**Subject**

**Mathematics Grade 8**

**Curriculum Guide**

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**LINDEN PUBLIC SCHOOLS**

**LINDEN, NEW JERSEY**

**DR. MARNIE HAZELTON**

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**DIRECTOR OF MATHEMATICS, VOCATIONAL, & TECHNICAL SUBJECTS**

**The Linden Board of Education adopted the Curriculum Guide on:**

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| **July 28, 2022** |  | **Education Report #22** |
| **Date** |  | **Agenda Item** |
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| **Rationale** | | |

**EDUCATION EQUITY:** The Linden Public School District guarantees each student equal educational opportunity regardless of age, race, color, creed, religion, gender, language, affectional or sexual orientation, ancestry, national origin, marital or economic status. For Information, contact District Educational Equity Officer Kevin Thurston at **(**908) 486-2800 x 8307**.**

**NONDISCRIMATION:** The Linden Public School District does not discriminate against handicapped persons in admission or access to or treatment or employment in its programs, activities, and vocational opportunities. For information contact District Public 504 Officer Annabell Louis at (908) 486-2800 x 8025.

**Linden Public Schools Vision**

The Linden Public School District is committed to developing respect for diversity, excellence in education, and a commitment to service, in order to promote global citizenship and ensure personal success for all students

**Linden Public Schools Mission**

The mission of the Linden Public School District is to promote distinction through the infinite resource that is Linden’s diversity, combined with our profound commitment to instructional excellence, so that each and every student achieves their maximum potential in an engaging, inspiring, and challenging learning environment.

**Math Department Vision**

To equip students with the understanding and application of mathematical skills and processes to foster a drive for advanced mathematics and higher-level thinking.

**Math Department Mission Statement**

To develop a community of learners who construct and communicate meaning from the mathematical world around them. Students will experience mathematics that encourage them to think critically, discover and apply concepts to solve problems strategically. Students will be encouraged to solve equations with accuracy, efficiency, and flexibility. Furthermore, students will have a multitude of opportunities to apply mathematical tools and practice standards to solve real-world and multi-step problems.

**Math Department Goals**

* Provide opportunities for student to develop computation skills, conceptual understanding, and problem-solving skills
* Require students to explain, justify or prove their thinking through mathematical reasoning, modeling, and speaking

Course Description

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.

This is a one-year course designed to develop reasoning and problem-solving skills. The topics studied include:

The Number System

Know that there are numbers that are not rational and approximate them by rational numbers.

Expressions and Equations

Work with radicals and integer exponents.

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

Analyze and solve linear equations and pairs of simultaneous linear equations.

Functions

Define, evaluate, and compare functions.

Use functions to model relationships between quantities.

Geometry

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

Understand and apply the Pythagorean Theorem.

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

Statistics and Probability

Investigate patterns of association in bivariate data.

Course Instructional Materials

* LPS Adopted Textbooks and Programs
  + Pearson EnVision Grade 8 Mathematics
  + Pearson Realize (Computer Based program supplementing Envision)
* NJSLA Released Items
* Khan Academy

Standards and NJDOE Mandates Guiding Instruction

* 1. New Jersey Student Learning Standards

<https://www.state.nj.us/education/standards/math/Docs/2016NJSLS-M_Grade8.pdf>

* 1. Power Standards from NJSLS
* 8.EE.A Work with radicals and integer exponents.
* 8.EE.B Understand the connections between proportional relationships, lines, and linear equations.
* 8.EE.C Analyze and solve linear equations and pairs of simultaneous linear equations.
* 8.F.A Define, evaluate, and compare functions.
* 8.F.B Use functions to model relationships between quantities.
* 8.G.A Understand congruence and similarity using physical models, transparencies, or geometry software.
* 8.G.B Understand and apply the Pythagorean Theorem.

Diversity, Equity, and Inclusion

* Use students’ interests in conceptualized tasks
* Expose students to a diverse group of mathematicians
* Design assessments and assignments with a variety of response types
* Use systematic grading and participation methods
* Encourage students to embrace a growth mindset

Pacing Guide

Linden Public Schools

Envision Pacing Guide

Grade 8 Math

2022-2023

Marking Period 1: Tuesday, September 6, 2022 to Tuesday, November 15, 2022

Topic 1 – Real Numbers – Estimated Time: 22 Days

Topic 2 – Analyze and Solve Linear Equations – Estimated Time: 22 Days

Marking Period 2: Wednesday, November 16, 2022 to Wednesday, January 31, 2023

Topic 3 – Use Functions to Model Relationships – Estimated Time: 17 Days

Topic 5 – Analyze and Solve Systems of Linear Equations – Estimated Time: 17 Days

Marking Period 3: Wednesday, February 1, 2023 – Wednesday April 5, 2023

Topic 6 – Congruence and Similarity – Estimated Time: 26 Days

Topic 7 – Understand and Apply the Pythagorean Theorem – Estimated Time: 16 Days

Marking Period 4: Monday, April 17, 2023 to Wednesday, June 22, 2023\*

Topic 8 – Solve Problems Involving Surface Area and Volume – Estimated Time: 16 Days

Topic 4 – Investigate Bivariate Data – Estimated Time: 16 Days

\*Date may be moved up if inclement weather days are not used

**Assessment days are built into each chapter**.

Vertical Integration – Program Mapping

The standards in this unit were introduced in Grade 7. Grade 8 coursework focuses on preparing the students to be proficient in Algebra 1 standards.

Accommodations, Modifications, and Teacher Strategies

(Specific recommendations are made in each unit)

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| **Instructional Strategies**   * Teacher Presentation * Student Presentation * Class Discussion * Reading for Meaning * Inquiry Design Model * Interactive Lecture * Interactive Notetaking * Compare and Contrast * Research Based * Problem Based * Project Based   **504 Plans**  Students can qualify for 504 plans if they have physical or mental impairments that affect or limit any of their abilities to:   * walk, breathe, eat, or sleep * communicate, see, hear, or speak * read, concentrate, think, or learn * stand, bend, lift, or work   Examples of accommodations in 504 plans include:   * preferential seating * extended time on tests and assignments * reduced homework or classwork * verbal, visual, or technology aids * modified textbooks or audio-video materials * behavior management support * adjusted class schedules or grading * verbal testing * excused lateness, absence, or missed classwork * pre-approved nurse's office visits and accompaniment to visits occupational or physical therapy | **Gifted and Talent Accommodations and Modifications**   * Increase the level of complexity * Decrease scaffolding * Variety of finished products * Allow for greater independence * Learning stations, interest groups * Varied texts and supplementary materials * Use of technology * Flexibility in assignments * Varied questioning strategies * Encourage research * Strategy and flexible groups based on formative assessment or student choice * Acceleration within a unit of study * Exposure to more advanced or complex concepts, abstractions, and materials * Encourage students to move through content areas at their own pace * After mastery of a unit, provide students with more advanced learning activities, not more of the same activity * Present information using a thematic, broad-based, and integrative content, rather than just single-subject areas | **Special Education and At-Risk Accommodations and Modifications**   * Remove unnecessary material, words, etc., that can distract from the content * Use of off-grade level materials * Provide appropriate scaffolding * Limit the number of steps required for completion * Time allowed * Level of independence required * Tiered centers, assignments, lessons, or products * Provide appropriate leveled reading materials * Deliver the content in “chunks” * Varied texts and supplementary materials * Use technology, if available and appropriate * Varied homework and products * Varied questioning strategies * Provide background knowledge * Define key vocabulary, multiple-meaning words, and figurative language. * Use audio and visual supports, if available and appropriate * Provide multiple learning opportunities to reinforce key concepts and vocabulary * Meet with small groups to reteach idea/skill * Provide cross-content application of concepts * Ability to work at their own pace * Present ideas using auditory, visual, kinesthetic, & tactile means * Provide graphic organizers and/or highlighted materials * Strategy and flexible groups based on formative assessment * Differentiated checklists and rubrics, if available and appropriate | **English Language Learners Accommodations and Modifications**   * Remove unnecessary materials, words, etc., that can distract from the content * Provide appropriate scaffolding * Limit the number of steps required for completion * Gradually increase the level of independence required * Tiered centers, assignments, lessons, or products * Provide appropriate leveled reading materials * Deliver the content in “chunks” * Varied texts and supplementary materials, including visuals * Use technology, if available and appropriate * Differentiate homework and products * Varied questioning strategies * Provide background knowledge * Define key vocabulary, multiple-meaning words, and figurative language. * Use audio and visual supports, if available and appropriate * Provide multiple learning opportunities to reinforce key concepts and vocabulary * Meet with small groups to reteach idea/skill * Provide cross-content application of concepts * Allow students to work at their own pace * Presenting ideas through auditory, visual, kinesthetic, & tactile means * Role play * Provide graphic organizers, highlighted materials * Strategy and flexible groups based on formative assessment |

**Unit #1: The Number System**

Content Area: **Mathematics**  
Course(s): **Math 8**  
Time Period: **First Marking Period**  
Length: **2 Weeks**  
Status: **Published**

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| **Unit Overview** |
| 1. Students will be able to define and distinguish between rational and irrational number.  2. write a rational number as a fraction or a rounded decimal.  3. understand that every number has a decimal expansion.  4. Estimate irrational numbers to compare and order them on a number line. |

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| **STAGE 1- DESIRED RESULTS** |
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| **Educational Standards** |
| The following goals, as outlined in the NJSLS, will provide a framework for preparation and instruction in mathematics. They are the eight mathematical standards:  1. Make sense of problems and persevere in solving them.  2. Reason abstractly and quantitatively.  3. Construct viable arguments and critique the reasoning of others.  4. Model with mathematics.  5. Use appropriate tools strategically.  6. Attend to precision.  7. Look for and make use of structure.  8. Look for and express regularity in repeated reasoning. |

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| **New Jersey Student Learning Standards- Mathematics** |
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| **Introduction- Grade 8** |
| |  |  | | --- | --- | | MA.8.8 | 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. | | MA.8.8.1 | Students use linear equations and systems of linear equations to represent, analyze, and solve a variety of problems. Students recognize equations for proportions (y/x = m or y = mx) as special linear equations (y = mx + b), understanding that the constant of proportionality (m) is the slope, and the graphs are lines through the origin. They understand that the slope (m) of a line is a constant rate of change, so that if the input or x-coordinate changes by an amount A, the output or y-coordinate changes by the amount m·A. Students also use a linear equation to describe the association between two quantities in bivariate data (such as arm span vs. height for students in a classroom). At this grade, fitting the model, and assessing its fit to the data are done informally. Interpreting the model in the context of the data requires students to express a relationship between the two quantities in question and to interpret components of the relationship (such as slope and y-intercept) in terms of the situation. 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. | | MA.8.8.2 | 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. | | MA.8.8.3 | 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. | |

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| **The Number System** |
| |  |  | | --- | --- | | MA.8.NS.A | Know that there are numbers that are not rational, and approximate them by rational numbers. | | MA.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. | | MA.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., π²). | |

