's fit. **<u>Learning Goal 3</u>**: Use a linear model (equation) representing measurement data to solve problems, interpreting the slope and intercept in the context of the situation. **<u>Learning Goal 4</u>**: Construct two-way frequency tables and two-way relative frequency tables, and describe possible associations between two variables. **<u>Learning Goal 5</u>**: 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. **<u>Learning Goal 6</u>**: points in the coordinate plane. **<u>Learning Goal 7</u>**: Apply the Pythagorean Theorem to determine unknown side lengths of right triangles in two and three dimensions to solve real-world and mathematical problems and to determine the distance between two **<u>Learning Goal 8</u>**: Solve real world and mathematical problems leading to two linear equations in two variables, interpreting solutions in context.

Knowledge and Skills:	**Demonstration of Learning:** ***Students are able to: (TLWBAT/SWBAT):***
<u>Concept 1</u>: Association in data (bivariate measurement data) **<u>Concept 2</u>**: Straight lines are used to model *approximately* linear relationships between quantitative variables.	**<u>Objective 1</u>**: construct and interpret scatter plots. **<u>Objective 2:</u>** analyze patterns of association between the two quantities represented in a scatter plot.

Concept 3: Categorical data: patterns of association can also be observed in bivariate categorical data through analyzing two-way tables containing frequencies or relative frequencies. **Concept 4**: As with equations, two (x,y) values can be used to construct a function. **Concept 5**: Simultaneous linear equations may have an infinite number of solutions. **Concept 6:** Simultaneous linear equations may have no solution or a single solution. **Concept 7:** Solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs.	**Objective 3**: describe clustering, outliers, positive or negative association, linear or non-linear association when explaining patterns of association in a scatter plot. **Objective 4**: informally fit a line (of best fit) to a scatter plot that suggests a linear association. **Objective 5**: informally assess the model's fit by judging the closeness of the data points to the line (line of best fit). **Objective 6**: given the equation for a linear model (line of best fit), interpret the slope and intercept. **Objective 7**: given the equation for a linear model, solve problems in the context of measurement data. **Objective 8**: construct and interpret a two-way frequency table containing data on two categorical variables. **Objective 9**: construct and interpret a two-way relative frequency table containing data on two categorical variables. **Objective 10**: describe any association between the two categorical variables using relative frequencies calculated for rows or columns. **Objective 11**: construct a function in order to model a linear relationship. **Objective 12**: interpret the rate of change and initial value of a linear function in context. **Objective 13**: determine side lengths of right triangles by applying the Pythagorean Theorem to solve real world and mathematical problems in two and three dimensions. **Objective 14**: determine the distance between two points in a coordinate plane by applying the Pythagorean Theorem.

	Objective 15: solve systems of two linear equations in two variables algebraically. **Objective 16**: estimate solutions of a linear system of two equations by graphing. **Objective 17**: solve simple cases of a linear system of two equations by inspection. **Objective 18**: solve real-world and mathematical problems leading to two linear equations in two variables.	
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Suggested Activities:	Probability of Events Game	Kahoot Game FACEing Math Menu Choice Board

Formative/Summative/Benchmark Assessments:

Diagnostic Assessment (as Pre-Assessment): Assesses a student's strengths, weaknesses, knowledge, and skills prior to instruction.

- STAR 360**,** iXL, Pre-assessments per grade level
- Summer packet review
- Daily Problem of the Day
- Diagnostic Pre-Chapter Assessment "Am I Ready" for each chapter

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Unit 4: Differentiation/Accommodations/Modifications

