Woodland Park Mathematics Curriculum

Mathematics Curriculum Map

7th Grade Pre-Algebra

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.

7th Grade Overview:

In Pre-Algebra, instructional time should focus on four critical areas:

1. **Developing understanding of and applying proportional relationships;**
    a. Students extend their understanding of ratios and develop understanding of proportionality to solve single- and multi-step problems. Students use their understanding of ratios and proportionality to solve a wide variety of percent problems, including those involving discounts, interest, taxes, tips, and percent increase or decrease. Students solve problems about scale drawings by relating corresponding lengths between the objects or by using the fact that relationships of lengths within an object are preserved in similar objects. Students graph proportional relationships and understand the unit rate informally as a measure of the steepness of the related line, called the slope. They distinguish proportional relationships from other relationships.

2. **Developing understanding of operations with rational numbers and working with expressions and linear equations;**
    a. Students develop a unified understanding of number, recognizing fractions, decimals (that have a finite or a repeating decimal representation), and percents as different representations of rational numbers. Students extend addition, subtraction, multiplication, and division to all rational numbers, maintaining the properties of operations and the relationships between addition and subtraction, and multiplication and division. By applying these properties, and by viewing negative numbers in terms of everyday contexts (e.g., amounts owed or temperatures below zero), students explain and interpret the rules for adding, subtracting, multiplying, and dividing with negative numbers. They use the arithmetic of rational numbers as they formulate expressions and equations in one variable and use these equations to solve problems.

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;**
    a. Students continue their work with area from Grade 6, solving problems involving the area and circumference of a circle and surface area of three dimensional objects. In preparation for work on congruence and similarity in Grade 8 they reason about relationships among two-dimensional figures using scale drawings and informal geometric constructions, and they gain familiarity with the relationships between angles formed by intersecting lines. Students work with three-dimensional figures, relating them to two-dimensional figures by examining cross-sections. They solve real-world and mathematical problems involving area, surface area, and volume of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes and right prisms.

4. **Drawing inferences about populations based on samples.**
    a. Students build on their previous work with single data distributions to compare two data distributions and address questions about differences between populations. They begin informal work with random sampling to generate data sets and learn about the importance of representative samples for drawing inferences.

5. **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 $m \cdot A$. 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.
6. **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
7. **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.

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	

Pre-Algebra Curriculum Pacing Guide	
Mathematics Unit Titles:	
Unit 1: Operations on Rational Numbers and Expressions	**September – October**
Unit 2: Equations, Ratios and Proportions	**November - December**
Unit 3: Drawing Inferences about Populations and Probability Models	**January - February**
Unit 4: Problem Solving with Geometry	**March-May**
Unit 5: 8th Grade Material (Pythagorean Theorem, Slope of a Line)	**June**

Content Area: Numerical Operations	Grade Level : Seventh
Unit 1: Operations on Rational Numbers and Expressions	Time Frame: September – October

Interdisciplinary Connections

ELA Connection:

Reading Literature

- RL.7.1. Cite several pieces of textual evidence and make relevant connections to support analysis of what the text says explicitly as well as inferences drawn from the text.

Informational Text Key Ideas

- RI.7.1. Cite several pieces of textual evidence and make relevant connections to support analysis of what the text says explicitly as well as inferences drawn from the text.
- RI.7.2. Determine two or more central ideas in a text and analyze their development over the course of the text; provide an objective summary of the text.

Comprehension and Collaboration

- SL.7.1: Engage effectively in a range of collaborative discussions (one-to-one, in groups, and teacher-led) with diverse partners on grade 7 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, track progress toward specific goals and deadlines, and define individual roles as needed
    - C. Pose questions that elicit elaboration and respond to others' questions and comments with relevant observations and ideas that bring discussion back on topic as needed.
    - D. Acknowledge new information expressed by others and, when warranted, modify their own ideas.
- SL. 7.2. Analyze the main ideas and supporting details presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how the ideas clarify a topic, text, or issue under study.
- SL.7.3. Delineate a speaker's argument and specific claims, evaluating claims the soundness of the reasoning and the relevance and sufficiency of the evidence.

Presentation of Knowledge and Ideas

- SL.7.4 Present claims and findings, emphasizing salient points in a focused, coherent manner with pertinent descriptions, facts, details, and examples; use appropriate eye contact, adequate volume, and clear pronunciation.
- SL.7.5 Include multimedia components and visual displays in presentations to clarify claims and findings and emphasize salient points.
- SL.7.6. Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate.

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.

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 B: MONEY MANAGEMENT
9.1.8.B.7 Construct a budget to save for long-term, short-term, and charitable goals.

STRAND D: PLANNING, SAVING, AND INVESTING
9.1.8.D.2 Differentiate among various savings tools and how to use them most effectively.
9.1.8.D.3 Differentiate among various investment options.

STRAND E: BECOMING A CRITICAL CONSUMER
9.1.8.E.4 Prioritize personal wants and needs when making purchases.
9.1.8.E.5 Analyze interest rates and fees associated with financial services, credit cards, debit cards, and gift cards.

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: Operations on Rational Numbers and Expressions

Standards:

7.NS.A. Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.

- 7.NS.A.1. Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line.
  - 7.NS.A.1(a). Describe situations in which opposite quantities combine to make 0. ***For example, In the first round of a game, Maria scored 20 points. In the second round of the same game, she lost 20 points. What is her score at the end of the second round?***
  - 7.NS.A.1(b). Understand $p + q$ as the number located a distance $|q|$ from p, in the positive or negative direction depending on whether q is positive or negative. Show that a number and its opposite have a sum of 0 (are additive inverses). Interpret sums of rational numbers by describing real-world contexts.
  - 7.NS.A.1(c). Understand subtraction of rational numbers as adding the additive inverse, $p – q = p + (–q)$. Show that the distance between two rational numbers on the number line is the absolute value of their difference, and apply this principle in real-world
  - 7.NS.A.1(d). Apply properties of operations as strategies to add and subtract rational numbers.
- 7.NS.A.2. Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers.
  - 7.NS.A.2(a). Understand that multiplication is extended from fractions to rational numbers by requiring that operations continue to satisfy the properties of operations, particularly the distributive property, leading to products such as $(–1)(–1) = 1$ and the rules for multiplying signed numbers. Interpret products of rational numbers by describing real-world contexts.
  - 7.NS.A.2(b). Understand that integers can be divided, provided that the divisor is not zero, and every quotient of integers (with non-zero divisor) is a rational number. If p and q are integers, then $–(p/q) = (–p)/q = p/(–q)$. 2c. Interpret quotients of rational numbers by describing real world contexts.
  - 7.NS.A.2(c). Apply properties of operations as strategies to multiply and divide rational numbers.
  - 7.NS.A.2(d). Convert a rational number to a decimal using long division; know that the decimal form of a rational number repeats in 0s or eventually will terminate with a zero.
- 7.NS.A.3. Solve real-world and mathematical problems involving the four operations with rational numbers.

7.EE.A. Use properties of operations to generate equivalent expressions.

