Pacing Guide For Math Curriculum

Grade 8

Topic	**Marking Period**	**Number of Days**
The Number System	MP1	12 weeks
Expressions and Equations	MP 1	12 weeks
Functions	MP 2	4 weeks
Geometry	MP 3	6 weeks
Statistics and Probability	MP 4	6 weeks

Alpha Public School
Math Curriculum Map

Grade: 8th grade

Unit: The Number System	**Content Topic:** Know that there are numbers that are not rational and approximate them by rational numbers

Standard	**Disciplinary Core Ideas / Essential Statement / Objective**
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.NS.A.3	Understand that the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational.

Practices / Skills & Lesson / Learning Activities

- Know that there are numbers that are not rational, and approximate them by rational numbers
- Expressions and Equations work with radicals and integer exponents
- Find the squares and square roots of both rational and integer exponents
- Know the perfect squares. They will also be able to simplify perfect square radical expressions as well as non-perfect square radicands. Use the perfect squares to approximate square roots. Understand the properties of exponents and will use them to solve equations with perfect square and cube roots.
    - Use their understanding of square roots to simplify roots of variables
    - Evaluate square and cube roots of perfect square and cubes to solve equations
    - Expressions and equations work with radical and integer exponents
    - Express numbers using scientific notation
    - Recognize the difference between scientific notation and standard form
    - Distinguish the difference between different numbers written in scientific notation
    - Solve equations with addition, subtraction, multiplication, and division using numbers in scientific notation

Whole Group-
- Introduction to check for previous understanding
- Class discussion
- Structured notes and examples

Individual-
- Provide opportunity for individual practice
- Tiered level questions

Small Group-
- Partner work
- Mini lesson
- Use of manipulatives
- Centers
- Investigations

Alpha Public School
Math Curriculum Map

Formative, Summative and Alternative Assessments	Benchmark Assessments	Core Instructional and Supplemental Materials (including various texts at each grade level)
● Quizzes ● Homework / classwork ● Question and Answer ● Teacher anecdotal notes ● IXL Summative- ● Unit test Alternative- ● Choice boards / projects ● Skits ● Demonstration ● Self-assessment ● Conferencing	● Module / Unit assessment ● Mid term ● Final ● IXL Diagnostic	● IXL ● Teacher created materials and assessments ● Khan academy ● Calculators ● National Library of Virtual Manipulatives ● Desmos

Technology	Crosscutting Concepts / Interdisciplinary Connections across grade levels and content areas (at least 1 must be in ELA)
8.1.8.DA.1- Organize and transform data collected using computational tools to make it usable for a specific purpose 8.1.8.DA.4- transform data to remove errors and improve the accuracy of the data for analysis 8.1.8.AP.2- Create clearly named variables that represent different data types and perform operations on their values 8.1.8.AP.6- Refine a solution that meets users' needs by incorporating feedback from team members and users	ELA-L.KL.8.2.A-Acquire and use accurately grade-appropriate general academic and domain-specific words and phrases ELA-W.AW.8.1.B-Support claim(s) with logical reasoning and relevant, using relevant, accurate data and evidence, that demonstrate an understanding of the topic or text, using credible sources ELA-SL.II.8.2-Analyze the purpose of information presented in diverse media and formats (e.g., visually, quantitatively, orally) and evaluate the motives (e.g., social, commercial, political) behind its presentation Science-MS-ETS1-3 Sometimes parts of different solutions can be combined to create a solution that is better than any of its predecessors (ETS1.B)