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| **Expressions and Equations** |
| |  |  | | --- | --- | | MA.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. | | MA.8.EE.C | Analyze and solve linear equations and pairs of simultaneous linear equations. | | MA.8.EE.A | Work with radicals and integer exponents. | | MA.8.EE.C.7 | Solve linear equations in one variable. | | MA.8.EE.A.1 | Know and apply the properties of integer exponents to generate equivalent numerical expressions. | | MA.8.EE.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). | | MA.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. | | MA.8.EE.C.8 | Analyze and solve pairs of simultaneous linear equations. | | MA.8.EE.C.8a | Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously. | | MA.8.EE.C.8b | Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection. | | MA.8.EE.C.8c | Solve real-world and mathematical problems leading to two linear equations in two variables. | | MA.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. | | MA.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. | | MA.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. | | MA.8.EE.B | Understand the connections between proportional relationships, lines, and linear equations. | | MA.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. | |

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| **Functions** |
| |  |  | | --- | --- | | MA.8.F.B.4 | Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (𝑥, 𝑦) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values. | | MA.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. | | MA.8.F.A | Define, evaluate, and compare functions. | | MA.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. | | MA.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). | | MA.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. | | MA.8.F.B | Use functions to model relationships between quantities. | |

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| **Geometry** |
| |  |  | | --- | --- | | MA.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. | | MA.8.G.A | Understand congruence and similarity using physical models, transparencies, or geometry software. | | MA.8.G.A.1 | Verify experimentally the properties of rotations, reflections, and translations: | | MA.8.G.A.1a | Lines are transformed to lines, and line segments to line segments of the same length. | | MA.8.G.A.1b | Angles are transformed to angles of the same measure. | | MA.8.G.A.1c | Parallel lines are transformed to parallel lines. | | MA.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. | | MA.8.G.A.3 | Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates. | | MA.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. | | MA.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. | | MA.8.G.B | Understand and apply the Pythagorean Theorem. | | MA.8.G.B.6 | Explain a proof of the Pythagorean Theorem and its converse. | | MA.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. | | MA.8.G.B.8 | Apply the Pythagorean Theorem to find the distance between two points in a coordinate system. | | MA.8.G.C | Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres. | |

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| **Statistics and Probability** |
| |  |  | | --- | --- | | MA.8.SP.A | Investigate patterns of association in bivariate data. | | MA.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. | | MA.8.SP.A.2 | Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit (e.g. line of best fit) by judging the closeness of the data points to the line. | | MA.8.SP.A.3 | Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. | | MA.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. | |

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| **Career Ready Practices** |
| CRP2.   Apply appropriate academic and technical skills.  CRP4.   Communicate clearly and effectively and with reason.  CRP6.   Demonstrate creativity and innovation.  CRP8.   Utilize critical thinking to make sense of problems and persevere in solving them.  CRP11.   Use technology to enhance productivity.  CRP12.   Work productively in teams while using cultural global competence. |

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| **Essential Questions** |
| * What are the characteristics of rational and irrational numbers? * What’s the best way to represent large and small numbers? * What are the characteristics related to a rational and irrational numbers? * How can we round rational and irrational numbers? |

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| **Enduring Understanding** |
| * All real numbers include rational and irrational numbers. * A quantity can be represented numerically in various ways. Problem solving depends on choosing wise ways. * The numbers included in the real number system. * The ways we can express a given quantity. |

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| **Students will know...** |
| * The numbers included in the real number system. * The ways we can express a given quantity. |

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| **Students will be able to...** |
| * All real numbers include rational and irrational numbers. * A quantity can be represented numerically in various ways.  Problem solving depends on choosing wise ways. |

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| **STAGE 2- EVIDENCE OF LEARNING** |
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| **Formative Assessment Suggestions** |
| 3- Minute Pause  Analogy Prompt  Choral Response  Debriefing  Exit Card / Ticket  Hand Signals  Index card summaries  Journal Entry  Misconception Check  Observation  Portfolio Check  Questions & Answers  Quiz  Self-Assessment  Student Conference  Think-Pair-Share  Think-Ink-Share  Web or Concept Map   |  |  | | --- | --- | | • 3- Minute Pause | **.** | | • A-B-C Summaries | **.** | | • Analogy Prompt | **.** | | • Choral Response | **.** | | • Debriefing | **.** | | • Exit Card / Ticket | **.** | | • Hand Signals | **.** | | • Idea Spinner | **.** | | • Index Card Summaries | **.** | | • Inside-Outside Circle Discussion (Fishbowl) | **.** | | • Journal Entry | **.** | | • Misconception Check | **.** | | • Observation | **.** | | • One Minute Essay | **.** | | • One Word Summary | **.** | | • Portfolio Check | **.** | | • Questions & Answers | **.** | | • Quiz | **.** | | • Self-Assessment | **.** | | • Student Conference | **.** | | • Think-Pair-Share | **.** | | • Web or Concept Map | **.** | |

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| **Authentic Assessments Suggestions** |
| Through the following authentic assessments, students will develop traits regarding thinking and reasoning, settings, mathematical tools and attitudes and dispositions:    1. Performance Assessments    2. Short Investigations    3. Open Ended Response Questions    4.  Portfolios    5.  Self-Assessments |

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| **Benchmark Assessments** |
| Math 8  Topics 1-2: Cumulative/Benchmark Assessment  Topics 1-4: Cumulative/Benchmark Assessment  Topics 1-6: Cumulative/Benchmark Assessment  End-Of-Year Assessment  Edmentum Fall Administration  Edmentum Winter Administration  Edmentum Spring Administration |

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| **STAGE 3- LEARNING PLAN** |
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| **Instructional Map** |
| **Step 1: What is it we want and expect students to learn?**   * Read domain overview, learning goal, and essential questions to gain an initial understanding of the domain. * Analyze cluster of standards, vertical progression, test item specifications to determine full intent of standards (DOK) and student outcomes. * Determine measurable objectives using unpacked standards. Review the assessments for determining acceptable evidence.   **Step 2: How will they learn it?**   * Select problem-based learning/formative assessment tasks. * Develop learning experiences utilizing the textbook and selected tasks along with higher order questions stems.   **Step 3: How will we know when they have learned it?**   * As a PLC, analyze students’ work reflecting on teacher practice and provide student feedback. * Provide additional assessments as necessary and collaboratively analyze the results.   **Step 4: How will we respond if they don’t learn it? How will we respond to those who already know it?**   * Using data analysis, develop small groups for enrichment and remediation. * Reassess student performance and provide opportunities for application. |

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| **Modifications/Differentiation of Instruction** |
| Differentiation Strategies for Special Education Students   * Remove unnecessary material, words, etc., that can distract from the content * Use of off-grade level materials * Provide appropriate scaffolding * Limit the number of steps required for completion * Time allowed * Level of independence required * Tiered centers, assignments, lessons, or products * Provide appropriate leveled reading materials * Deliver the content in “chunks” * Varied texts and supplementary materials * Use technology, if available and appropriate * Varied homework and products * Varied questioning strategies * Provide background knowledge * Define key vocabulary, multiple-meaning words, and figurative language. * Use audio and visual supports, if available and appropriate * Provide multiple learning opportunities to reinforce key concepts and vocabulary * Meet with small groups to reteach idea/skill * Provide cross-content application of concepts * Ability to work at their own pace * Present ideas using auditory, visual, kinesthetic, & tactile means * Provide graphic organizers and/or highlighted materials * Strategy and flexible groups based on formative assessment * Differentiated checklists and rubrics, if available and appropriate       Differentiation Strategies for Gifted and Talented Students   * Increase the level of complexity * Decrease scaffolding * Variety of finished products * Allow for greater independence * Learning stations, interest groups * Varied texts and supplementary materials * Use of technology * Flexibility in assignments * Varied questioning strategies * Encourage research * Strategy and flexible groups based on formative assessment or student choice * Acceleration within a unit of study * Exposure to more advanced or complex concepts, abstractions, and materials * Encourage students to move through content areas at their own pace * After mastery of a unit, provide students with more advanced learning activities, not more of the same activity * Present information using a thematic, broad-based, and integrative content, rather than just single-subject areas     Differentiated Strategies for ELL Students   * Remove unnecessary materials, words, etc., that can distract from the content * Provide appropriate scaffolding * Limit the number of steps required for completion * Gradually increase the level of independence required * Tiered centers, assignments, lessons, or products * Provide appropriate leveled reading materials * Deliver the content in “chunks” * Varied texts and supplementary materials, including visuals * Use technology, if available and appropriate * Differentiate homework and products * Varied questioning strategies * Provide background knowledge * Define key vocabulary, multiple-meaning words, and figurative language. * Use audio and visual supports, if available and appropriate * Provide multiple learning opportunities to reinforce key concepts and vocabulary * Meet with small groups to reteach idea/skill * Provide cross-content application of concepts * Allow students to work at their own pace * Presenting ideas through auditory, visual, kinesthetic, & tactile means * Role play * Provide graphic organizers, highlighted materials * Strategy and flexible groups based on formative assessment       Differentiation Strategies for At Risk Students   * Remove unnecessary materials, words, etc., that can distract from the content * Provide appropriate scaffolding * Limit the number of steps required for completion * Gradually increase the level of independence required * Tiered centers, assignments, lessons, or products * Provide appropriate leveled reading materials * Deliver the content in “chunks” * Varied texts and supplementary materials * Use technology, if available and appropriate * Differentiate homework and products * Varied questioning strategies * Provide background knowledge * Define key vocabulary, multiple-meaning words, and figurative language * Use audio and visual supports, if available and appropriate * Provide multiple learning opportunities to reinforce key concepts and vocabulary * Meet with small groups to reteach idea/skill * Provide cross-content application of concepts * Presenting ideas through auditory, visual, kinesthetic, & tactile means * Provide graphic organizers and/or highlighted materials * Strategy and flexible groups based on formative assessment   **504 Plans**  Students can qualify for 504 plans if they have physical or mental impairments that affect or limit any of their abilities to:   * walk, breathe, eat, or sleep * communicate, see, hear, or speak * read, concentrate, think, or learn * stand, bend, lift, or work   Examples of accommodations in 504 plans include:   * preferential seating * extended time on tests and assignments * reduced homework or classwork * verbal, visual, or technology aids * modified textbooks or audio-video materials * behavior management support * adjusted class schedules or grading * verbal testing * excused lateness, absence, or missed classwork * pre-approved nurse's office visits and accompaniment to visits * occupational or physical therapy |

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| **Modification Strategies** |
| |  |  | | --- | --- | | • Extended Time | **.** | | • Frequent Breaks | **.** | | • Highlighted Text | **.** | | • Interactive Notebook | **.** | | • Modified Test | **.** | | • Oral Directions | **.** | | • Peer Tutoring | **.** | | • Preferential Seating | **.** | | • Re-Direct | **.** | | • Repeated Drill / Practice | **.** | | • Shortened Assignments | **.** | | • Teacher Notes | **.** | | • Tutorials | **.** | | • Use of Additional Reference Material | **.** | | • Use of Audio Resources | **.** | |