- 7.EE.A.1. Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.
- 7.EE.A.2. Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related. ***For example, a + 0.05a = 1.05a means that "increase by 5%" is the same as "multiply by 1.05.".***

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.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.***

Essential Questions:	**Enduring Understanding:**
• Why does one need rational numbers? • When does one use decimal forms versus fractional forms of rational numbers? • In what real world contexts would negative numbers be used? • Why does one need to distinguish between rational and irrational numbers? • How does one locate irrational numbers on a number line? • How does thinking of a unit rate as the slope of a line help to solve problems?	**Learning Goal 1**: Describe real-world situations in which (positive and negative) rational numbers are combined, emphasizing rational numbers that combine to make 0. Represent sums of rational numbers (p + q) on horizontal and vertical number lines, showing that the distance along the number line is $\|q\|$ and including situations in which q is negative and positive. **Learning Goal 2**: Add and subtract (positive and negative) rational numbers, showing that the distance between two points on a number line is the absolute value of their difference and representing subtraction using an additive inverse. **Learning Goal 3**: Multiply and divide signed numbers, including rational numbers, and interpret the products and quotients using real-world contexts. **Learning Goal 4**: Convert a rational number to a decimal using long division and explain why the decimal is either a terminating or repeating decimal. **Learning Goal 5**: Apply properties of operations as strategies to add, subtract, multiply, and divide rational numbers. **Learning Goal 6**: Solve mathematical and real-world problems involving addition, subtraction, multiplication, and division of signed rational numbers. **Learning Goal 7**: Apply the properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients. **Learning Goal 8**: Rewrite algebraic expressions in equivalent forms to highlight how the quantities in it are related.

	8th Grade Learning Standards: **Learning Goal 9**: Represent a rational number with its decimal expansion, showing that it eventually repeats, and convert such decimal expansions into rational numbers. **Learning Goal 10**: Graph proportional relationships, interpreting slope as unit rate, and compare two proportional relationships, each represented in different ways.
Knowledge and Skills: **Concept 1**: Opposite quantities combine to make 0 (additive inverses). **Concept 2**: $p + q$ is the number located a distance $\|q\|$ from p, in the positive or negative direction depending on whether q is positive or negative. **Concept 3**: Subtraction of rational numbers as adding the additive inverse, $p – q = p + (–q)$ **Concept 4**: The product of two whole numbers is the total number of objects in a number of equal groups. **Concept 5**: Every quotient of integers (with non-zero divisor) is a rational number. **Concept 6:** Decimal form of a rational number terminates in 0s or eventually repeats. **Concept 7:** Integers can be divided, provided that the divisor is not zero. **Concept 8:** If p and q are integers, then $–(p/q) = (–p)/q = p/(–q)$.	**Demonstration of Learning:** ***Students are able to: (TLWBAT/SWBAT):*** **Objective 1**: represent addition and subtraction on a horizontal and vertical number line. **Objective 2:** interpret sums of rational numbers in real-world situations. **Objective 3**: show that the distance between two rational numbers on the number line is the absolute value of their difference. **Objective 4**: multiply and divide signed numbers. Use long division to convert a rational number to a decimal. **Objective 5**: add and subtract rational numbers. Solve real world problems involving these two operations with rational numbers. **Objective 6**: multiply and divide rational numbers using the properties of operations. Solve real world problems involving these two operations with rational numbers. **Objective 7**: apply the convention of order of operations to add, subtract, multiply and divide rational numbers. Solve real world problems involving the four operations with rational numbers. **Objective 8**: add and subtract linear expressions having rational coefficients, using properties of operations.

Concept 9: The process for multiplying and dividing fractions extends to multiplying and dividing rational numbers. **Concept 10:** Rewriting an expression in different forms in a problem context can shed light on the problem. **8th Grade Concepts:** **Concept 11:** Numbers that are not rational are irrational. **Concept 12:** Every number has a decimal expansion. **Concept 13:** Qualitative relationships can be represented in different ways.	**Objective 9**: factor and expand linear expressions having rational coefficients, using properties of operations. **Objective 10**: write expressions in equivalent forms to shed light on the problem and interpret the relationship between the quantities in the context of the problem. **8th Grade Objectives:** **Objective 11**: compare decimal expansions of rational and irrational numbers. **Objective 12**: represent a rational number with its decimal expansion, showing that it repeats eventually. **Objective 13**: convert a decimal expansion (which repeats eventually) into a rational number. **Objective 14**: Graph proportional relationships. **Objective 15**: Interpret unit rate as the slope of a graph. C **Objective 16**: Compare two different proportional relationships that are represented in different ways (table of values, equation, graph, verbal descriptions).	
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: Accelerated Pre-Algebra grade 7*. 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 • www.smartexchange.com(interactive smartboard tools)	**Illustrative Mathematics** 7.NS.A.1 Comparing Freezing Points 7.NS.A.1b-c Differences of Integers 7.NS.A.2 Why is a Negative Times a Negative Always Positive 7.NS.A.2d Equivalent fractions approach to non-repeating decimals 7.NS.A.2d Repeating decimal as approximation

• 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.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/	7.EE.A.1 Writing Expressions 7.EE.A.2 Ticket to Ride 8.EE.B.5 Who Has the Best Job? 8.NS.A.1 Converting Decimal Representations of Rational Numbers to Fraction Representations

Suggested Activities: Teacher generated assessments Interactive on line activities Create a conversion chart of fractions and decimals Justify as to why it is important to have a knowledge before purchasing store items Zero pair Math Lab: introduction to the purpose of zero pairs Addition Math Lab: Students will use information about the signs of addends and sums to write their own addition sentences.	Subtraction Math Lab: Students will use information about the signs of addends and sums to write their own subtraction sentences. Multiplication Math Lab: Students will use information about the signs of addends and sums to write their own multiplication sentences. Division Math Lab: Students will use information about the signs of addends and sums to write their own division sentences. Integer game: https://www.mathgoodies.com/games/integer_game	FACEing Math Activities Think Tac Toe Boards Create expressions given real world problems Math stations leveled with geometric figures for adding, subtracting, factoring, and expanding linear expressions Number line: https://www.saddleback.edu/faculty/lperez/algebra2go/tools/addsubnumline/index.html Operations Properties: https://www.youtube.com/watch?v=5RZwBqvMVMI&feature=youtu.be

Formative/Summative/Benchmark Assessments:

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

- iXL, Pre-assessments per grade level

- Linkit
- 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)

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: Equations	Grade Level : Seventh
Unit 2: Equations, Ratios, and Proportions	Time Frame: November - December

Interdisciplinary Connections

ELA Connection:

Reading Literature

- RL.7.1. Cite several pieces of textual evidence and make relevant connections to support analysis of what the text says explicitly as well as inferences drawn from the text.

Informational Text Key Ideas

- RI.7.1. Cite several pieces of textual evidence and make relevant connections to support analysis of what the text says explicitly as well as inferences drawn from the text.
- RI.7.2. Determine two or more central ideas in a text and analyze their development over the course of the text; provide an objective summary of the text.

Comprehension and Collaboration

- SL.7.1: Engage effectively in a range of collaborative discussions (one-to-one, in groups, and teacher-led) with diverse partners on grade 7 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, track progress toward specific goals and deadlines, and define individual roles as needed
    - C. Pose questions that elicit elaboration and respond to others' questions and comments with relevant observations and ideas that bring discussion back on topic as needed.
    - D. Acknowledge new information expressed by others and, when warranted, modify their own ideas.
- SL. 7.2. Analyze the main ideas and supporting details presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how the ideas clarify a topic, text, or issue under study.
- SL.7.3. Delineate a speaker's argument and specific claims, evaluating claims the soundness of the reasoning and the relevance and sufficiency of the evidence.

Presentation of Knowledge and Ideas

- SL.7.4 Present claims and findings, emphasizing salient points in a focused, coherent manner with pertinent descriptions, facts, details, and examples; use appropriate eye contact, adequate volume, and clear pronunciation.
- SL.7.5 Include multimedia components and visual displays in presentations to clarify claims and findings and emphasize salient points.
- SL.7.6. Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate.

NGSS Connection:

MS-PS2 Motion and Stability: Forces and Interactions

- MS-PS2-1. Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.
    - **Cross cutting concepts to NJSLS math standard(s): 7.EE.B.3** Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form, using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.
    - **Cross cutting concepts to NJSLS math standard(s): 7.EE.B.4** Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.
- MS-PS2-2. Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.
    - **Cross cutting concepts to NJSLS math standard(s): 7.EE.B.3** Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form, using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.
    - **Cross cutting concepts to NJSLS math standard(s): 7.EE.B.4** Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.