Differentiation (IEPs / 504s)	Differentiation (ELL)	Differentiation (G &T)
● Printed copy of board work / notes provided ● Additional time for skill mastery ● Assistive technology ● Center-based instruction ● Check work frequently for understanding ● Computer or electronic divide utilization ● Extended time on tests /	● Allow students to correct errors (looking for understanding) ● Teaching key aspects of a topic, eliminate nonessential information using videos, illustrations, pictures, and drawings to explain or clarify ● Allowing products (projects, timelines, demonstrations,	● Alternative formatives and summative assessments ● Choice boards ● Games and tournaments ● Group investigations ● Independent research and projects interest groups ● Learning contracts ● Leveled rubrics ● Multiple intelligence options

quizzes ● Have student repeat directions to check for understanding ● Modified assignment format ● Modified test content ● Modified test format ● Modified test length ● Multiple test sessions ● Multi-sensory presentation ● Preferential seating ● Preview of content, concepts, and vocabulary ● Reduced / shortened written assignments ● Secure attention before giving ● Instruction / directions ● Shortened assignments ● Student working with an assigned partner ● Teacher initiated weekly assignment sheet ● Choice of activities ● Exploration by interest ● Flexible grouping ● Goal setting with students ● Mini-workshops to reteach or extend skills ● Open ended activities ● Think-pair-share ● Varied supplemental materials ● Allowing students to correct errors (looking for understanding) ● Teaching key aspects of a topic eliminates nonessential information allowing products (projects, timelines, demonstrations, models, drawings, diorama, poster boards, charts, graphs, slideshows, videos, etc). To demonstrate students learning ● Collaborating (general education teacher and specialist) to modify vocabulary, omit or modify items to reflect objectives for the student, eliminate sections of the test, and determine how the grade will be determined prior to giving the test ● decreasing the amount of work presented or required	models, drawings, dioramas, poster boards, charts, graphs, slideshows, videos, etc) to demonstrate students learning ● Decreasing the amount of work presented or required ● Modifying tests to reflect selected objectives ● Reducing the number of answer choices on a multiple choice test ● Tutoring by peers ● Using true / false, matching, or fill in the blank tests in lieu of essay tests	● Personal agendas ● Project-based learning ● Problem-based learning ● Stations / centers ● Think-tac-toes ● Tiered activities / assignments ● Tiered products ● Varying organizers for instructions

• Making students' correct and acceptable work, not the mistakes		

Unit: Expression and Equations	**Content Topic:** Work with radicals and integer exponents

Standard	Disciplinary Core Ideas / Essential Statement / Objective
8.EE.A.1	Know and apply the properties of integer exponents to generate equivalent numerical expressions. For example, $3^2 \times 3^{-5} = 3^{-3} = \frac{1}{3^3} = \frac{1}{27}$
8.EE.A.2.a	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.2.b	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. Simplify numerical radicals, limiting to square roots (i.e. non perfect squares). For example, simplify $\sqrt{8}$ to $2\sqrt{2}$.
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.

Practices / Skills & Lesson / Learning Activities

- Expressions and Equations work with radicals and integer exponents
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Small Group-

- Partner work
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- Investigations

Formative, Summative and Alternative Assessments	Benchmark Assessments	Core Instructional and Supplemental Materials (including various texts at each grade level)
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Unit: Expressions and Equations	**Content Topic:** Understand the connections between proportional relationships, lines, and linear equations

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

Practices / Skills & Lesson / Learning Activities
● Analyze and solve linear equations and pairs of simultaneous linear equations ● Graph systems of linear equations to find a solution ● Solve a system of equations by using substitution and elimination ● Translate real world problem into a system Whole Group- ● Introduction to check for previous understanding ● Class discussion ● Structured notes and examples Individual- ● Provide opportunity for individual practice ● Tiered level questions Small Group- ● Partner work ● Mini lesson ● Use of manipulatives ● Centers ● Investigations

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Unit: Expressions and Equations	**Content Topic:** Analyze and solve linear equations and pairs of simultaneous linear equations

Standard	**Disciplinary Core Ideas / Essential Statement / Objective**
8.EE.C.7.a	Solve linear equations in one variable. 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.7.b	Solve linear equations in one variable. Solve linear equations with rational number coefficients,

	including equations whose solutions require expanding expressions using the distributive property and collecting like terms.
8.EE.C.8.a	Analyze and solve pairs of simultaneous linear equations. Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously.
8.EE.C.8.b	Analyze and solve pairs of simultaneous linear equations. Solve systems of two linear equations in two variables using the substitution method and estimate solutions by graphing the equations. Solve simple cases by inspection. For example, by inspection, conclude that $3x + 2y = 5$ and $3x + 2y = 6$ have no solution because $3x + 2y$ cannot simultaneously be 5 and 6. Solve $3x + y = 30$ and $y = 2x$ using the substitution method: Solve $y = 3x + 1$ and $-2x + 7$ using the substitution method.
8.EE.C.8.c	Analyze and solve pairs of simultaneous linear equations. Solve real-world and mathematical problems leading to two linear equations in two variables. For example, given coordinates for two pairs of points, determine whether the line through the first pair of points intersects the line through the second pair.