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| **High Preparation Differentiation** |
| |  |  | | --- | --- | | • Alternative Assessments | **.** | | • Choice Boards | **.** | | • Games and Tournaments | **.** | | • Group Investigations | **.** | | • Guided Reading | **.** | | • Independent Research / Project | **.** | | • Interest Groups | **.** | | • Learning Contracts | **.** | | • Leveled Rubrics | **.** | | • Literature Circles | **.** | | • Menu Assignments | **.** | | • Multiple Intelligence Options | **.** | | • Multiple Texts | **.** | | • Personal Agendas | **.** | | • Project Based Learning (PBL) | **.** | | • Stations / Centers | **.** | | • Think-Tac-Toe | **.** | | • Tiered Activities / Assignments | **.** | | • Varying Graphic Organizers | **.** | |

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| **Low Preparation Differentiation** |
| |  |  | | --- | --- | | • Choice of Book / Activity | **.** | | • Cubing Activities | **.** | | • Exploration by Interest (using interest inventories) | **.** | | • Flexible Grouping | **.** | | • Goal Setting With Student | **.** | | • Homework Options | **.** | | • Jigsaw | **.** | | • Mini Workshops to Extend Skills | **.** | | • Mini Workshops to Re-teach | **.** | | • Open-ended Activities | **.** | | • Think-Pair-Share by Interest | **.** | | • Think-Pair-Share by Learning Style | **.** | | • Think-Pair-Share by Learning Style | **.** | | • Think-Pair-Share by Readiness | **.** | | • Use of Collaboration | **.** | | • Use of Reading Buddies | **.** | | • Varied Journal Prompts | **.** | | • Varied Product Choice | **.** | | • Varied Supplemental Materials | **.** | | • Work Alone / Together | **.** | |

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| **Vertical Integration- Discipline Mapping** |
| The Number System Vertical Alignment  In Grade 7 Students will be able to do...   * Apply and extend previous understanding of operations with fractions to add, subtract, multiply, and divide rational numbers.   In Grade 8 Students will be able to do...   * Know that there are numbers that are not rational and approximate them by rational numbers.     In High School Math Students will be able to do...  The Real Number System   * Extend the properties of exponents to rational exponents. * Use properties of rational and irrational numbers.   Quantities   * Reason quantitatively and use units to solve problems.   The Complex Number System   * Perform arithmetic operations with complex numbers. * Represent complex numbers and their operations on the complex plane. * Use complex numbers in polynomial identities and equations. |

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| **Additional Materials** |
| LPS Adopted Textbooks and Programs   * Pearson EnVision Grade 8 * Pearson Realize (Computer Based program supplementing Envision)   Edmentum Testing   * Data Analysis Reports   NJSLA (PARCC) Released Items  Khan Academy |

**Unit #2: Expressions and Equations**

Content Area: **Mathematics**  
Course(s): **Math 8**  
Time Period: **First Marking Period**  
Length: **10-12 Weeks**  
Status: **Published**

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| **Unit Overview** |
| 1. Students will simplify expressions by applying the properties of integer exponents.  2. Students will be able to solve multi-step equations with infinite, finite and no solutions.  3. Students will define unit/constant rate as slope. Students will compare and contrast two different proportional relationships represented as graphs, tables and equations.  4. Use the slope formula given two points. Students will find solutions to linear systems of equations by a point of intersection, graphing, substitution and combination/elimination techniques.  5. Students will be able to find the square and cube roots of rational numbers.  6. Students will write and perform all four operations involving numbers written in scientific notation.  7. Students will represent each event in one real world situation by writing two bivariate linear equations.  8. Students will use similar triangles to explain why the slope is the same between any two distinct points on a non-vertical line in a coordinate plane. |

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| **STAGE 1- DESIRED RESULTS** |
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| **Educational Standards** |
| The following goals, as outlined in the NJSLS, will provide a framework for preparation and instruction in mathematics. They are the eight mathematical standards:  1. Make sense of problems and persevere in solving them.  2. Reason abstractly and quantitatively.  3. Construct viable arguments and critique the reasoning of others.  4. Model with mathematics.  5. Use appropriate tools strategically.  6. Attend to precision.  7. Look for and make use of structure.  8. Look for and express regularity in repeated reasoning. |

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| **New Jersey Student Learning Standards- Mathematics** |
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| **Introduction- Grade 8** |
| |  |  | | --- | --- | | MA.8.8 | 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. | | MA.8.8.1 | Students use linear equations and systems of linear equations to represent, analyze, and solve a variety of problems. Students recognize equations for proportions (y/x = m or y = mx) as special linear equations (y = mx + b), understanding that the constant of proportionality (m) is the slope, and the graphs are lines through the origin. They understand that the slope (m) of a line is a constant rate of change, so that if the input or x-coordinate changes by an amount A, the output or y-coordinate changes by the amount m·A. Students also use a linear equation to describe the association between two quantities in bivariate data (such as arm span vs. height for students in a classroom). At this grade, fitting the model, and assessing its fit to the data are done informally. Interpreting the model in the context of the data requires students to express a relationship between the two quantities in question and to interpret components of the relationship (such as slope and y-intercept) in terms of the situation. 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. | | MA.8.8.2 | 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. | | MA.8.8.3 | 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. | |

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| **The Number System** |
| |  |  | | --- | --- | | MA.8.NS.A | Know that there are numbers that are not rational, and approximate them by rational numbers. | | MA.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. | | MA.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., π²). | |

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| **Expressions and Equations** |
| |  |  | | --- | --- | | MA.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. | | MA.8.EE.C | Analyze and solve linear equations and pairs of simultaneous linear equations. | | MA.8.EE.A | Work with radicals and integer exponents. | | MA.8.EE.C.7 | Solve linear equations in one variable. | | MA.8.EE.A.1 | Know and apply the properties of integer exponents to generate equivalent numerical expressions. | | MA.8.EE.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). | | MA.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. | | MA.8.EE.C.8 | Analyze and solve pairs of simultaneous linear equations. | | MA.8.EE.C.8a | Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously. | | MA.8.EE.C.8b | Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection. | | MA.8.EE.C.8c | Solve real-world and mathematical problems leading to two linear equations in two variables. | | MA.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. | | MA.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. | | MA.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. | | MA.8.EE.B | Understand the connections between proportional relationships, lines, and linear equations. | | MA.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. | |

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| **Functions** |
| |  |  | | --- | --- | | MA.8.F.B.4 | Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (𝑥, 𝑦) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values. | | MA.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. | | MA.8.F.A | Define, evaluate, and compare functions. | | MA.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. | | MA.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). | | MA.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. | | MA.8.F.B | Use functions to model relationships between quantities. | |

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| **Geometry** |
| |  |  | | --- | --- | | MA.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. | | MA.8.G.A | Understand congruence and similarity using physical models, transparencies, or geometry software. | | MA.8.G.A.1 | Verify experimentally the properties of rotations, reflections, and translations: | | MA.8.G.A.1a | Lines are transformed to lines, and line segments to line segments of the same length. | | MA.8.G.A.1b | Angles are transformed to angles of the same measure. | | MA.8.G.A.1c | Parallel lines are transformed to parallel lines. | | MA.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. | | MA.8.G.A.3 | Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates. | | MA.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. | | MA.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. | | MA.8.G.B | Understand and apply the Pythagorean Theorem. | | MA.8.G.B.6 | Explain a proof of the Pythagorean Theorem and its converse. | | MA.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. | | MA.8.G.B.8 | Apply the Pythagorean Theorem to find the distance between two points in a coordinate system. | | MA.8.G.C | Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres. | |

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| **Statistics and Probability** |
| |  |  | | --- | --- | | MA.8.SP.A | Investigate patterns of association in bivariate data. | | MA.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. | | MA.8.SP.A.2 | Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit (e.g. line of best fit) by judging the closeness of the data points to the line. | | MA.8.SP.A.3 | Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. | | MA.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. | |

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| **Career Ready Practices** |
| CRP2.   Apply appropriate academic and technical skills.    CRP4.   Communicate clearly and effectively and with reason.    CRP6.   Demonstrate creativity and innovation.    CRP8.   Utilize critical thinking to make sense of problems and persevere in solving them.    CRP11.   Use technology to enhance productivity.    CRP12.   Work productively in teams while using cultural global competence |

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| **Essential Questions** |
| * How to evaluate square and cube roots. * How to solve linear equations that yield one, no, and infinitely many solutions. * How to represent functions using verbal rules, equations, tables and graphs. * What’s the best way to represent large and small numbers? * How can we use the properties of exponents? * How do we evaluate and simplify radical expressions? * How do you use exponent rules to simplify expressions or solve equations? * What are the steps required to solve linear equations? * How are functions represented? * How can we use the vertical line test or mapping to determine if a relation is a function? * What information is needed to create a function using a graph or table? |

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| **Enduring Understanding** |
| * Radicals can be used to simplify and evaluate expressions and equations. * Linear equations in one variable can be solved informally and formally. * Functions can be represented in multiple ways: such as verbal rules, equations, tables, and graphs. * A quantity can be represented numerically in various ways.  Problem solving depends on choosing wise ways. * Numbers can be manipulated using radicals and integer exponents and graphs. * How to evaluate square and cube roots. * How to solve linear equations that yield one, no, and infinitely many solutions. * How to represent functions using verbal rules, equations, tables and graphs. * How we can use scientific notation to express very large or very small numbers. * How to apply exponent rules. |

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| **Students will know...** |
| * How to evaluate square and cube roots. * How to solve linear equations that yield one, no, and infinitely many solutions. * How to represent functions using verbal rules, equations, tables and graphs. * How we can use scientific notation to express very large or very small numbers. * How to apply exponent rules. |

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| **Students will be able to...** |
| * Radicals can be used to simplify and evaluate expressions and equations. * Linear equations in one variable can be solved informally and formally. * Functions can be represented in multiple ways: such as verbal rules, equations, tables, and * A quantity can be represented numerically in various ways. Problem solving depends on choosing wise ways. |

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| **STAGE 2- EVIDENCE OF LEARNING** |
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| **Formative Assessment Suggestions** |
| 3- Minute Pause  Analogy Prompt  Choral Response  Debriefing  Exit Card / Ticket  Hand Signals  Index card summaries  Journal Entry  Misconception Check  Observation  Portfolio Check  Questions & Answers  Quiz  Self-Assessment  Student Conference  Think-Pair-Share  Think-Ink-Share  Web or Concept Map   |  |  | | --- | --- | | • 3- Minute Pause | **.** | | • A-B-C Summaries | **.** | | • Analogy Prompt | **.** | | • Choral Response | **.** | | • Debriefing | **.** | | • Exit Card / Ticket | **.** | | • Hand Signals | **.** | | • Idea Spinner | **.** | | • Index Card Summaries | **.** | | • Inside-Outside Circle Discussion (Fishbowl) | **.** | | • Journal Entry | **.** | | • Misconception Check | **.** | | • Observation | **.** | | • One Minute Essay | **.** | | • One Word Summary | **.** | | • Portfolio Check | **.** | | • Questions & Answers | **.** | | • Quiz | **.** | | • Self-Assessment | **.** | | • Student Conference | **.** | | • Think-Pair-Share | **.** | | • Web or Concept Map | **.** | |