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): 7.RP.A.2** Recognize and represent proportional relationships between quantities.
- 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): 7.RP.A.2** Recognize and represent proportional relationships between quantities.

MS-LS4 Biological Evolution: Unity and Diversity

- MS-LS4-4. Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment.
    - **Cross cutting concepts to NJSLS math standard(s): 7.RP.A.2** Recognize and represent proportional relationships between quantities.
- MS-LS4-6. Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.
    - **Cross cutting concepts to NJSLS math standard(s): 7.RP.A.2** Recognize and represent proportional relationships between quantities.

MS-ESS1 Earth's Place in the Universe

- MS-ESS1-1. Develop and use a model of the Earth-sun-moon system to describe the cyclic patterns of lunar phases, eclipses of the sun and moon, and seasons.
    - **Cross cutting concepts to NJSLS math standard(s): 7.RP.A.2** Recognize and represent proportional relationships between quantities.
- MS-ESS1-2. Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.
    - **Cross cutting concepts to NJSLS math standard(s): 7.RP.A.2** Recognize and represent proportional relationships between quantities.
    - **Cross cutting concepts to NJSLS math standard(s): 7.EE.B.4** Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.
- MS-ESS1-3. Analyze and interpret data to determine scale properties of objects in the solar system.
    - **Cross cutting concepts to NJSLS math standard(s): 7.RP.A.2** Recognize and represent proportional relationships between quantities.
- MS-ESS1-4. Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize Earth's 4.6-billion-year-old history.
    - **Cross cutting concepts to NJSLS math standard(s): 7.EE.B.4** Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities. (MS-ESS1-2),(MS-ESS1-4)

MS-ESS3 Earth and Human Activity

- MS-ESS3-1. Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes. [Clarification Statement: Emphasis is on how these resources are limited and typically non-renewable, and how their distributions are significantly changing as a result of removal by humans.
    - **Cross cutting concepts to NJSLS math standard(s): 7.EE.B.4** Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.
- MS-ESS3-2. Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.
    - **Cross cutting concepts to NJSLS math standard(s): 7.EE.B.4** Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.
- MS-ESS3-3. Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.
    - **Cross cutting concepts to NJSLS math standard(s): 7.EE.B.4** Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.
    - **Cross cutting concepts to NJSLS math standard(s): 7.RP.A.2** Recognize and represent proportional relationships between quantities.
- MS-ESS3-4. Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.
    - **Cross cutting concepts to NJSLS math standard(s): 7.EE.B.4** Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.
    - **Cross cutting concepts to NJSLS math standard(s): 7.RP.A.2** Recognize and represent proportional relationships between quantities.

- MS-ESS3-5. Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.
    - **Cross cutting concepts to NJSLS math standard(s):** **7.EE.B.4** Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.

MS-ETS1 Engineering Design

- MS-ETS1-1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.
    - **Cross cutting concepts to NJSLS math standard(s):** **7.EE.3** Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.
- MS-ETS1-2. Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
    - **Cross cutting concepts to NJSLS math standard(s):** **7.EE.3** Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.
- MS-ETS1-3. Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.
    - **Cross cutting concepts to NJSLS math standard(s):** **7.EE.3** Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.

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.

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 D: PLANNING, SAVING, AND INVESTING
9.1.8.D.1 Determine how saving contributes to financial well-being.
9.1.8.D.3 Differentiate among various investment options.

STRAND E: BECOMING A CRITICAL CONSUMER
9.1.8.E.5 Analyze interest rates and fees associated with financial services, credit cards, debit cards, and gift cards.

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.

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. Digital Citizenship: *Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior.*

Advocate and practice safe, legal, and responsible use of information and technology.

8.1.8.D.1: Understand and model appropriate online behaviors related to cyber safety, cyber bullying, cyber security, and cyber ethics including appropriate use of social media.

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.

E. Computational Thinking: Programming: *Computational thinking builds and enhances problem solving, allowing students to move beyond using knowledge to creating knowledge.*

Computational thinking and computer programming as tools used in design and engineering.

8.2.8.E.1: Identify ways computers are used that have had an impact across the range of human activity and within different careers where they are used.

Unit 2: Equations, Ratios, and Proportions

Standards:

7.EE.B Solve real-life and mathematical problems using numerical and algebraic expressions and equations.

- 7.EE.B.3. Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. ***For example: If a woman making $25 an hour gets a 10% raise, she will make an additional 1/10 of her salary an hour, or $2.50, for a new salary of $27.50. If you want to place a towel bar 9 3/4 inches long in the center of a door that is 27 1/2 inches wide, you will need to place the bar about 9 inches from each edge; this estimate can be used as a check on the exact computation.***
- 7.EE.B.4. Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.
  - 7.EE.B.4(a). Solve word problems leading to equations of the form $px + q = r$ and $p(x + q) = r$, where p, q, and r are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach. ***For example, the perimeter of a rectangle is 54 cm. Its length is 6 cm. What is its width?***
  - 7.EE.B.4(b). Solve word problems leading to inequalities of the form $px + q > r$ or $px + q < r$, where p, q, and r are specific rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem. ***For example: As a salesperson, you are paid $50 per week plus $3 per sale. This week you want your pay to be at least $100. Write an inequality for the number of sales you need to make, and describe the solutions.*** ***(benchmarked).**

7.RP.A. Analyze proportional relationships and use them to solve real-world and mathematical problems.

- 7.RP.A.1. Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. ***For example, if a person walks 1/2 mile in each 1/4 hour, compute the unit rate as the complex fraction*** $\frac{1/2}{1/4}$ ***mph, equivalently 2 mph.***
- 7.RP.A.2. Recognize and represent proportional relationships between quantities.
  - 7.RP.A.2(a). Decide whether two quantities are in a proportional relationship, e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin.
  - 7.RP.A.2(b). Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.
  - 7.RP.A.2(c). Represent proportional relationships by equations. ***For example, if total cost t is proportional to the number n of items purchased at a constant price p, the relationship between the total cost and the number of items can be expressed as t = pn.***
  - 7.RP.A.2(d). Explain what a point *(x, y)* on the graph of a proportional relationship means in terms of the situation, with special attention to the points (0, 0) and (1, *r)* where *r* is the unit rate.

- 7.RP.A.3. Use proportional relationships to solve multistep ratio and percent problems. ***Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error.*** ***(benchmarked).**
- 7.G.A.1: Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.

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.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.

Essential Questions:	**Enduring Understanding:**
• What do variables represent when constructing simple equations and inequalities? • What is the difference between a ratio, rate, and unit rate? • When does proportional relationships exist? • How can you determine proportionality with a table, ratio, or graph? • Why do we represent numbers in different forms? • What is the purpose of finding a unit rate? • Why are the two measurements in a unit rate different?	**Learning Goal 1**: Solve multi-step real life and mathematical problems with rational numbers in any form (fractions, decimals) by applying properties of operations and converting rational numbers between forms as needed. Assess the reasonableness of answers using mental computation and estimation strategies. **Learning Goal 2***:* Use variables to represent quantities in a real-world or mathematical problem by constructing simple equations and inequalities to represent problems. **Learning Goal 3**: Fluently solve equations; solve inequalities, graph the solution set of the inequality and interpret the solutions in the context of the problem (*Equations of the form $px + q = r$ and $p(x + q) = r$ and inequalities of the form $px + q > r$, $px + q \geq r$, $px + q \leq r$, or $px + q < r$, where p, q, and r are specific rational numbers).* **Learning Goal 4**: Calculate and interpret unit rates of various quantities involving ratios of fractions that contain like and different units.