Practices / Skills & Lesson / Learning Activities

- Analyze and solve linear equations and pairs of simultaneous linear equations
- Solve two-step equations
- Solve multi-step equations
- Solve equations that contain fractions
- Solve equations that contain the same variable on both sides of the equation
- Simplify and compare algebraic expressions that contain the same variable
- Translate world problems into equations and solve them
    - Expressions and equations work with radicals and integer exponents

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• Unit test Alternative- • Choice boards / projects • Skits • Demonstration • Self-assessment • Conferencing		Manipulatives

Technology	Crosscutting Concepts / Interdisciplinary Connections across grade levels and content areas (at least 1 must be in ELA)
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● Preview of content, concepts, and vocabulary ● Reduced / shortened written assignments ● Secure attention before giving ● Instruction / directions ● Shortened assignments ● Student working with an assigned partner ● Teacher initiated weekly assignment sheet ● Choice of activities ● Exploration by interest ● Flexible grouping ● Goal setting with students ● Mini-workshops to reteach or extend skills ● Open ended activities ● Think-pair-share ● Varied supplemental materials ● Allowing students to correct errors (looking for understanding) ● Teaching key aspects of a topic eliminates nonessential information allowing products (projects, timelines, demonstrations, models, drawings, diorama, poster boards, charts, graphs, slideshows, videos, etc). To demonstrate students learning ● Collaborating (general education teacher and specialist) to modify vocabulary, omit or modify items to reflect objectives for the student, eliminate sections of the test, and determine how the grade will be determined prior to giving the test ● decreasing the amount of work presented or required ● Making students' correct and acceptable work, not the mistakes	multiple choice test ● Tutoring by peers ● Using true / false, matching, or fill in the blank tests in lieu of essay tests	

Unit: Functions	**Content Topic:** Define, evaluate and compare functions

Standard	**Disciplinary Core Ideas / Essential Statement / Objective**

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. (Clarification: Function notation is not required in Grade 8).
8.F.A.2	Compare properties (e.g., rate of change, intercepts, domain and range) of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change.
8.F.A.3	Interpret the equation $y=mx + b$ as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. For example, the function $A = s^2$ giving the area of a square as a function of its side length is not linear because its graph contains the points (1,1), (2,4), and (3,9) , which are not on a straight line.

Practices / Skills & Lesson / Learning Activities

- Define, evaluate, and compare functions
- Use functions to model relationships between quantities
- Understand what a function is and its corresponding graph
- Compare properties of different functions and relate the information to real world situations
- Graph slope-intercept form of a line
    - Construct a function and determine the rate of change and initial value
    - Describe a functional relationship by examining a graph

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● Demonstration ● Self-assessment ● Conferencing		

Unit: Functions	**Content Topic:** Use functions to model relationships between quantities

Standard	Disciplinary Core Ideas / Essential Statement / Objective
8.F.B.4	Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x,y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of linear function in terms of the situation it models, in terms of its graph or a table of values.
8.F.B.5	Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g, where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally.

Practices / Skills & Lesson / Learning Activities

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Unit: Geometry	**Content Topic:** Understand congruence and similarity using physical models, transparencies, or geometry software

Standard	Disciplinary Core Ideas / Essential Statement / Objective
8.G.A.1.a	Verify experimentally the properties of rotations, reflections, and translations. Lines are transformed to lines, and line segments to line segments of the same length.
8.G.A.1.b	Verify experimentally the properties of rotations, reflections, and translations. Angles are transformed to angles of the same measure.
8.G.A.1.c	Verify experimentally the properties of rotations, reflections, and translations. 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 angles 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.