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| **Authentic Assessments Suggestions** |
| Through the following authentic assessments, students will develop traits regarding thinking and reasoning, settings, mathematical tools and attitudes and dispositions:    1. Performance Assessments    2. Short Investigations    3. Open Ended Response Questions    4.  Portfolios    5.  Self-Assessments |

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| **Benchmark Assessments** |
| Math 8  Topics 1-2: Cumulative/Benchmark Assessment  Topics 1-4: Cumulative/Benchmark Assessment  Topics 1-6: Cumulative/Benchmark Assessment  End-Of-Year Assessment  Edmentum Fall Administration  Edmentum Winter Administration  Edmentum Spring Administration |

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| **STAGE 3- LEARNING PLAN** |
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| **Instructional Map** |
| **Step 1: What is it we want and expect students to learn?**   * Read domain overview, learning goal, and essential questions to gain an initial understanding of the domain. * Analyze cluster of standards, vertical progression, test item specifications to determine full intent of standards (DOK) and student outcomes. * Determine measurable objectives using unpacked standards. Review the assessments for determining acceptable evidence.   **Step 2: How will they learn it?**   * Select problem-based learning/formative assessment tasks. * Develop learning experiences utilizing the textbook and selected tasks along with higher order questions stems.   **Step 3: How will we know when they have learned it?**   * As a PLC, analyze students’ work reflecting on teacher practice and provide student feedback. * Provide additional assessments as necessary and collaboratively analyze the results.   **Step 4: How will we respond if they don’t learn it? How will we respond to those who already know it?**   * Using data analysis, develop small groups for enrichment and remediation. * Reassess student performance and provide opportunities for application. |

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| **Modifications/Differentiation of Instruction** |
| Differentiation Strategies for Special Education Students   * Remove unnecessary material, words, etc., that can distract from the content * Use of off-grade level materials * Provide appropriate scaffolding * Limit the number of steps required for completion * Time allowed * Level of independence required * Tiered centers, assignments, lessons, or products * Provide appropriate leveled reading materials * Deliver the content in “chunks” * Varied texts and supplementary materials * Use technology, if available and appropriate * Varied homework and products * Varied questioning strategies * Provide background knowledge * Define key vocabulary, multiple-meaning words, and figurative language. * Use audio and visual supports, if available and appropriate * Provide multiple learning opportunities to reinforce key concepts and vocabulary * Meet with small groups to reteach idea/skill * Provide cross-content application of concepts * Ability to work at their own pace * Present ideas using auditory, visual, kinesthetic, & tactile means * Provide graphic organizers and/or highlighted materials * Strategy and flexible groups based on formative assessment * Differentiated checklists and rubrics, if available and appropriate       Differentiation Strategies for Gifted and Talented Students   * Increase the level of complexity * Decrease scaffolding * Variety of finished products * Allow for greater independence * Learning stations, interest groups * Varied texts and supplementary materials * Use of technology * Flexibility in assignments * Varied questioning strategies * Encourage research * Strategy and flexible groups based on formative assessment or student choice * Acceleration within a unit of study * Exposure to more advanced or complex concepts, abstractions, and materials * Encourage students to move through content areas at their own pace * After mastery of a unit, provide students with more advanced learning activities, not more of the same activity * Present information using a thematic, broad-based, and integrative content, rather than just single-subject areas       Differentiated Strategies for ELL Students   * Remove unnecessary materials, words, etc., that can distract from the content * Provide appropriate scaffolding * Limit the number of steps required for completion * Gradually increase the level of independence required * Tiered centers, assignments, lessons, or products * Provide appropriate leveled reading materials * Deliver the content in “chunks” * Varied texts and supplementary materials, including visuals * Use technology, if available and appropriate * Differentiate homework and products * Varied questioning strategies * Provide background knowledge * Define key vocabulary, multiple-meaning words, and figurative language. * Use audio and visual supports, if available and appropriate * Provide multiple learning opportunities to reinforce key concepts and vocabulary * Meet with small groups to reteach idea/skill * Provide cross-content application of concepts * Allow students to work at their own pace * Presenting ideas through auditory, visual, kinesthetic, & tactile means * Role play * Provide graphic organizers, highlighted materials * Strategy and flexible groups based on formative assessment   Differentiation Strategies for At Risk Students   * Remove unnecessary materials, words, etc., that can distract from the content * Provide appropriate scaffolding * Limit the number of steps required for completion * Gradually increase the level of independence required * Tiered centers, assignments, lessons, or products * Provide appropriate leveled reading materials * Deliver the content in “chunks” * Varied texts and supplementary materials * Use technology, if available and appropriate * Differentiate homework and products * Varied questioning strategies * Provide background knowledge * Define key vocabulary, multiple-meaning words, and figurative language * Use audio and visual supports, if available and appropriate * Provide multiple learning opportunities to reinforce key concepts and vocabulary * Meet with small groups to reteach idea/skill * Provide cross-content application of concepts * Presenting ideas through auditory, visual, kinesthetic, & tactile means * Provide graphic organizers and/or highlighted materials * Strategy and flexible groups based on formative assessment     **504 Plans**  Students can qualify for 504 plans if they have physical or mental impairments that affect or limit any of their abilities to:   * walk, breathe, eat, or sleep * communicate, see, hear, or speak * read, concentrate, think, or learn * stand, bend, lift, or work       Examples of accommodations in 504 plans include:   * preferential seating * extended time on tests and assignments * reduced homework or classwork * verbal, visual, or technology aids * modified textbooks or audio-video materials * behavior management support * adjusted class schedules or grading * verbal testing * excused lateness, absence, or missed classwork * pre-approved nurse's office visits and accompaniment to visits * occupational or physical therapy |

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| **Modification Strategies** |
| |  |  | | --- | --- | | • Extended Time | **.** | | • Frequent Breaks | **.** | | • Highlighted Text | **.** | | • Interactive Notebook | **.** | | • Modified Test | **.** | | • Oral Directions | **.** | | • Peer Tutoring | **.** | | • Preferential Seating | **.** | | • Re-Direct | **.** | | • Repeated Drill / Practice | **.** | | • Shortened Assignments | **.** | | • Teacher Notes | **.** | | • Tutorials | **.** | | • Use of Additional Reference Material | **.** | | • Use of Audio Resources | **.** | |

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| **High Preparation Differentiation** |
| |  |  | | --- | --- | | • Alternative Assessments | **.** | | • Choice Boards | **.** | | • Games and Tournaments | **.** | | • Group Investigations | **.** | | • Guided Reading | **.** | | • Independent Research / Project | **.** | | • Interest Groups | **.** | | • Learning Contracts | **.** | | • Leveled Rubrics | **.** | | • Literature Circles | **.** | | • Menu Assignments | **.** | | • Multiple Intelligence Options | **.** | | • Multiple Texts | **.** | | • Personal Agendas | **.** | | • Project Based Learning (PBL) | **.** | | • Stations / Centers | **.** | | • Think-Tac-Toe | **.** | | • Tiered Activities / Assignments | **.** | | • Varying Graphic Organizers | **.** | |

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| **Low Preparation Differentiation** |
| |  |  | | --- | --- | | • Choice of Book / Activity | **.** | | • Cubing Activities | **.** | | • Exploration by Interest (using interest inventories) | **.** | | • Flexible Grouping | **.** | | • Goal Setting With Student | **.** | | • Homework Options | **.** | | • Jigsaw | **.** | | • Mini Workshops to Extend Skills | **.** | | • Mini Workshops to Re-teach | **.** | | • Open-ended Activities | **.** | | • Think-Pair-Share by Interest | **.** | | • Think-Pair-Share by Learning Style | **.** | | • Think-Pair-Share by Learning Style | **.** | | • Think-Pair-Share by Readiness | **.** | | • Use of Collaboration | **.** | | • Use of Reading Buddies | **.** | | • Varied Journal Prompts | **.** | | • Varied Product Choice | **.** | | • Varied Supplemental Materials | **.** | | • Work Alone / Together | **.** | |

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| **Vertical Integration- Discipline Mapping** |
| Expressions and Equations Vertical Alignment    In Grade 7 Students will be able to do...   * Use properties of operations to generate equivalent expressions. * Solve real-life and mathematical problems using numerical and algebraic expressions and equations.   In Grade 8 Students will be able to do...   * Work with radicals and integer exponents. * Understand the connections between proportional relationships, lines, and linear equations. * Analyze and solve linear equations and pairs of simultaneous linear equations.   In High School Math Students will be able to do…  Algebra  Seeing Structure in Expressions   * Interpret the structure of expressions * Write expressions in equivalent forms to solve problems   Arithmetic with Polynomials and Rational Expressions   * Perform arithmetic operations on polynomials * Understand the relationship between zeros and factors of polynomials * Use polynomial identities to solve problems * Rewrite rational expressions   Creating Equations   * Create equations that describe numbers or relationships   Reasoning with Equations and Inequalities   * Understand solving equations as a process of reasoning and explain the reasoning * Solve equations and inequalities in one variable * Solve systems of equations * Represent and solve equations and inequalities graphically |

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| **Additional Materials** |
| LPS Adopted Textbooks and Programs   * Pearson EnVision Grade 8 * Pearson Realize (Computer Based program supplementing Envision)   Edmentum Testing   * Data Analysis Reports   NJSLA (PARCC) Released Items  Khan Academy |

**Unit #3: Functions**

Content Area: **Mathematics**  
Course(s): **Math 8**  
Time Period: **Second Marking period**  
Length: **8 Weeks**  
Status: **Published**

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| **Unit Overview** |
| 1. Students will be able to determine if a relation forms a function using tables, graphs and verbal models; map and graph relations to determine if relation is a function.  2. Define the domain and range of a function; compare two functions represented algebraically, graphically, numerically or by verbal description.  3. Write an equation of a linear function; determine if a function is linear or non-linear.  4. Find and interpret the rate of change from a table, graph or verbal description; and determine the behavior of a linear function by looking at an equation. |

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| **STAGE 1- DESIRED RESULTS** |
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| **Educational Standards** |
| The following goals, as outlined in the NJSLS, will provide a framework for preparation and instruction in mathematics. They are the eight mathematical standards:  1. Make sense of problems and persevere in solving them.  2. Reason abstractly and quantitatively.  3. Construct viable arguments and critique the reasoning of others.  4. Model with mathematics.  5. Use appropriate tools strategically.  6. Attend to precision.  7. Look for and make use of structure.  8. Look for and express regularity in repeated reasoning |