	Learning Goal 5: Determine if a proportional relationship exists between two quantities e.g. by testing for equivalent ratios in a table or graph on the coordinate plane and observing whether the graph is a straight line through the origin. **Learning Goal 6**: Identify the constant of proportionality (unit rate) from tables, graphs, equations, diagrams, and verbal descriptions. **Learning Goal 7**: Write equations to model proportional relationships in real world problems. **Learning Goal 8**: Use the graph of a proportional relationship to interpret the meaning of any point (x, y) on the graph in terms of the situation - including the points (0, 0) and (1, r), recognizing that r is the unit rate. **Learning Goal 9**: Solve multi-step ratio and percent problems using proportional relationships (*simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error).* **Learning Goal 10**: Use ratio and proportion to solve problems involving scale drawings of geometric figures. **8th Grade Learning Goals:** **Learning Goal 11**: Graph proportional relationships, interpreting slope as unit rate, and compare two proportional relationships, each represented in different. **Learning Goal 12**: 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.
Knowledge and Skills: **Concept 1**: Rational numbers can take different forms. **Concept 2**: Proportions represent equality between two ratios.	**Demonstration of Learning:** ***Students are able to: (TLWBAT/SWBAT):*** **Objective 1**: solve multi-step real-life problems using rational numbers in any form. Solve multi-step mathematical problems using rational numbers in any form.

Concept 3: Constant of proportionality. **Concept 4**: Recognize percent as a ratio indicating the quantity *per one hundred*. **Concept 5**: Scale and proportion. **8th Grade Concepts:** **Concept 6**: Quantitative relationships can be represented in different ways. **Concept 7**: Linear equations may have an infinite number of solutions. **Concept 8**: Linear equations may have no solution or a single solution.	**Objective 2:** convert between decimals and fractions and apply properties of operations when calculating with rational numbers. **Objective 3**: estimate to determine the reasonableness of answers. **Objective 4**: compare an arithmetic solution to a word problem to the algebraic solution of the word problem, identifying the sequence of operations in each solution. **Objective 5**: write an equation of the form px + q = r or p(x + q)=r in order to solve a word problem. **Objective 6**: fluently solve equations of the form px + q = r and p(x + q)= r. **Objective 7**: write an inequality of the form $px + q > r$, $px + q < r$, $px + q \geq r$ or $px + q \leq r$ to solve a word problem. Graph the solution set of the inequality. **Objective 8**: interpret the solution to an inequality in the context of the problem. **Objective 9**: compute unit rates with ratios of fractions. Write equations representing proportional relationships. **Objective 10**: compute unit rates with ratios of fractions representing measurement quantities in both like and different units of measure. **Objective 11**: use tables and graphs to determine if two quantities are in a proportional relationship. Interpret the origin and (1, r) on the graph of a proportional relationship in context. Interpret a point on the graph of a proportional relationship in context. **Objective 12**: identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships. Interpret the origin and (1, r) on the

	graph of a proportional relationship in context. Interpret a point on the graph of a proportional relationship in context. **Objective 13**: use proportions to solve multistep percent problems including simple interest, tax, markups, discounts, gratuities, commissions, fees, percent increase, percent decrease, percent error. Use proportions to solve multistep ratio problems. **Objective 14**: use ratios and proportions to create scale drawings. Reproduce a scale drawing at a different scale. Computing actual lengths and areas from a scale drawing. Solve problems involving scale drawings using proportions. **8th Grade Objectives:** **Objective 15**: graph proportional relationships. **Objective 16**: interpret unit rate as the slope of a graph. **Objective 17**: compare two different proportional relationships that are represented indifferent ways (table of values, equation, graph, verbal description). **Objective 18**: give examples of linear equations in one variable with one solution *(x = a),* infinitely many solutions *(a = a),* or no solutions *(a = b.)* **Objective 19**: transform a given equation, using the properties of equality, into simpler forms. **Objective 20**: 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 21**: solve linear equations that have fractional coefficients; include equations requiring use of the distributive property and collecting like terms.

Core Instructional and Supplemental Materials:	**Technology Integration**:	**Illustrative Mathematics Integration:**
Carter, John A., Ph.D., Cuevas, Gilbert Ph.D., Day, Roger Ph.D., Malloy, Carol Ph.D. *McGraw-Hill Education: Course 2 grade 7*. 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	• 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/	7.EE.B.3 Discounted Books 7.EE.B.3 Shrinking 7.EE.B.4 Fishing Adventures 2 7.EE.B.4, 7.NS.A.1 Bookstore Account 7.EE.B.4b Sports Equipment Set 7.RP.A.1 Cooking with the Whole Cup 7.RP.A.2 Sore Throats, Variation 1 7.RP.A.2 Buying Coffee 7.RP.A.2c Gym Membership Plans 7.G.A.1 Floor Plan 7.G.A.1 Map distance 8.EE.B.5 Who Has the Best Job? 8.EE.C.7 The Sign of Solutions

Suggested Activities:		
Smart Board guided notes Wipe off boards activity Graphic organizers Create foldable(s) Create vocabulary cards Graph paper	Rulers to create proportional relationships Teacher generated assessments Interactive on line activities Create a conversion chart of fractions and decimals and percent Justify as to why it is important to have a knowledge before purchasing store items for percent error Discount math stations	FACEing Math Activities Think Tac Toe Boards Create tables, graphs, and proportional relationship sentences based on real world extensions created by the teacher

Formative/Summative/Benchmark Assessments:

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

- iXL, Pre-assessments per grade level
- Linkit
- 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)

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

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: Probability and Statistics	Grade Level : Seventh
Unit 3: Drawing Inferences about Populations and Probability Models	Time Frame: January - February

Interdisciplinary Connections

ELA Connection:

Reading Literature

- RL.7.1. Cite several pieces of textual evidence and make relevant connections to support analysis of what the text says explicitly as well as inferences drawn from the text.

Informational Text Key Ideas

- RI.7.1. Cite several pieces of textual evidence and make relevant connections to support analysis of what the text says explicitly as well as inferences drawn from the text.
- RI.7.2. Determine two or more central ideas in a text and analyze their development over the course of the text; provide an objective summary of the text.

Comprehension and Collaboration

- SL.7.1: Engage effectively in a range of collaborative discussions (one-to-one, in groups, and teacher-led) with diverse partners on grade 7 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, track progress toward specific goals and deadlines, and define individual roles as needed
    - C. Pose questions that elicit elaboration and respond to others' questions and comments with relevant observations and ideas that bring discussion back on topic as needed.
    - D. Acknowledge new information expressed by others and, when warranted, modify their own ideas.
- SL. 7.2. Analyze the main ideas and supporting details presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how the ideas clarify a topic, text, or issue under study.
- SL.7.3. Delineate a speaker's argument and specific claims, evaluating claims the soundness of the reasoning and the relevance and sufficiency of the evidence.

Presentation of Knowledge and Ideas

- SL.7.4 Present claims and findings, emphasizing salient points in a focused, coherent manner with pertinent descriptions, facts, details, and examples; use appropriate eye contact, adequate volume, and clear pronunciation.
- SL.7.5 Include multimedia components and visual displays in presentations to clarify claims and findings and emphasize salient points.
- SL.7.6. Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate.

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.

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.

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.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.

8.2.8.D.3: Build a prototype that meets a STEM-based design challenge using science, engineering, and math principles that validate a solution.

Unit 3: Drawing Inferences about Populations and Probability Models

Standards:

7.SP.A. Use random sampling to draw inferences about a population

- 7.SP.A.1. Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences.
- 7.SP.A.2. Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions. ***For example, estimate the mean word length in a book by randomly sampling words from the book; predict the winner of a school election based on randomly sampled survey data. Gauge how far off the estimate or prediction might be.***

7.SP.C. Investigate chance processes and develop, use, and evaluate probability models.