Practices / Skills & Lesson / Learning Activities
● Understand congruence and similarity using physical models, transparencies, or geometry software ● Transform figures on a coordinate plane ● Use their understanding of angle relationships to find unknown angles ● Describe a sequence of transformations and dilations that will result in similar figures ● Identify relationships between angles formed when two parallel lines are cut by a transversal ● Determine the measure of angles formed by parallel lines cut by a transversal ● Write and solve algebraic equations to find missing angle measures ● Tiered level questions Small Group- ● Partner work ● Mini lesson ● Use of manipulatives ● Centers ● Investigations

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Unit: Geometry	**Content Topic:** Understand and apply the Pythagorean Theorem

Standard	Disciplinary Core Ideas / Essential Statement / Objective
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.

Practices / Skills & Lesson / Learning Activities
● Understand the Pythagorean Theorem and its converse ● Given two sides of a right triangle, use the Pythagorean Theorem to find the third side ● Use the Pythagorean Theorem to determine if a given triangle is a right triangle ● Apply the Pythagorean Theorem to solve problems that involve three dimensions ● Apply the Pythagorean Theorem to solve real world problems ● Find the distance between two points on a coordinate plane ● Find perimeter of 2-d figures on coordinate plane using Pythagorean Theorem ● Tiered level questions Small Group- ● Partner work ● Mini lesson ● Use of manipulatives ● Centers ● Investigations

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Unit: Geometry	**Content Topic:** solve real-world and mathematical problems involving volume of cylinders, cones and spheres

Standard	**Disciplinary Core Ideas / Essential Statement / Objective**	**Practices / Skills & Lesson**
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.	● Solve real world and mathematical problems involving volume of cylinders, cones and spheres ● Identify what a 3-dimensional figure is ● Use a formula to find the volume of pyramids, cones and spheres ● Tiered level questions Small Group- ● Partner work ● Mini lesson ● Use of manipulatives ● Centers ● investigations

Formative, Summative and Alternative Assessments	**Benchmark Assessments**	**Core Instructional and Supplemental Materials (including various texts at each grade level)**
● Quizzes ● Homework / classwork ● Question and Answer ● Teacher anecdotal notes ● IXL Summative- ● Unit test Alternative- ● Choice boards / projects ● Skits ● Demonstration ● Self-assessment ● Conferencing	● Module / Unit assessment ● Mid term ● Final ● IXL Diagnostic	● IXL ● Teacher created materials and assessments ● Khan academy ● Calculators ● National Library of Virtual Manipulatives ● Desmos

Technology	Crosscutting Concepts / Interdisciplinary Connections across grade levels and content areas (at least 1 must be in ELA)
8.1.8.DA.1- Organize and transform data collected using computational tools to make it usable for a specific purpose 8.1.8.DA.4- transform data to remove errors and improve the accuracy of the data for analysis 8.1.8.AP.2- Create clearly named variables that represent different data types and perform operations on their values 8.1.8.AP.6- Refine a solution that meets users' needs by incorporating feedback from team members and users	ELA-L.KL.8.2.AAcquire and use accurately grade-appropriate general academic and domain-specific words and phrases ELA-W.AW.8.1.B-Support claim(s) with logical reasoning and relevant, using relevant, accurate data and evidence, that demonstrate an understanding of the topic or text, using credible sources ELA-SL.II.8.2-Analyze the purpose of information presented in diverse media and formats (e.g., visually, quantitatively, orally) and evaluate the motives (e.g., social, commercial, political) behind its presentation Science-MS-ETS1-3 Sometimes parts of different solutions can be combined to create a solution that is better than any of its predecessors (ETS1.B)