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| **New Jersey Student Learning Standards- Mathematics** |
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| **Introduction- Grade 8** |
| |  |  | | --- | --- | | MA.8.8 | 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. | | MA.8.8.1 | Students use linear equations and systems of linear equations to represent, analyze, and solve a variety of problems. Students recognize equations for proportions (y/x = m or y = mx) as special linear equations (y = mx + b), understanding that the constant of proportionality (m) is the slope, and the graphs are lines through the origin. They understand that the slope (m) of a line is a constant rate of change, so that if the input or x-coordinate changes by an amount A, the output or y-coordinate changes by the amount m·A. Students also use a linear equation to describe the association between two quantities in bivariate data (such as arm span vs. height for students in a classroom). At this grade, fitting the model, and assessing its fit to the data are done informally. Interpreting the model in the context of the data requires students to express a relationship between the two quantities in question and to interpret components of the relationship (such as slope and y-intercept) in terms of the situation. 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. | | MA.8.8.2 | 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. | | MA.8.8.3 | 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. | |

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| **The Number System** |
| |  |  | | --- | --- | | MA.8.NS.A | Know that there are numbers that are not rational, and approximate them by rational numbers. | | MA.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. | | MA.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., π²). | |

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| **Expressions and Equations** |
| |  |  | | --- | --- | | MA.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. | | MA.8.EE.C | Analyze and solve linear equations and pairs of simultaneous linear equations. | | MA.8.EE.A | Work with radicals and integer exponents. | | MA.8.EE.C.7 | Solve linear equations in one variable. | | MA.8.EE.A.1 | Know and apply the properties of integer exponents to generate equivalent numerical expressions. | | MA.8.EE.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). | | MA.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. | | MA.8.EE.C.8 | Analyze and solve pairs of simultaneous linear equations. | | MA.8.EE.C.8a | Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously. | | MA.8.EE.C.8b | Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection. | | MA.8.EE.C.8c | Solve real-world and mathematical problems leading to two linear equations in two variables. | | MA.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. | | MA.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. | | MA.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. | | MA.8.EE.B | Understand the connections between proportional relationships, lines, and linear equations. | | MA.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. | |

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| **Functions** |
| |  |  | | --- | --- | | MA.8.F.B.4 | Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (𝑥, 𝑦) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values. | | MA.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. | | MA.8.F.A | Define, evaluate, and compare functions. | | MA.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. | | MA.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). | | MA.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. | | MA.8.F.B | Use functions to model relationships between quantities. | |

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| **Geometry** |
| |  |  | | --- | --- | | MA.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. | | MA.8.G.A | Understand congruence and similarity using physical models, transparencies, or geometry software. | | MA.8.G.A.1 | Verify experimentally the properties of rotations, reflections, and translations: | | MA.8.G.A.1a | Lines are transformed to lines, and line segments to line segments of the same length. | | MA.8.G.A.1b | Angles are transformed to angles of the same measure. | | MA.8.G.A.1c | Parallel lines are transformed to parallel lines. | | MA.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. | | MA.8.G.A.3 | Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates. | | MA.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. | | MA.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. | | MA.8.G.B | Understand and apply the Pythagorean Theorem. | | MA.8.G.B.6 | Explain a proof of the Pythagorean Theorem and its converse. | | MA.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. | | MA.8.G.B.8 | Apply the Pythagorean Theorem to find the distance between two points in a coordinate system. | | MA.8.G.C | Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres. | |

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| **Statistics and Probability** |
| |  |  | | --- | --- | | MA.8.SP.A | Investigate patterns of association in bivariate data. | | MA.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. | | MA.8.SP.A.2 | Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit (e.g. line of best fit) by judging the closeness of the data points to the line. | | MA.8.SP.A.3 | Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. | | MA.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. | |

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| **Career Ready Practices** |
| CRP2.   Apply appropriate academic and technical skills.    CRP4.   Communicate clearly and effectively and with reason.    CRP6.   Demonstrate creativity and innovation.    CRP8.   Utilize critical thinking to make sense of problems and persevere in solving them.    CRP11.   Use technology to enhance productivity.    CRP12.   Work productively in teams while using cultural global competence. |

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| **Essential Questions** |
| * How are proportional relationships related to rate of change (slope)? * How can rate of change be represented in various ways? * What does the rate of change and y- intercept represent in a real-world situation? * How can we compare and analyze two quantities on a graph? * How can you determine if a function is linear or non-linear? * How to find the slope of given data? * How can we find the rate of change given two points? * Where does the function intersect the y-axis and how does it move? * What functions are parallel, perpendicular, or intersecting? * How to interpret a graph to see if a function is linear or non-linear? |

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| **Enduring Understanding** |
| * Functions can model relationships between quantities. * Functions can be modeled different ways. * There are connections between proportional relationships, lines, and linear equations. * Bivariate data can be investigated to find patterns of association. * How functions model relationships between quantities. * How to use mapping, tables and graphs to model functions. * The connections between proportional relationships, lines and linear equations. * How to investigate bivariate data to find patterns. |

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| **Students will know...** |
| * How functions model relationships between quantities. * How to use mapping, tables and graphs to model functions. * The connections between proportional relationships, lines and linear equations. * How to investigate bivariate data to find patterns. |

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| **Students will be able to...** |
| * Functions can model relationships between quantities. * Functions can be modeled different ways. * There are connections between proportional relationships, lines, and linear equations. * Bivariate data can be investigated to find patterns of association. |

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| **STAGE 2- EVIDENCE OF LEARNING** |
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| **Formative Assessment Suggestions** |
| 3- Minute Pause  Analogy Prompt  Choral Response  Debriefing  Exit Card / Ticket  Hand Signals  Index card summaries  Journal Entry  Misconception Check  Observation  Portfolio Check  Questions & Answers  Quiz  Self-Assessment  Student Conference  Think-Pair-Share  Think-Ink-Share  Web or Concept Map   |  |  | | --- | --- | | • 3- Minute Pause | **.** | | • A-B-C Summaries | **.** | | • Analogy Prompt | **.** | | • Choral Response | **.** | | • Debriefing | **.** | | • Exit Card / Ticket | **.** | | • Hand Signals | **.** | | • Idea Spinner | **.** | | • Index Card Summaries | **.** | | • Inside-Outside Circle Discussion (Fishbowl) | **.** | | • Journal Entry | **.** | | • Misconception Check | **.** | | • Observation | **.** | | • One Minute Essay | **.** | | • One Word Summary | **.** | | • Portfolio Check | **.** | | • Questions & Answers | **.** | | • Quiz | **.** | | • Self-Assessment | **.** | | • Student Conference | **.** | | • Think-Pair-Share | **.** | | • Web or Concept Map | **.** | |

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| **Authentic Assessments Suggestions** |
| Through the following authentic assessments, students will develop traits regarding thinking and reasoning, settings, mathematical tools and attitudes and dispositions:  1. Performance Assessments    2. Short Investigations    3. Open Ended Response Questions    4.  Portfolios    5.  Self-Assessments |

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| **Benchmark Assessments** |
| Math 8  Topics 1-2: Cumulative/Benchmark Assessment  Topics 1-4: Cumulative/Benchmark Assessment  Topics 1-6: Cumulative/Benchmark Assessment  End-Of-Year Assessment  Edmentum Fall Administration  Edmentum Winter Administration  Edmentum Spring Administration |

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| **STAGE 3- LEARNING PLAN** |
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| **Instructional Map** |
| **Step 1: What is it we want and expect students to learn?**   * Read domain overview, learning goal, and essential questions to gain an initial understanding of the domain. * Analyze cluster of standards, vertical progression, test item specifications to determine full intent of standards (DOK) and student outcomes. * Determine measurable objectives using unpacked standards. Review the assessments for determining acceptable evidence.   **Step 2: How will they learn it?**   * Select problem-based learning/formative assessment tasks. * Develop learning experiences utilizing the textbook and selected tasks along with higher order questions stems.   **Step 3: How will we know when they have learned it?**   * As a PLC, analyze students’ work reflecting on teacher practice and provide student feedback. * Provide additional assessments as necessary and collaboratively analyze the results.   **Step 4: How will we respond if they don’t learn it? How will we respond to those who already know it?**   * Using data analysis, develop small groups for enrichment and remediation. * Reassess student performance and provide opportunities for application. |

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| **Modifications/Differentiation of Instruction** |
| Differentiation Strategies for Special Education Students   * Remove unnecessary material, words, etc., that can distract from the content * Use of off-grade level materials * Provide appropriate scaffolding * Limit the number of steps required for completion * Time allowed * Level of independence required * Tiered centers, assignments, lessons, or products * Provide appropriate leveled reading materials * Deliver the content in “chunks” * Varied texts and supplementary materials * Use technology, if available and appropriate * Varied homework and products * Varied questioning strategies * Provide background knowledge * Define key vocabulary, multiple-meaning words, and figurative language. * Use audio and visual supports, if available and appropriate * Provide multiple learning opportunities to reinforce key concepts and vocabulary * Meet with small groups to reteach idea/skill * Provide cross-content application of concepts * Ability to work at their own pace * Present ideas using auditory, visual, kinesthetic, & tactile means * Provide graphic organizers and/or highlighted materials * Strategy and flexible groups based on formative assessment * Differentiated checklists and rubrics, if available and appropriate     Differentiation Strategies for Gifted and Talented Students   * Increase the level of complexity * Decrease scaffolding * Variety of finished products * Allow for greater independence * Learning stations, interest groups * Varied texts and supplementary materials * Use of technology * Flexibility in assignments * Varied questioning strategies * Encourage research * Strategy and flexible groups based on formative assessment or student choice * Acceleration within a unit of study * Exposure to more advanced or complex concepts, abstractions, and materials * Encourage students to move through content areas at their own pace * After mastery of a unit, provide students with more advanced learning activities, not more of the same activity * Present information using a thematic, broad-based, and integrative content, rather than just single-subject areas     Differentiated Strategies for ELL Students   * Remove unnecessary materials, words, etc., that can distract from the content * Provide appropriate scaffolding * Limit the number of steps required for completion * Gradually increase the level of independence required * Tiered centers, assignments, lessons, or products * Provide appropriate leveled reading materials * Deliver the content in “chunks” * Varied texts and supplementary materials, including visuals * Use technology, if available and appropriate * Differentiate homework and products * Varied questioning strategies * Provide background knowledge * Define key vocabulary, multiple-meaning words, and figurative language. * Use audio and visual supports, if available and appropriate * Provide multiple learning opportunities to reinforce key concepts and vocabulary * Meet with small groups to reteach idea/skill * Provide cross-content application of concepts * Allow students to work at their own pace * Presenting ideas through auditory, visual, kinesthetic, & tactile means * Role play * Provide graphic organizers, highlighted materials * Strategy and flexible groups based on formative assessment     Differentiation Strategies for At Risk Students   * Remove unnecessary materials, words, etc., that can distract from the content * Provide appropriate scaffolding * Limit the number of steps required for completion * Gradually increase the level of independence required * Tiered centers, assignments, lessons, or products * Provide appropriate leveled reading materials * Deliver the content in “chunks” * Varied texts and supplementary materials * Use technology, if available and appropriate * Differentiate homework and products * Varied questioning strategies * Provide background knowledge * Define key vocabulary, multiple-meaning words, and figurative language * Use audio and visual supports, if available and appropriate * Provide multiple learning opportunities to reinforce key concepts and vocabulary * Meet with small groups to reteach idea/skill * Provide cross-content application of concepts * Presenting ideas through auditory, visual, kinesthetic, & tactile means * Provide graphic organizers and/or highlighted materials * Strategy and flexible groups based on formative assessment       **504 Plans**  Students can qualify for 504 plans if they have physical or mental impairments that affect or limit any of their abilities to:   * walk, breathe, eat, or sleep * communicate, see, hear, or speak * read, concentrate, think, or learn * stand, bend, lift, or work       Examples of accommodations in 504 plans include:   * preferential seating * extended time on tests and assignments * reduced homework or classwork * verbal, visual, or technology aids * modified textbooks or audio-video materials * behavior management support * adjusted class schedules or grading * verbal testing * excused lateness, absence, or missed classwork * pre-approved nurse's office visits and accompaniment to visits * occupational or physical therapy |