- 7.SP.C.5. Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around 1/2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.
- 7.SP.C.6. Approximate the probability of a chance event by collecting data on the chance process that produces it and observing its long-run relative frequency, and predict the approximate relative frequency given the probability. ***For example, when rolling a number cube 600 times, predict that a 3 or 6 would be rolled roughly 200 times, but probably not exactly 200 times.***
- 7.SP.C.7. Develop a probability model and use it to find probabilities of events. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy.
  - 7.SP.C.7(a). Develop a uniform probability model by assigning equal probability to all outcomes, and use the model to determine probabilities of events. ***For example, if a student is selected at random from a class, find the probability that Jane will be selected and the probability that a girl will be selected.***
  - 7.SP.C.7(b) Develop a probability model (which may not be uniform) by observing frequencies in data generated from a chance process. ***For example, find the approximate probability that a spinning penny will land heads up or that a tossed paper cup will land open-end down. Do the outcomes for the spinning penny appear to be equally likely based on the observed frequencies?***
- 7.SP.C.8. Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation.
  - 7.SP.C.8(a). Understand that, just as with simple events, the probability of a compound event is the fraction of outcomes in the sample space for which the compound event occurs.
  - 7.SP.C.8b. Represent sample spaces for compound events using methods such as organized lists, tables and tree diagrams. For an event described in everyday language (e.g., “rolling double sixes”), identify the outcomes in the sample space which compose the event.

- 7.SP.C.8c. Design and use a simulation to generate frequencies for compound events. ***For example, use random digits as a simulation tool to approximate the answer to the question: If 40% of donors have type A blood, what is the probability that it will take at least 4 donors to find one with type A blood?***

7.SP.B. Draw informal comparative inferences about two populations.

- 7.SP.B.3. Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities, measuring the difference between the centers by expressing it as a multiple of a measure of variability. ***For example, the mean height of players on the basketball team is 10 cm greater than the mean height of players on the soccer team, about twice the variability (mean absolute deviation) on either team; on a dot plot, the separation between the two distributions of heights is noticeable.***
- 7.SP.B.4. Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations. ***For example, decide whether the words in a chapter of a seventh-grade science book are generally longer than the words in a chapter of a fourth-grade science book.***

Essential Questions:	**Enduring Understanding:**
• What is the relationship between a sample and a population? • Why would one want to compare two populations? • What does the shape of data in a display tell one about the data? • What real-life applications would involve finding the probability of an event? • What is the purpose of a simulation? • Why would one need to use a probability model?	**Learning Goal 1**: Distinguish between representative and non-representative samples of a population (*e.g. if the class had 50% girls and the sample had 10% girls, then that sample was not representative of the population*). **Learning Goal 2***:* Use random sampling to produce a representative sample. **Learning Goal 3**: Develop inferences about a population using data from a random sample and assess the variation in estimates after generating multiple samples of the same size. **Learning Goal 4**: Visually compare the means of two distributions that have similar variability; express the difference between the centers as a multiple of a measure of variability. **Learning Goal 5**: Draw informal comparative inferences about two populations using their measures of center and measures of variability.

	Learning Goal 6: Interpret and express the likelihood of a chance event as a number between 0 and 1, relating that the probability of an unlikely event happening is near 0, a likely event is near 1, and 1/2 is neither likely nor unlikely. **Learning Goal 7**: Approximate the probability of a chance event by collecting data and observing long-run relative frequency; predict the approximate relative frequency given the probability. **Learning Goal 8**: Develop a uniform probability model by assigning equal probability to all outcomes; develop probability models by observing frequencies and use the models to determine probabilities of events; compare probabilities from a model to observed frequencies and explain sources of discrepancy when agreement is not good. **Learning Goal 9**: Represent sample spaces for compound events using methods such as organized lists, tables and tree diagrams, identifying the outcomes in the sample space which compose the event. Use the sample space to find the probability of a compound event. **Learning Goal 10**: Design and use a simulation to generate frequencies for compound events.
Knowledge and Skills: **Concept 1**: Inferences can be drawn from random sampling. **Concept 2**: Probability of a chance event is a number between 0 and 1. **Concept 3**: Probability expresses the likelihood of the event occurring. Larger probability indicates greater likelihood. **Concept 4**: Relative frequency, Experimental probability, AND Theoretical probability similarity and differences. **Concept 5**: Uniform (equally likely) and non-uniform probability models.	**Demonstration of Learning:** ***Students are able to: (TLWBAT/SWBAT):*** **Objective 1**: analyze and distinguish between representative and non-representative samples of a population. **Objective 2:** analyze data from a sample to draw inferences about the population. Generate multiple random samples of the same size. analyze the variation in multiple random samples of the same size. **Objective 3**: locate, approximately, the measure of center (mean or median) of a distribution visually assess, given a distribution, the measure of spread (mean absolute deviation or inter-quartile range).

Concept 6: Just as with simple events, the probability of a compound event is the fraction of outcomes in the sample space.	**Objective 4**: visually compare two numerical data distributions and describe the degree of overlap. Measure or approximate the difference between the measures centers and express it as a multiple of a measure of variability. **Objective 5**: using measures of center, draw informal inferences about two populations and compare the inferences. **Objective 6**: using measures of variability, draw informal inferences about two populations and compare the inferences. **Objective 7**: draw conclusions about the likelihood of events given their probability. **Objective 8**: collect data on chance processes, noting the long-run relative frequency. Predict the approximate relative frequency given the theoretical probability. **Objective 9**: develop a uniform probability model. Use a uniform probability model to determine the probabilities of events. **Objective 10**: develop (non-uniform) probability models by observing frequencies in data that has been generated from a chance process. **Objective 11**: use organized lists, tables, and tree diagrams to represent sample spaces. **Objective 12**: given a description of an event using everyday language, identify the outcomes in a sample space that make up the described event. **Objective 13**: design simulations. use designed simulations to generate frequencies for compound events.

Core Instructional and Supplemental Materials:	**Technology Integration**:	**Illustrative Mathematics Integration:**
Carter, John A., Ph.D., Cuevas, Gilbert Ph.D., Day, Roger Ph.D., Malloy, Carol Ph.D.. *McGraw-Hill Education: Accelerated Pre-Algebra grade 7*. 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	• 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/	• 7.SP.A.1 Mr. Briggs Class Likes Math • 7.SP.A.2 Valentine Marbles • 7.SP.B.3,4 College Athletes • 7.SP.B.3,4 Offensive Linemen • 7.SP.C.6 Heads or Tails • 7.SP.C.7, 6 Rolling Dice • 7.SP.C.7a How Many Buttons • 7.SP.C.8 Tetrahedral Dice • 7.SP.C.8 Waiting Times

Suggested Activities:		
Collect and use multiple samples of data to answer questions about a population Generate multiple samples Compare two sets of data using measures of center and variability	Represent sample spaces using organized lists, tables, tree diagrams, and simulations Identify the outcomes in the sample space which compose the event Design and use simulation to generate frequencies for compound event	Experimental Probability games Theoretical Probability games Simulations word problem games Create bar graphs, box and whisker plots, line plots, and pie charts.

Formative/Summative/Benchmark Assessments:

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

- iXL, Pre-assessments per grade level
- Linkit
- 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)

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: Geometry	Grade Level : Seventh
Unit 4: Problem Solving with Geometry	Time Frame: March - May

Interdisciplinary Connections

ELA Connection:

Reading Literature

- RL.7.1. Cite several pieces of textual evidence and make relevant connections to support analysis of what the text says explicitly as well as inferences drawn from the text.

Informational Text Key Ideas

- RI.7.1. Cite several pieces of textual evidence and make relevant connections to support analysis of what the text says explicitly as well as inferences drawn from the text.
- RI.7.2. Determine two or more central ideas in a text and analyze their development over the course of the text; provide an objective summary of the text.