Differentiation (IEPs / 504s)	Differentiation (ELL)	Differentiation (G &T)
● Printed copy of board work / notes provided ● Additional time for skill mastery ● Assistive technology ● Center-based instruction ● Check work frequently for understanding ● Computer or electronic divide utilization ● Extended time on tests / quizzes ● Have student repeat directions to check for understanding ● Modified assignment format ● Modified test content ● Modified test format ● Modified test length ● Multiple test sessions ● Multi-sensory presentation ● Preferential seating ● Preview of content, concepts, and vocabulary ● Reduced / shortened written assignments ● Secure attention before giving ● Instruction / directions ● Shortened assignments ● Student working with an assigned partner	● Allow students to correct errors (looking for understanding) ● Teaching key aspects of a topic, eliminate nonessential information using videos, illustrations, pictures, and drawings to explain or clarify ● Allowing products (projects, timelines, demonstrations, models, drawings, dioramas, poster boards, charts, graphs, slideshows, videos, etc) to demonstrate students learning ● Decreasing the amount of work presented or required ● Modifying tests to reflect selected objectives ● Reducing the number of answer choices on a multiple choice test ● Tutoring by peers ● Using true / false, matching, or fill in the blank tests in lieu of essay tests	● Alternative formatives and summative assessments ● Choice boards ● Games and tournaments ● Group investigations ● Independent research and projects interest groups ● Learning contracts ● Leveled rubrics ● Multiple intelligence options ● Personal agendas ● Project-based learning ● Problem-based learning ● Stations / centers ● Think-tac-toes ● Tiered activities / assignments ● Tiered products ● Varying organizers for instructions

• Teacher initiated weekly assignment sheet • Choice of activities • Exploration by interest • Flexible grouping • Goal setting with students • Mini-workshops to reteach or extend skills • Open ended activities • Think-pair-share • Varied supplemental materials • Allowing students to correct errors (looking for understanding) • Teaching key aspects of a topic eliminates nonessential information allowing products (projects, timelines, demonstrations, models, drawings, diorama, poster boards, charts, graphs, slideshows, videos, etc). To demonstrate students learning • Collaborating (general education teacher and specialist) to modify vocabulary, omit or modify items to reflect objectives for the student, eliminate sections of the test, and determine how the grade will be determined prior to giving the test • decreasing the amount of work presented or required • Making students' correct and acceptable work, not the mistakes		

Unit: Statistics and Probability	**Content Topic:** Investigate patterns of association in bivariate data

Standard	Disciplinary Core Ideas / Essential Statement / Objective
8.SP.A.1	Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.
8.SP.A.2	Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit (e.g., line of best fit) by judging the closeness of data points to the line.

8.SP.A.3	Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and the intercept. For example, in a linear model for a biology experiment, interpret a slope of 1.5 cm/ hr as meaning that an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height.
8.SP.A.4	Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables. For example, collect data from students in your class on whether or not they have a curfew on school nights and whether or not they have assigned chores at home. Is there evidence that those who have a curfew also tend to have chores?

Practices / Skills & Lesson / Learning Activities
● Investigate patterns of association in bivariate data ● Graph scatter plots ● Interpret and examine data to come to a conclusion ● Know about line of best fit and two variable data relationships ● Understand patterns of association in bivariate categorical data ● Use frequency to solve real life problems and make predictions for future ones ● Tiered level questions Small Group- ● Partner work ● Mini lesson ● Use of manipulatives ● Centers ● Investigations

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For all Math units:

21st Century Education (NJSLS Standard 9)	**Career Education**
<u>THEMES:</u> Global Awareness Financial, Economic, Business and Entrepreneurial Literacy Critical Thinking Problem Solving Communication Collaboration Information Literacy ICT (Information, Communication and Technology) Literacy	-Business Management & Administration -Education & Training -Finance -Information Technology -Manufacturing -Marketing -Science, Technology, Engineering & Mathematics (STEM) -Transportation, Distribution & Logistics

SKILLS: CRP2. Apply appropriate academic and technical skills CRP3. Attend to personal health and financial well-being CRP4. Communicate clearly and effectively with reason CRP7. Employ valid and reliable research strategies CRP8. Utilize critical thinking to make sense of problems and persevere in solving them. CRP9. Model integrity, ethical leadership and effective management. CRP11. Use technology to enhance productivity CRP12. Work productively in teams while using cultural global competence	