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| **Modification Strategies** |
| |  |  | | --- | --- | | • Extended Time | **.** | | • Frequent Breaks | **.** | | • Highlighted Text | **.** | | • Interactive Notebook | **.** | | • Modified Test | **.** | | • Oral Directions | **.** | | • Peer Tutoring | **.** | | • Preferential Seating | **.** | | • Re-Direct | **.** | | • Repeated Drill / Practice | **.** | | • Shortened Assignments | **.** | | • Teacher Notes | **.** | | • Tutorials | **.** | | • Use of Additional Reference Material | **.** | | • Use of Audio Resources | **.** | |

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| **High Preparation Differentiation** |
| |  |  | | --- | --- | | • Alternative Assessments | **.** | | • Choice Boards | **.** | | • Games and Tournaments | **.** | | • Group Investigations | **.** | | • Guided Reading | **.** | | • Independent Research / Project | **.** | | • Interest Groups | **.** | | • Learning Contracts | **.** | | • Leveled Rubrics | **.** | | • Literature Circles | **.** | | • Menu Assignments | **.** | | • Multiple Intelligence Options | **.** | | • Multiple Texts | **.** | | • Personal Agendas | **.** | | • Project Based Learning (PBL) | **.** | | • Stations / Centers | **.** | | • Think-Tac-Toe | **.** | | • Tiered Activities / Assignments | **.** | | • Varying Graphic Organizers | **.** | |

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| **Low Preparation Differentiation** |
| |  |  | | --- | --- | | • Choice of Book / Activity | **.** | | • Cubing Activities | **.** | | • Exploration by Interest (using interest inventories) | **.** | | • Flexible Grouping | **.** | | • Goal Setting With Student | **.** | | • Homework Options | **.** | | • Jigsaw | **.** | | • Mini Workshops to Extend Skills | **.** | | • Mini Workshops to Re-teach | **.** | | • Open-ended Activities | **.** | | • Think-Pair-Share by Interest | **.** | | • Think-Pair-Share by Learning Style | **.** | | • Think-Pair-Share by Learning Style | **.** | | • Think-Pair-Share by Readiness | **.** | | • Use of Collaboration | **.** | | • Use of Reading Buddies | **.** | | • Varied Journal Prompts | **.** | | • Varied Product Choice | **.** | | • Varied Supplemental Materials | **.** | | • Work Alone / Together | **.** | |

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| **Vertical Integration- Discipline Mapping** |
| Functions Vertical Alignment  In Grade 7 Students will be able to do...   * Use properties of operations to generate equivalent expressions. * Solve real-life and mathematical problems using numerical and algebraic expressions and equations.   In Grade 8 Students will be able to do...   * Define, evaluate, and compare functions. * Use functions to model relationships between quantities.     In High School Math Students will be able to do...  Functions  Interpreting Functions   * Understand the concept of a function and use function notation * Interpret functions that arise in applications in terms of the context * Analyze functions using different representations   Building Functions   * Build a function that models a relationship between two quantities * Build new functions from existing functions   Linear, Quadratic, and Exponential Models   * Construct and compare linear, quadratic, and exponential models and solve problems * Interpret expressions for functions in terms of the situation they model   Trigonometric Functions   * Extend the domain of trigonometric functions using the unit circle * Model periodic phenomena with trigonometric functions * Prove and apply trigonometric identities |

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| **Additional Materials** |
| LPS Adopted Textbooks and Programs   * Pearson EnVision Grade 8 * Pearson Realize (Computer Based program supplementing Envision)   Edmentum Testing   * Data Analysis Reports   NJSLA (PARCC) Released Items  Khan Academy |

**Unit #4: Geometry**

Content Area: **Mathematics**  
Course(s): **Math 8**  
Time Period: **Third Marking Period**  
Length: **10 Weeks**  
Status: **Published**

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| **Unit Overview** |
| 1. Students will be able to define and perform rotations, reflections, translations and dilations.  2. They will match lines to lines, line segments to line segments, parallel lines to parallel lines, and angles to angles.  3. Students will prove that area and shape will not change a figure that is rotated, translated or reflected.  4. Students will plot coordinates to describe the effect of transformations on the pre-image.  5. Students will compare and contrast similarity and congruency. Students will explain a proof of the Pythagorean Theorem and its converse. Students will apply the Pythagorean Theorem to find missing measures in a right triangle.  6. Students will determine the distance between two points by constructing a right triangle.  7. Students will apply the formula for area of a circle, volume of a cylinder, cone or sphere.  8. Students will identify angles using the properties of intersecting parallel lines by a transversal.  9. Students will be able to establish facts about the angle sum and exterior angles of a triangle. |

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| **STAGE 1- DESIRED RESULTS** |
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| **Educational Standards** |
| The following goals, as outlined in the NJSLS, will provide a framework for preparation and instruction in mathematics. They are the eight mathematical standards:  1. Make sense of problems and persevere in solving them.  2. Reason abstractly and quantitatively.  3. Construct viable arguments and critique the reasoning of others.  4. Model with mathematics.  5. Use appropriate tools strategically.  6. Attend to precision.  7. Look for and make use of structure.  8. Look for and express regularity in repeated reasoning. |

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| **Expressions and Equations** |
| |  |  | | --- | --- | | MA.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. | | MA.8.EE.C | Analyze and solve linear equations and pairs of simultaneous linear equations. | | MA.8.EE.A | Work with radicals and integer exponents. | | MA.8.EE.C.7 | Solve linear equations in one variable. | | MA.8.EE.A.1 | Know and apply the properties of integer exponents to generate equivalent numerical expressions. | | MA.8.EE.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). | | MA.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. | | MA.8.EE.C.8 | Analyze and solve pairs of simultaneous linear equations. | | MA.8.EE.C.8a | Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously. | | MA.8.EE.C.8b | Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection. | | MA.8.EE.C.8c | Solve real-world and mathematical problems leading to two linear equations in two variables. | | MA.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. | | MA.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. | | MA.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. | | MA.8.EE.B | Understand the connections between proportional relationships, lines, and linear equations. | | MA.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. | |

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| **Functions** |
| |  |  | | --- | --- | | MA.8.F.B.4 | Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (𝑥, 𝑦) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values. | | MA.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. | | MA.8.F.A | Define, evaluate, and compare functions. | | MA.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. | | MA.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). | | MA.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. | | MA.8.F.B | Use functions to model relationships between quantities. | |

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| **Geometry** |
| |  |  | | --- | --- | | MA.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. | | MA.8.G.A | Understand congruence and similarity using physical models, transparencies, or geometry software. | | MA.8.G.A.1 | Verify experimentally the properties of rotations, reflections, and translations: | | MA.8.G.A.1a | Lines are transformed to lines, and line segments to line segments of the same length. | | MA.8.G.A.1b | Angles are transformed to angles of the same measure. | | MA.8.G.A.1c | Parallel lines are transformed to parallel lines. | | MA.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. | | MA.8.G.A.3 | Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates. | | MA.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. | | MA.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. | | MA.8.G.B | Understand and apply the Pythagorean Theorem. | | MA.8.G.B.6 | Explain a proof of the Pythagorean Theorem and its converse. | | MA.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. | | MA.8.G.B.8 | Apply the Pythagorean Theorem to find the distance between two points in a coordinate system. | | MA.8.G.C | Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres. | |

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| **Statistics and Probability** |
| |  |  | | --- | --- | | MA.8.SP.A | Investigate patterns of association in bivariate data. | | MA.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. | | MA.8.SP.A.2 | Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit (e.g. line of best fit) by judging the closeness of the data points to the line. | | MA.8.SP.A.3 | Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. | | MA.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. | |

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| **Career Ready Practices** |
| CRP2.   Apply appropriate academic and technical skills.    CRP4.   Communicate clearly and effectively and with reason.    CRP6.   Demonstrate creativity and innovation.    CRP8.   Utilize critical thinking to make sense of problems and persevere in solving them.    CRP11.   Use technology to enhance productivity.    CRP12.   Work productively in teams while using cultural global competence. |

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| **Essential Questions** |
| * How are angles, lines, and figures affected by various transformations? * How can we verify experimentally the properties of rotations, reflections, and translations? * What do we know about angle measures when a transversal interests parallel lines? * How to perform transformations the coordinate plane? * How can we use the Geometer Sketchpad? * What congruent angles are formed when a transversal intersects parallel lines? |

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| **Enduring Understanding** |
| * Congruence and similarity can be understood using physical models, transparencies, or geometry software. * Informal arguments can be established with transversals and parallel lines. * How we can prove similarity or congruence using a variety of methods. * How a dilation takes a line not passing through the center of dilation to a parallel line, and leaves a line passing through the center unchanged. |

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| **Students will know...** |
| * How we can prove similarity or congruence using a variety of methods. * How a dilation takes a line not passing through the center of dilation to a parallel line, and leaves a line passing through the center unchanged. |

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| **Students will be able to...** |
| * Congruence and similarity can be understood using physical models, transparencies, or geometry software. * Informal arguments can be established with transversals and parallel lines. |