Comprehension and Collaboration

- SL.7.1: Engage effectively in a range of collaborative discussions (one-to-one, in groups, and teacher-led) with diverse partners on grade 7 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, track progress toward specific goals and deadlines, and define individual roles as needed
    - C. Pose questions that elicit elaboration and respond to others' questions and comments with relevant observations and ideas that bring discussion back on topic as needed.
    - D. Acknowledge new information expressed by others and, when warranted, modify their own ideas.
- SL. 7.2. Analyze the main ideas and supporting details presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how the ideas clarify a topic, text, or issue under study.
- SL.7.3. Delineate a speaker's argument and specific claims, evaluating claims the soundness of the reasoning and the relevance and sufficiency of the evidence.

Presentation of Knowledge and Ideas

- SL.7.4 Present claims and findings, emphasizing salient points in a focused, coherent manner with pertinent descriptions, facts, details, and examples; use appropriate eye contact, adequate volume, and clear pronunciation.
- SL.7.5 Include multimedia components and visual displays in presentations to clarify claims and findings and emphasize salient points.
- SL.7.6. Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate.

NGSS Connection:

MS-PS2 Motion and Stability: Forces and Interactions

- MS-PS2-1. Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.
    - **Cross cutting concepts to NJSLS math standard(s): 7. EE.B.4** Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.
- MS-PS2-2. Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.
    - **Cross cutting concepts to NJSLS math standard(s): 7. EE.B.4** Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.

MS-ESS1 Earth's Place in the Universe

- MS-ESS1-2. Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.
    - **Cross cutting concepts to NJSLS math standard(s): 7. EE.B.4** Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.
- MS-ESS1-4. Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize Earth's 4.6-billion-year-old history.
    - **Cross cutting concepts to NJSLS math standard(s): 7. EE.B.4** Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.

MS-ESS3 Earth and Human Activity

- MS-ESS3-1. Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes.
    - **Cross cutting concepts to NJSLS math standard(s): 7. EE.B.4** Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.
- MS-ESS3-2. Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.
    - **Cross cutting concepts to NJSLS math standard(s): 7. EE.B.4** Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.
- MS-ESS3-3. Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.
    - **Cross cutting concepts to NJSLS math standard(s): 7. EE.B.4** Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.
- MS-ESS3-4. Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.
    - **Cross cutting concepts to NJSLS math standard(s): 7. EE.B.4** Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.

- MS-ESS3-5. Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.
    - **Cross cutting concepts to NJSLS math standard(s): 7. EE.B.4** Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.

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 A: INCOME AND CAREERS
9.1.8.A.4 Relate earning power to quality of life across cultures.
9.1.8.A.5 Relate how the demand for certain skills determines an individual's earning power.

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.

8.1 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. Creativity and Innovation: *Students demonstrate creative thinking, construct knowledge and develop innovative products and process using technology.*

Apply existing knowledge to generate new ideas, products, or processes.

8.1.8.B.1: Synthesize and publish information about a local or global issue or event (ex. telecollaborative project, blog, school web).

Unit 4: Problem Solving with Geometry

Standards:

7.G.A Draw, construct, and describe geometrical figures and describe the relationships between them.

- 7.G.A.2. Draw **(with technology, with ruler and protractor as well as freehand)** geometric shapes with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle.
- 7.G.A.3. Describe the two-dimensional figures that result from slicing three-dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids.

7.G.B. Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.

- 7.G.B.4: Know the formulas for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle.
- 7.G.B.5. Use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure.
- 7.G.B.6. Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.

7.EE.B. Solve real-life and mathematical problems using numerical and algebraic expressions and equations.

- 7.EE.B.4. Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.
  - 7.EE.B.4(a). Solve word problems leading to equations of the form $px + q = r$ and $p(x + q) = r$, where p, q, and r are specific rational numbers. Solve equations of these forms fluently.
  - 7.EE.B.4(a). Solve word problems leading to equations of the form $px + q = r$ and $p(x + q) = r$, where p, q, and r are specific rational numbers. Solve equations of these forms fluently. **Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach.** ***For example, the perimeter of a rectangle is 54 cm. Its length is 6 cm. What is its width?***

7.RP.A. Analyze proportional relationships and use them to solve real-world and mathematical problems.

- 7.RP.A.3. Use proportional relationships to solve multistep ratio and percent problems. ***Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error*** ***(benchmarked).**

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.***

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.

Essential Questions:	**Enduring Understanding:**
• When would one want to find area of a figure? • When would one want to find surface area of a figure? • When would one want to find volume of a figure? • How would changing the radius or diameter of a circle affect its circumference and area? • 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 1**: Know the formulas for the area and circumference of a circle and use them to solve problems. Give an informal derivation of the relationship between the circumference and area of a circle. **Learning Goal 2**: Write and solve simple multi-step algebraic equations involving supplementary, complementary, vertical, and adjacent angles. **Learning Goal 3**: Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms. **Learning Goal 4**: Use freehand, mechanical (i.e. ruler, protractor) and technological tools to draw geometric shapes with given conditions (e.g. scale factor), focusing on constructing triangles. **Learning Goal 5**: Describe all of the 2-dimensional figures that result when a 3-dimemsional figures are sliced from multiple angles.

	Learning Goal 6: Fluently solve simple equations of the form px + q = r and p(x + q) = r, where p, q, and r are specific rational numbers. **Learning Goal 7**: Solve multi-step ratio and percent problems using proportional relationships (simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error). **8th Grade Learning Goals:** **Learning Goal 8**: 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. **Learning Goal 9**: 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 10**: 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 11**: 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 12**: 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 13**: 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 14:** 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:	**Demonstration of Learning:** ***Students are able to: (TLWBAT/SWBAT):***
Concept 1: Circumference **Concept 2**: Conditions for unique triangles, more than one triangle, and no triangle. **Concept 3**: Cross-sections of three-dimensional objects **Concept 4**: Recognize percent as a ratio indicating the quantity *per one hundred.* **8th Concepts:** **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. **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. **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. **Concept 8:** Congruent figures are also similar.	**Objective 1**: solve problems by finding the area and circumference of circles. show that the area of a circle can be derived from the circumference. **Objective 2:** use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations. Solve mathematical problems by writing and solving simple algebraic equations based on the relationships between and properties of angles (supplementary, complementary, vertical, and adjacent. **Objective 3**: solve real-world and mathematical problems involving area of two dimensional objects composed of triangles, quadrilaterals, and polygons. **Objective 4**: solve real-world and mathematical problems involving volume of three dimensional objects composed of cubes and right prisms. **Objective 5**: solve real-world and mathematical problems involving surface area of three-dimensional objects composed of cubes and right prisms. **Objective 6**: draw geometric shapes with given conditions, including constructing triangles from three measures of angles or sides. Recognize conditions determining a unique triangle, more than one triangle, or no triangle. **Objective 7**: analyze three dimensional shapes (right rectangular pyramids and prisms) by examining and describing all of the 2-dimensional figures that result from slicing it at various angles. **Objective 8**: write an equation of the form $px + q = r$ or $p(x + q)=r$ in order to solve a word problem. Fluently solve equations of the form $px + q = r$ and $p(x + q)= r$.

	Objective 9: use proportions to solve multistep percent problems including simple interest, tax, markups, discounts, gratuities, commissions, fees, percent increase, percent decrease, percent error. Use proportions to solve multistep ratio problems. **8th grade Objectives:** **Objective 10**: solve equations of the form $x^3 = p$, where p is a positive rational number. **Objective 11**: use the cube root symbol to represent solutions to equations of the form $x^3 = p$. **Objective 12**: show or explain that $\sqrt{2}$ is an irrational number. **Objective 13**: use volume formulas to find a single unknown dimension of cones, cylinders and spheres when solving real world problems. **Objective 14**: show and explain that performing rotations, reflections, and translations on lines results in a line. **Objective 15**: show and explain that performing rotations, reflections, and translations on parallel lines results in parallel lines. **Objective 16**: 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 17**: 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 18:** 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 19**: given two congruent figures, describe a transformation or sequence of transformations that shows the congruence between them.