	Content Curriculum, standards	**Process** How students make sense or understand information being taught	**Product** Evidence of Learning
G&T	❖ Compacting ❖ Flexible grouping ❖ Independent study/set own learning goals ❖ Interest/station groups ❖ Varying levels of resources and materials ❖ Use of technology	❖ Tiered Assignments ❖ Leveled questions- written responses, think-pair-share, multiple choice, open ended… ❖ Centers/Stations ❖ Use of technology ❖ Journals/Logs	❖ Choice boards ❖ Podcast/blog ❖ Debate ❖ Design and conduct experiments ❖ Formulate & defend theory ❖ Design a game ❖ Rubrics
ELL	❖ Compacting ❖ Flexible grouping ❖ Controlled choice ❖ Multi-sensory learning-auditory, visual, kinesthetic, tactile ❖ Pre-teach vocabulary ❖ Vocabulary lists ❖ Visuals/Modeling ❖ Varying levels of resources and materials ❖ Use of technology	❖ Tiered Assignments ❖ Leveled questions- written responses, think-pair-share, choice, open ended… ❖ Centers/Stations ❖ Scaffolding ❖ Chunking ❖ E-Dictionaries, bilingual dictionaries ❖ Extended time ❖ Differentiated instructional outcomes ❖ Use of technology ❖ Frequent checks for understanding	❖ Rubrics ❖ Simple to complex ❖ Group tasks ❖ Quizzes, tests with various types of questions ❖ Generate charts or diagrams to show what was learned ❖ Act out or role play
At Risk	❖ Compacting ❖ Flexible grouping ❖ Controlled choice ❖ Multi-sensory learning-auditory, visual, kinesthetic, tactile ❖ Pre-teach vocabulary ❖ Vocabulary lists ❖ Visuals/Modeling Varying levels of resources and materials ❖ Use of technology	❖ Tiered Assignments ❖ Leveled questions- written responses, think-pair-share, multiple choice, open ended… ❖ Centers/Stations ❖ Scaffolding ❖ Chunking ❖ Extended time ❖ Differentiated instructional outcomes ❖ Use of technology ❖ Partner work ❖ Frequent checks for understanding	❖ Rubrics ❖ Simple to complex ❖ Group tasks ❖ Quizzes, tests ❖ Oral Assessments ❖ Generate charts or diagrams to show what was learned ❖ Act out or role play
IEP/504	❖ Compacting ❖ Flexible grouping ❖ Controlled choice ❖ Multi-sensory learning-auditory, visual, kinesthetic, tactile ❖ Pre-teach vocabulary ❖ Visuals/Modeling Varying levels of resources and materials	❖ Tiered Assignments ❖ Leveled questions- written responses, think-pair-share, multiple choice, open ended… ❖ Centers/Stations ❖ Scaffolding ❖ Extended time ❖ Differentiated instructional outcomes ❖ Preferential Seating	❖ Rubrics ❖ Simple to complex ❖ Group tasks ❖ Quizzes, tests ❖ Oral Assessments ❖ Generate charts or diagrams to show what was learned ❖ Act out or role play

	❖ Use of technology ❖ Provide word boxes ❖ Use of a calculator ❖ Present fewer multiple choice answers ❖ Acknowledge alternate responses such as pictures and/or verbal instead of written ❖ Teacher may scribe for student ❖ Oral assessment instead of written	❖ Use of technology ❖ Small group/one-to-one instruction ❖ Teach information processing strategies ❖ Chunking ❖ Frequent checks for understanding ❖ Access to teacher created notes ❖ Use of visual and multisensory formats ❖ Use of assistive technology ❖ Use of prompts ❖ Vocabulary walls and anchor charts available ❖ Provide a Study Guide ❖ Graphic organizers ❖ Teacher modeling or anchor charts on board ❖ Provide multi-level reading material ❖ Chunk learning into smaller segments ❖ Small group instruction	

Instructional Routines for Core Instructional Delivery

Collaborative Problem Solving Connect Previous Knowledge to New Learning Making Thinking Visible Develop and Demonstrate Mathematical Practices Inquiry-Oriented and Exploratory Approach Multiple Solution Paths and Strategies	Use of Multiple Representations Explain the Rationale of your Math Work Quick Writes Pair/Trio Sharing Turn and Talk Charting Gallery Walks Small Group and Whole Class Discussions Student Modeling	Analyze Student Work Identify Student's Mathematical Understanding Identify Student's Mathematical Misunderstandings Interviews Role Playing Diagrams, Charts, Tables, and Graphs Anticipate Likely and Possible Student Responses Collect Different Student Approaches	Multiple Response Strategies Asking Assessing and Advancing Questions Revoicing Marking Recapping Challenging Pressing for Accuracy and Reasoning Maintain the Cognitive Demand