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| **STAGE 2- EVIDENCE OF LEARNING** |
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| **Formative Assessment Suggestions** |
| 3- Minute Pause  Analogy Prompt  Choral Response  Debriefing  Exit Card / Ticket  Hand Signals  Index card summaries  Journal Entry  Misconception Check  Observation  Portfolio Check  Questions & Answers  Quiz  Self-Assessment  Student Conference  Think-Pair-Share  Think-Ink-Share  Web or Concept Map   |  |  | | --- | --- | | • 3- Minute Pause | **.** | | • A-B-C Summaries | **.** | | • Analogy Prompt | **.** | | • Choral Response | **.** | | • Debriefing | **.** | | • Exit Card / Ticket | **.** | | • Hand Signals | **.** | | • Idea Spinner | **.** | | • Index Card Summaries | **.** | | • Inside-Outside Circle Discussion (Fishbowl) | **.** | | • Journal Entry | **.** | | • Misconception Check | **.** | | • Observation | **.** | | • One Minute Essay | **.** | | • One Word Summary | **.** | | • Portfolio Check | **.** | | • Questions & Answers | **.** | | • Quiz | **.** | | • Self-Assessment | **.** | | • Student Conference | **.** | | • Think-Pair-Share | **.** | | • Web or Concept Map | **.** | |

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| **Authentic Assessments Suggestions** |
| Through the following authentic assessments, students will develop traits regarding thinking and reasoning, settings, mathematical tools and attitudes and dispositions:    1. Performance Assessments  2. Short Investigations  3. Open Ended Response Questions  4.  Portfolios  5.  Self-Assessments |

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| **Benchmark Assessments** |
| Math 8  Topics 1-2: Cumulative/Benchmark Assessment  Topics 1-4: Cumulative/Benchmark Assessment  Topics 1-6: Cumulative/Benchmark Assessment  End-Of-Year Assessment  Edmentum Fall Administration  Edmentum Winter Administration  Edmentum Spring Administration |

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| **STAGE 3- LEARNING PLAN** |
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| **Instructional Map** |
| **Step 1: What is it we want and expect students to learn?**   * Read domain overview, learning goal, and essential questions to gain an initial understanding of the domain. * Analyze cluster of standards, vertical progression, test item specifications to determine full intent of standards (DOK) and student outcomes. * Determine measurable objectives using unpacked standards. Review the assessments for determining acceptable evidence.   **Step 2: How will they learn it?**   * Select problem-based learning/formative assessment tasks. * Develop learning experiences utilizing the textbook and selected tasks along with higher order questions stems.   **Step 3: How will we know when they have learned it?**   * As a PLC, analyze students’ work reflecting on teacher practice and provide student feedback. * Provide additional assessments as necessary and collaboratively analyze the results.   **Step 4: How will we respond if they don’t learn it? How will we respond to those who already know it?**   * Using data analysis, develop small groups for enrichment and remediation. * Reassess student performance and provide opportunities for application. |

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| **Modifications/Differentiation of Instruction** |
| Differentiation Strategies for Special Education Students   * Remove unnecessary material, words, etc., that can distract from the content * Use of off-grade level materials * Provide appropriate scaffolding * Limit the number of steps required for completion * Time allowed * Level of independence required * Tiered centers, assignments, lessons, or products * Provide appropriate leveled reading materials * Deliver the content in “chunks” * Varied texts and supplementary materials * Use technology, if available and appropriate * Varied homework and products * Varied questioning strategies * Provide background knowledge * Define key vocabulary, multiple-meaning words, and figurative language. * Use audio and visual supports, if available and appropriate * Provide multiple learning opportunities to reinforce key concepts and vocabulary * Meet with small groups to reteach idea/skill * Provide cross-content application of concepts * Ability to work at their own pace * Present ideas using auditory, visual, kinesthetic, & tactile means * Provide graphic organizers and/or highlighted materials * Strategy and flexible groups based on formative assessment * Differentiated checklists and rubrics, if available and appropriate       Differentiation Strategies for Gifted and Talented Students   * Increase the level of complexity * Decrease scaffolding * Variety of finished products * Allow for greater independence * Learning stations, interest groups * Varied texts and supplementary materials * Use of technology * Flexibility in assignments * Varied questioning strategies * Encourage research * Strategy and flexible groups based on formative assessment or student choice * Acceleration within a unit of study * Exposure to more advanced or complex concepts, abstractions, and materials * Encourage students to move through content areas at their own pace * After mastery of a unit, provide students with more advanced learning activities, not more of the same activity * Present information using a thematic, broad-based, and integrative content, rather than just single-subject areas       Differentiated Strategies for ELL Students   * Remove unnecessary materials, words, etc., that can distract from the content * Provide appropriate scaffolding * Limit the number of steps required for completion * Gradually increase the level of independence required * Tiered centers, assignments, lessons, or products * Provide appropriate leveled reading materials * Deliver the content in “chunks” * Varied texts and supplementary materials, including visuals * Use technology, if available and appropriate * Differentiate homework and products * Varied questioning strategies * Provide background knowledge * Define key vocabulary, multiple-meaning words, and figurative language. * Use audio and visual supports, if available and appropriate * Provide multiple learning opportunities to reinforce key concepts and vocabulary * Meet with small groups to reteach idea/skill * Provide cross-content application of concepts * Allow students to work at their own pace * Presenting ideas through auditory, visual, kinesthetic, & tactile means * Role play * Provide graphic organizers, highlighted materials * Strategy and flexible groups based on formative assessment       Differentiation Strategies for At Risk Students   * Remove unnecessary materials, words, etc., that can distract from the content * Provide appropriate scaffolding * Limit the number of steps required for completion * Gradually increase the level of independence required * Tiered centers, assignments, lessons, or products * Provide appropriate leveled reading materials * Deliver the content in “chunks” * Varied texts and supplementary materials * Use technology, if available and appropriate * Differentiate homework and products * Varied questioning strategies * Provide background knowledge * Define key vocabulary, multiple-meaning words, and figurative language * Use audio and visual supports, if available and appropriate * Provide multiple learning opportunities to reinforce key concepts and vocabulary * Meet with small groups to reteach idea/skill * Provide cross-content application of concepts * Presenting ideas through auditory, visual, kinesthetic, & tactile means * Provide graphic organizers and/or highlighted materials * Strategy and flexible groups based on formative assessment       **504 Plans**  Students can qualify for 504 plans if they have physical or mental impairments that affect or limit any of their abilities to:   * walk, breathe, eat, or sleep * communicate, see, hear, or speak * read, concentrate, think, or learn * stand, bend, lift, or work       Examples of accommodations in 504 plans include:   * preferential seating * extended time on tests and assignments * reduced homework or classwork * verbal, visual, or technology aids * modified textbooks or audio-video materials * behavior management support * adjusted class schedules or grading * verbal testing * excused lateness, absence, or missed classwork * pre-approved nurse's office visits and accompaniment to visits * occupational or physical therapy |

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| **Modification Strategies** |
| |  |  | | --- | --- | | • Extended Time | **.** | | • Frequent Breaks | **.** | | • Highlighted Text | **.** | | • Interactive Notebook | **.** | | • Modified Test | **.** | | • Oral Directions | **.** | | • Peer Tutoring | **.** | | • Preferential Seating | **.** | | • Re-Direct | **.** | | • Repeated Drill / Practice | **.** | | • Shortened Assignments | **.** | | • Teacher Notes | **.** | | • Tutorials | **.** | | • Use of Additional Reference Material | **.** | | • Use of Audio Resources | **.** | |

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| **High Preparation Differentiation** |
| |  |  | | --- | --- | | • Alternative Assessments | **.** | | • Choice Boards | **.** | | • Games and Tournaments | **.** | | • Group Investigations | **.** | | • Guided Reading | **.** | | • Independent Research / Project | **.** | | • Interest Groups | **.** | | • Learning Contracts | **.** | | • Leveled Rubrics | **.** | | • Literature Circles | **.** | | • Menu Assignments | **.** | | • Multiple Intelligence Options | **.** | | • Multiple Texts | **.** | | • Personal Agendas | **.** | | • Project Based Learning (PBL) | **.** | | • Stations / Centers | **.** | | • Think-Tac-Toe | **.** | | • Tiered Activities / Assignments | **.** | | • Varying Graphic Organizers | **.** | |

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| **Low Preparation Differentiation** |
| |  |  | | --- | --- | | • Choice of Book / Activity | **.** | | • Cubing Activities | **.** | | • Exploration by Interest (using interest inventories) | **.** | | • Flexible Grouping | **.** | | • Goal Setting With Student | **.** | | • Homework Options | **.** | | • Jigsaw | **.** | | • Mini Workshops to Extend Skills | **.** | | • Mini Workshops to Re-teach | **.** | | • Open-ended Activities | **.** | | • Think-Pair-Share by Interest | **.** | | • Think-Pair-Share by Learning Style | **.** | | • Think-Pair-Share by Learning Style | **.** | | • Think-Pair-Share by Readiness | **.** | | • Use of Collaboration | **.** | | • Use of Reading Buddies | **.** | | • Varied Journal Prompts | **.** | | • Varied Product Choice | **.** | | • Varied Supplemental Materials | **.** | | • Work Alone / Together | **.** | |

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| **Vertical Integration- Discipline Mapping** |
| Geometry Vertical Alignment  In Grade 7 Students will be able to do...   * Draw, construct and describe geometrical figures and describe the relationships between them. * Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.   In Grade 8 Students will be able to do...   * Understand congruence and similarity using physical models, transparencies, or geometry software. * Understand and apply the Pythagorean Theorem. * Solve real-world and mathematical problems involving volume of cylinders, cones and spheres.   In High School Math Students will be able to do...  Geometry  Congruence   * Experiment with transformations in the plane * Understand congruence in terms of rigid motions * Prove geometric theorems * Make geometric constructions   Similarity, Right   * Understand similarity in terms of similarity transformations   Triangles, and Trigonometry   * Prove theorems involving similarity * Define trigonometric ratios and solve problems involving right triangles * Apply trigonometry to general triangles   Circles   * Understand and apply theorems about circles * Find arc lengths and areas of sectors of circles   Expressing Geometric Properties with Equations   * Translate between the geometric description and the equation for a conic section * Use coordinates to prove simple geometric theorems algebraically   Geometric Measurement and Dimension   * Explain volume formulas and use them to solve problems * Visualize relationships between two dimensional and three-dimensional objects   Modeling with Geometry   * Apply geometric concepts in modeling situations |

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| **Additional Materials** |
| LPS Adopted Textbooks and Programs   * Pearson EnVision Grade 8 * Pearson Realize (Computer Based program supplementing Envision)   Edmentum Testing   * Data Analysis Reports   NJSLA (PARCC) Released Items  Khan Academy |

**Unit #5: Statistics and Probability**

Content Area: **Mathematics**  
Course(s): **Math 8**  
Time Period: **Fourth Marking Period**  
Length: **2-4 Weeks**  
Status: **Published**

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| **Unit Overview** |
| 1. Students will be able to construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities.  2. Students will informally assess the model fit by judging the closeness of the data points to the line.  3. Students will determine the meaning of slope and y-intercept.  4. Students will investigate patterns of association in bivariate data. |