	Objective 20: describe, using coordinates, the resulting two-dimensional figure after applying dilations with scale factor greater than, less than, and equal to 1. **Objective 21**: describe, using coordinates, the resulting two-dimensional figure after applying translation, rotation, and reflection. **Objective 22**: describe a transformation or sequence of transformations that show the similarity between them given two similar two-dimensional figures. **Objective 23**: 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 24**: 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: Accelerated Pre-Algebra grade 7*. 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	**Illustrative Mathematics Integration:** 7.G.B.4 Wedges of a Circle 7.G.B.4 Eight Circles 7.G.B.6, 7.RP.A.3 Sand under the Swing Set 7.G.A.2 A task related to 7.G.A.2 7.G.A.3 Cube Ninjas! 7.RP, 7.EE, 7.NS Drill Rig 7.RP.A.3, 7.EE.B.3,4 Gotham City Taxis 8.G.A.1 Reflections, Rotations, and Translations 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

	• https://www.illustrativemathematics.org/ • http://www.nctm.org/ • http://nlvm.usu.edu/ • http://illuminations.nctm.org/ • https://www.explorelearning.com/	
Suggested Activities: Straw activity to explain the property of two sides of a triangle must be greater than the third side. (drawing triangles) Math lab activity on how the area of a circle formula is constructed Math stations leveled by instruction Area and Circumference of a circle activity (circle manipulatives)	Use a protractor to prove which angles are congruent when parallel lines are cut by a transversal Cut three angles in a triangle and line them up to prove that their sum is 180 degrees Use tangram pieces to model and trace translations, rotations and reflections Fill 3D shapes with uncooked rice to identify the fractional difference between the formulas of pyramids and cones as compared to prisms and cylinders	Volume and Surface Area robot project Volume and Surface Area mobile project FACEing math activities Roller coaster design Nets lab activity

Formative/Summative/Benchmark Assessments:

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

- iXL, Pre-assessments per grade level
- Linkit
- 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)

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 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

Content Area: Pre-Algebra	Grade Level : Seventh
Unit 5: 8th Grade Material	Time Frame: June

Interdisciplinary Connections

ELA Connection:

Reading Literature

- RL.7.1. Cite several pieces of textual evidence and make relevant connections to support analysis of what the text says explicitly as well as inferences drawn from the text.

Informational Text Key Ideas

- RI.7.1. Cite several pieces of textual evidence and make relevant connections to support analysis of what the text says explicitly as well as inferences drawn from the text.
- RI.7.2. Determine two or more central ideas in a text and analyze their development over the course of the text; provide an objective summary of the text.

Comprehension and Collaboration

- SL.7.1: Engage effectively in a range of collaborative discussions (one-to-one, in groups, and teacher-led) with diverse partners on grade 7 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, track progress toward specific goals and deadlines, and define individual roles as needed
    - C. Pose questions that elicit elaboration and respond to others' questions and comments with relevant observations and ideas that bring discussion back on topic as needed.
    - D. Acknowledge new information expressed by others and, when warranted, modify their own ideas.
- SL. 7.2. Analyze the main ideas and supporting details presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how the ideas clarify a topic, text, or issue under study.
- SL.7.3. Delineate a speaker's argument and specific claims, evaluating claims the soundness of the reasoning and the relevance and sufficiency of the evidence.

Presentation of Knowledge and Ideas

- SL.7.4 Present claims and findings, emphasizing salient points in a focused, coherent manner with pertinent descriptions, facts, details, and examples; use appropriate eye contact, adequate volume, and clear pronunciation.
- SL.7.5 Include multimedia components and visual displays in presentations to clarify claims and findings and emphasize salient points.
- SL.7.6. Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate.

NGSS Connection:

MS-PS2 Motion and Stability: Forces and Interactions

- MS-PS2-1. Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.
    - **Cross cutting concepts to NJSLS math standard(s): 7. EE.B.4** Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.
- MS-PS2-2. Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.
    - **Cross cutting concepts to NJSLS math standard(s): 7. EE.B.4** Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.

MS-ESS1 Earth's Place in the Universe

- MS-ESS1-2. Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.
    - **Cross cutting concepts to NJSLS math standard(s): 7. EE.B.4** Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.
- MS-ESS1-4. Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize Earth's 4.6-billion-year-old history.
    - **Cross cutting concepts to NJSLS math standard(s): 7. EE.B.4** Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.

MS-ESS3 Earth and Human Activity

- MS-ESS3-1. Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes.
    - **Cross cutting concepts to NJSLS math standard(s): 7. EE.B.4** Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.
- MS-ESS3-2. Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.
    - **Cross cutting concepts to NJSLS math standard(s): 7. EE.B.4** Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.
- MS-ESS3-3. Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.
    - **Cross cutting concepts to NJSLS math standard(s): 7. EE.B.4** Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.
- MS-ESS3-4. Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.
    - **Cross cutting concepts to NJSLS math standard(s): 7. EE.B.4** Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.

- MS-ESS3-5. Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.
    - **Cross cutting concepts to NJSLS math standard(s): 7. EE.B.4** Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.

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): 7.RP.A.2** Recognize and represent proportional relationships between quantities.
- 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): 7.RP.A.2** Recognize and represent proportional relationships between quantities.

MS-LS4 Biological Evolution: Unity and Diversity

- MS-LS4-4. Construct an explanation based on evidence that describes how genetic variations of traits in a population increase some individuals' probability of surviving and reproducing in a specific environment.
    - **Cross cutting concepts to NJSLS math standard(s): 7.RP.A.2** Recognize and represent proportional relationships between quantities.
- MS-LS4-6. Use mathematical representations to support explanations of how natural selection may lead to increases and decreases of specific traits in populations over time.
    - **Cross cutting concepts to NJSLS math standard(s): 7.RP.A.2** Recognize and represent proportional relationships between quantities.

8th Grade Interdisciplinary Connections

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.

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.

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.4 Relate earning power to quality of life across cultures.
9.1.8.A.5 Relate how the demand for certain skills determines an individual's earning power.

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.

E. 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.

8.1 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. Creativity and Innovation: *Students demonstrate creative thinking, construct knowledge and develop innovative products and process using technology.*

Apply existing knowledge to generate new ideas, products, or processes.

8.1.8.B.1: Synthesize and publish information about a local or global issue or event (ex. telecollaborative project, blog, school web).

Unit 5: 8th Grade Material

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.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.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.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.***

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.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.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.

7.RP.A. Analyze proportional relationships and use them to solve real-world and mathematical problems.

- 7.RP.A.2. Recognize and represent proportional relationships between quantities.
  - 7.RP.A.2(b). Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.
  - 7.RP.A.2(c). Represent proportional relationships by equations. ***For example, if total cost t is proportional to the number n of items purchased at a constant price p, the relationship between the total cost and the number of items can be expressed as t = pn.***
  - 7.RP.A.2(d). Explain what a point *(x, y)* on the graph of a proportional relationship means in terms of the situation, with special attention to the points (0, 0) and (1, *r)* where *r* is the unit rate.

7.EE.B Solve real-life and mathematical problems using numerical and algebraic expressions and equations.

- 7.EE.B.4. Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.
  - 7.EE.B.4(a). Solve word problems leading to equations of the form $px + q = r$ and $p(x + q) = r$, where p, q, and r are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach. ***For example, the perimeter of a rectangle is 54 cm. Its length is 6 cm. What is its width?***
  - 7.EE.B.4(b). Solve word problems leading to inequalities of the form $px + q > r$ or $px + q < r$, where p, q, and r are specific rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem. ***For example: As a salesperson, you are paid $50 per week plus $3 per sale. This week you want your pay to be at least $100. Write an inequality for the number of sales you need to make, and describe the solutions.*** ***(benchmarked).**

Essential Questions:	**Enduring Understanding:**
• What is the purpose of the Pythagorean Theorem? • Why does one need to express a number in a form with integer exponents? • Why does one need to write numbers in scientific notation?	**8th Grade Learning Goals:** **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.

• What is the advantage of performing operations on numbers expressed in scientific notation rather than numbers in standard form? • Why does one need to define a function? • When should functions be evaluated and compared? • 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? • Why does one need to perform transformations on figures? • How does knowing two figures are congruent or similar help one to solve problems?	**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**: 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. **Learning Goal 5**: 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 6**: 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 7**: 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 8**: 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 9***:* 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. **Learning Goal 10**: Explain a proof of the Pythagorean Theorem and its converse.

	Learning Goal 11: 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 12**: Use the Pythagorean Theorem to determine the distance between two points in the coordinate plane. **Learning Goal 13**: Represent a rational number with its decimal expansion, showing that it eventually repeats, and convert such decimal expansions into rational numbers. **Learning Goal 14:** 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 15:** 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. **7th Concepts:** **Learning Goal 16:** Determine if a proportional relationship exists between two quantities e.g. by testing for equivalent ratios in a table or graph on the coordinate plane and observing whether the graph is a straight line through the origin. **Learning Goal 17:** Identify the constant of proportionality (unit rate) from tables, graphs, equations, diagrams, and verbal descriptions. **Learning Goal 18:** Write equations to model proportional relationships in real world problems. **Learning Goal 19:** Use the graph of a proportional relationship to interpret the meaning of any point (x, y) on the graph in terms of the situation - including the points (0, 0) and (1, r), recognizing that r is the unit rate. **Learning Goal 20:** Use variables to represent quantities in a real-world or mathematical problem by constructing simple equations and inequalities to represent problems.

	Learning Goal 21: Fluently solve equations; solve inequalities, graph the solution set of the inequality and interpret the solutions in the context of the problem (*Equations of the form px + q = r and p(x + q) = r and inequalities of the form px + q > r, px + q ≥r, px+ q ≤ r, or px + q < r, where **p, q, and r** are specific rational numbers).*
Knowledge and Skills: **8th Concepts:** **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**: Square root and cube roots; perfect squares and perfect cubes **Concept 4**: Inverse relationship between powers and square roots **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. **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. **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. **Concept 8:** Congruent figures are also similar.	**Demonstration of Learning:** ***Students are able to: (TLWBAT/SWBAT):*** **8th grade Objectives:** **Objective 1**: apply properties of exponents to numerical expressions. Generate equivalent numerical expressions using positive and negative integer exponents. Find volume of cones, cylinders and spheres using to solve real world problems. **Objective 2:** estimate very large and very small quantities with numbers expressed in the form of a single digit times an integer power of 10. **Objective 3:** 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 4:** 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 5:** 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 6:** use scientific notation and choose units of appropriate size for measurements of very large or very small quantities. **Objective 7:** 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 8**: use function language. Describe a function as providing a single output for each input.

Concept 9: Pythagorean Theorem **Concept 10:** 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). **Concept 11:** Numbers that are not rational are irrational. **Concept 12:** Every number has a decimal expansion. **Concept 13:** Rational approximation of irrational numbers **Concept 14:** A function is a rule. **Concept 15:** If a rule is a function, then for each input there is exactly one output. **7th grade Concepts:** **Concept 16:** Proportions represent equality between two ratios. **Concept 17:** Constant of proportionality.	**Objective 9**: determine whether non-numerical relationships are functions. Describe a function as a set of ordered pairs. **Objective 10**: read inputs and outputs from a graph. Describe the ordered pairs as containing an input, and the corresponding output. **Objective 11**: compare decimal expansions of rational and irrational numbers. Represent a rational number with its decimal expansion, showing that it repeats eventually. Convert a decimal expansion (which repeats eventually) into a rational number. **Objective 12**: compare irrational numbers by replacing each with its rational approximation. **Objective 13**: locate rational approximations on a number line. Estimate the value of expressions containing irrational numbers. **Objective 14**: show and explain that performing rotations, reflections, and translations on lines results in a line. 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 15**: show and explain that performing rotations, reflections, and translations on parallel lines results in parallel lines. 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 16**: 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 17**: given two congruent figures, describe a transformation or sequence of transformations that shows the congruence between them **Objective 18**: describe, using coordinates, the resulting two-dimensional figure after applying dilations with scale factor greater than, less than, and equal to 1.

	Objective 19: describe, using coordinates, the resulting two-dimensional figure after applying translation, rotation, and reflection. **Objective 20**: describe a transformation or sequence of transformations that show the similarity between them given two similar two-dimensional figures. **Objective 21**: give informal arguments to establish facts about the angle sum of triangles. **Objective 22**: give informal arguments to establish facts about exterior angles of triangles. **Objective 23:** give informal arguments to establish facts about the angles created when parallel lines are cut by a transversal. Give informal arguments to establish the angle-angle criterion for similarity of triangles. **Objective 24**: given a proof of the Pythagorean theorem, explain the proof. Given a proof of the converse of the Pythagorean theorem, explain the proof. **Objective 25**: determine side lengths of right triangles by applying the Pythagorean Theorem to solve real world and mathematical problems involving two dimensional spaces. **Objective 26**: determine side lengths of right triangles by applying the Pythagorean Theorem to solve real world and mathematical problems involving three dimensional spaces. **Objective 27:** determine the distance between two points in a coordinate plane by drawing a right triangle and applying the Pythagorean Theorem. **7th Objectives:** **Objective 28**: compare an arithmetic solution to a word problem to the algebraic solution of the word problem, identifying the sequence of operations in each solution.

	Objective 29: write an equation of the form px + q = r or p(x + q)=r in order to solve a word problem. Fluently solve equations of the form px + q = r and p(x + q)= r. Write an inequality of the form $px + q > r$, $px + q < r$, $px + q \geq r$ or $px + q \leq r$ to solve a word problem. **Objective 30**: graph the solution set of the inequality and interpret the solution to an inequality in the context of the problem. **Objective 31**: use tables and graphs to determine if two quantities are in a proportional relationship. **Objective 32**: identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships. **Objective 33**: write equations representing proportional relationships. Interpret the origin and (1, r) on the graph of a proportional relationship in context. Interpret a point on the graph of a proportional relationship in context.	
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: Accelerated Pre-Algebra grade 7*. 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	**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/	**Illustrative Mathematics Integration:** 7.RP, 7.EE, 7.NS Drill Rig 7.RP.A.3, 7.EE.B.3,4 Gotham City Taxis 7.EE.B.4 Fishing Adventures 2 7.EE.B.4, 7.NS.A.1 Bookstore Account 7.EE.B.4b Sports Equipment Set 7.RP.A.2 Sore Throats, Variation 1 7.RP.A.2 Buying Coffee 8.EE.A.1 Extending the Definitions of Exponents 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

<table>
<tr>
<td>

- Reference sheets created by teachers
- Vocabulary Activities/Math Word Wall
- Problem of the day(s)/Weeks

</td>
<td>

- 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/

</td>
<td>

8.G.A.1 Reflections, Rotations, and Translations
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
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.F.A.1 Function Rules

</td>
</tr>
<tr>
<td>

Suggested Activities:
Straw activity to explain the property of two sides of a triangle must be greater than the third side. (drawing triangles)

Math stations leveled by instruction

</td>
<td>

Use a protractor to prove which angles are congruent when parallel lines are cut by a transversal

FACEing math activities

Roller coaster design

</td>
<td>

Volume and Surface Area robot project

Volume and Surface Area mobile project

Nets lab activity

</td>
</tr>
<tr>
<td colspan="3">

Formative/Summative/Benchmark Assessments:

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

- iXL, Pre-assessments per grade level
- Linkit
- 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)

</td>
</tr>
</table>

- Assessment Masters – Diagnostic Test for each unit Chapter Test – on level (2A)

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 5: 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, and 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, and 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, and 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, and 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