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| **STAGE 1- DESIRED RESULTS** |
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| **Educational Standards** |
| The following goals, as outlined in the NJSLS, will provide a framework for preparation and instruction in mathematics. They are the eight mathematical standards:  1. Make sense of problems and persevere in solving them.  2. Reason abstractly and quantitatively.  3. Construct viable arguments and critique the reasoning of others.  4. Model with mathematics.  5. Use appropriate tools strategically.  6. Attend to precision.  7. Look for and make use of structure.  8. Look for and express regularity in repeated reasoning. |

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| **New Jersey Student Learning Standards- Mathematics** |
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| **Introduction- Grade 8** |
| |  |  | | --- | --- | | MA.8.8 | 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. | | MA.8.8.1 | Students use linear equations and systems of linear equations to represent, analyze, and solve a variety of problems. Students recognize equations for proportions (y/x = m or y = mx) as special linear equations (y = mx + b), understanding that the constant of proportionality (m) is the slope, and the graphs are lines through the origin. They understand that the slope (m) of a line is a constant rate of change, so that if the input or x-coordinate changes by an amount A, the output or y-coordinate changes by the amount m·A. Students also use a linear equation to describe the association between two quantities in bivariate data (such as arm span vs. height for students in a classroom). At this grade, fitting the model, and assessing its fit to the data are done informally. Interpreting the model in the context of the data requires students to express a relationship between the two quantities in question and to interpret components of the relationship (such as slope and y-intercept) in terms of the situation. 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. | | MA.8.8.2 | 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. | | MA.8.8.3 | 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. | |

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| **The Number System** |
| |  |  | | --- | --- | | MA.8.NS.A | Know that there are numbers that are not rational, and approximate them by rational numbers. | | MA.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. | | MA.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., π²). | |

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| **Expressions and Equations** |
| |  |  | | --- | --- | | MA.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. | | MA.8.EE.C | Analyze and solve linear equations and pairs of simultaneous linear equations. | | MA.8.EE.A | Work with radicals and integer exponents. | | MA.8.EE.C.7 | Solve linear equations in one variable. | | MA.8.EE.A.1 | Know and apply the properties of integer exponents to generate equivalent numerical expressions. | | MA.8.EE.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). | | MA.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. | | MA.8.EE.C.8 | Analyze and solve pairs of simultaneous linear equations. | | MA.8.EE.C.8a | Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously. | | MA.8.EE.C.8b | Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection. | | MA.8.EE.C.8c | Solve real-world and mathematical problems leading to two linear equations in two variables. | | MA.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. | | MA.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. | | MA.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. | | MA.8.EE.B | Understand the connections between proportional relationships, lines, and linear equations. | | MA.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. | |

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| **Functions** |
| |  |  | | --- | --- | | MA.8.F.B.4 | Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (𝑥, 𝑦) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values. | | MA.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. | | MA.8.F.A | Define, evaluate, and compare functions. | | MA.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. | | MA.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). | | MA.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. | | MA.8.F.B | Use functions to model relationships between quantities. | |

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| **Geometry** |
| |  |  | | --- | --- | | MA.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. | | MA.8.G.A | Understand congruence and similarity using physical models, transparencies, or geometry software. | | MA.8.G.A.1 | Verify experimentally the properties of rotations, reflections, and translations: | | MA.8.G.A.1a | Lines are transformed to lines, and line segments to line segments of the same length. | | MA.8.G.A.1b | Angles are transformed to angles of the same measure. | | MA.8.G.A.1c | Parallel lines are transformed to parallel lines. | | MA.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. | | MA.8.G.A.3 | Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates. | | MA.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. | | MA.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. | | MA.8.G.B | Understand and apply the Pythagorean Theorem. | | MA.8.G.B.6 | Explain a proof of the Pythagorean Theorem and its converse. | | MA.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. | | MA.8.G.B.8 | Apply the Pythagorean Theorem to find the distance between two points in a coordinate system. | | MA.8.G.C | Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres. | |

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| **Statistics and Probability** |
| |  |  | | --- | --- | | MA.8.SP.A | Investigate patterns of association in bivariate data. | | MA.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. | | MA.8.SP.A.2 | Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit (e.g. line of best fit) by judging the closeness of the data points to the line. | | MA.8.SP.A.3 | Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. | | MA.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. | |

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| **Career Ready Practices** |
| CRP2.   Apply appropriate academic and technical skills.    CRP4.   Communicate clearly and effectively and with reason.    CRP6.   Demonstrate creativity and innovation.    CRP8.   Utilize critical thinking to make sense of problems and persevere in solving them.    CRP11.   Use technology to enhance productivity.    CRP12.   Work productively in teams while using cultural global competence. |

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| **Essential Questions** |
| * How can scatter plots distinguish correlation between two quantities? * How do you recognize and interpret a non-linear correlation between data points? * How can we use data to construct scatter plots? * How can we analyze the correlation between data points? |

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| **Enduring Understanding** |
| * Describe the correlation between two bivariate quantities. * Construct best line of fit from given data. * How the striking deviation helps to determine the correlation between two quantities. * How you can draw the best line of fit on a scatter plot. |

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| **Students will know...** |
| * How the striking deviation helps to determine the correlation between two quantities. * How you can draw the best line of fit on a scatter plot. |

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| **Students will be able to...** |
| * Describe the correlation between two bivariate quantities. * Construct best line of fit from given data. |

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| **STAGE 2- EVIDENCE OF LEARNING** |
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| **Formative Assessment Suggestions** |
| 3- Minute Pause  Analogy Prompt  Choral Response  Debriefing  Exit Card / Ticket  Hand Signals  Index card summaries  Journal Entry  Misconception Check  Observation  Portfolio Check  Questions & Answers  Quiz  Self-Assessment  Student Conference  Think-Pair-Share  Think-Ink-Share  Web or Concept Map   |  |  | | --- | --- | | • 3- Minute Pause | **.** | | • A-B-C Summaries | **.** | | • Analogy Prompt | **.** | | • Choral Response | **.** | | • Debriefing | **.** | | • Exit Card / Ticket | **.** | | • Hand Signals | **.** | | • Idea Spinner | **.** | | • Index Card Summaries | **.** | | • Inside-Outside Circle Discussion (Fishbowl) | **.** | | • Journal Entry | **.** | | • Misconception Check | **.** | | • Observation | **.** | | • One Minute Essay | **.** | | • One Word Summary | **.** | | • Portfolio Check | **.** | | • Questions & Answers | **.** | | • Quiz | **.** | | • Self-Assessment | **.** | | • Student Conference | **.** | | • Think-Pair-Share | **.** | | • Web or Concept Map | **.** | |

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| **Authentic Assessments Suggestions** |
| Through the following authentic assessments, students will develop traits regarding thinking and reasoning, settings, mathematical tools and attitudes and dispositions:    1. Performance Assessments    2. Short Investigations    3. Open Ended Response Questions    4.  Portfolios    5.  Self-Assessments |

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| **Benchmark Assessments** |
| Math 8  Topics 1-2: Cumulative/Benchmark Assessment  Topics 1-4: Cumulative/Benchmark Assessment  Topics 1-6: Cumulative/Benchmark Assessment  End-Of-Year Assessment  Edmentum Fall Administration  Edmentum Spring Administration |

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| **STAGE 3- LEARNING PLAN** |
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| **Instructional Map** |
| **Step 1: What is it we want and expect students to learn?**   * Read domain overview, learning goal, and essential questions to gain an initial understanding of the domain. * Analyze cluster of standards, vertical progression, test item specifications to determine full intent of standards (DOK) and student outcomes. * Determine measurable objectives using unpacked standards. Review the assessments for determining acceptable evidence.   **Step 2: How will they learn it?**   * Select problem-based learning/formative assessment tasks. * Develop learning experiences utilizing the textbook and selected tasks along with higher order questions stems.   **Step 3: How will we know when they have learned it?**   * As a PLC, analyze students’ work reflecting on teacher practice and provide student feedback. * Provide additional assessments as necessary and collaboratively analyze the results.   **Step 4: How will we respond if they don’t learn it? How will we respond to those who already know it?**   * Using data analysis, develop small groups for enrichment and remediation. * Reassess student performance and provide opportunities for application. |

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| **Modifications/Differentiation of Instruction** |
| Differentiation Strategies for Special Education Students   * Remove unnecessary material, words, etc., that can distract from the content * Use of off-grade level materials * Provide appropriate scaffolding * Limit the number of steps required for completion * Time allowed * Level of independence required * Tiered centers, assignments, lessons, or products * Provide appropriate leveled reading materials * Deliver the content in “chunks” * Varied texts and supplementary materials * Use technology, if available and appropriate * Varied homework and products * Varied questioning strategies * Provide background knowledge * Define key vocabulary, multiple-meaning words, and figurative language. * Use audio and visual supports, if available and appropriate * Provide multiple learning opportunities to reinforce key concepts and vocabulary * Meet with small groups to reteach idea/skill * Provide cross-content application of concepts * Ability to work at their own pace * Present ideas using auditory, visual, kinesthetic, & tactile means * Provide graphic organizers and/or highlighted materials * Strategy and flexible groups based on formative assessment * Differentiated checklists and rubrics, if available and appropriate       Differentiation Strategies for Gifted and Talented Students   * Increase the level of complexity * Decrease scaffolding * Variety of finished products * Allow for greater independence * Learning stations, interest groups * Varied texts and supplementary materials * Use of technology * Flexibility in assignments * Varied questioning strategies * Encourage research * Strategy and flexible groups based on formative assessment or student choice * Acceleration within a unit of study * Exposure to more advanced or complex concepts, abstractions, and materials * Encourage students to move through content areas at their own pace * After mastery of a unit, provide students with more advanced learning activities, not more of the same activity * Present information using a thematic, broad-based, and integrative content, rather than just single-subject areas       Differentiated Strategies for ELL Students   * Remove unnecessary materials, words, etc., that can distract from the content * Provide appropriate scaffolding * Limit the number of steps required for completion * Gradually increase the level of independence required * Tiered centers, assignments, lessons, or products * Provide appropriate leveled reading materials * Deliver the content in “chunks” * Varied texts and supplementary materials, including visuals * Use technology, if available and appropriate * Differentiate homework and products * Varied questioning strategies * Provide background knowledge * Define key vocabulary, multiple-meaning words, and figurative language. * Use audio and visual supports, if available and appropriate * Provide multiple learning opportunities to reinforce key concepts and vocabulary * Meet with small groups to reteach idea/skill * Provide cross-content application of concepts * Allow students to work at their own pace * Presenting ideas through auditory, visual, kinesthetic, & tactile means * Role play * Provide graphic organizers, highlighted materials * Strategy and flexible groups based on formative assessment       Differentiation Strategies for At Risk Students   * Remove unnecessary materials, words, etc., that can distract from the content * Provide appropriate scaffolding * Limit the number of steps required for completion * Gradually increase the level of independence required * Tiered centers, assignments, lessons, or products * Provide appropriate leveled reading materials * Deliver the content in “chunks” * Varied texts and supplementary materials * Use technology, if available and appropriate * Differentiate homework and products * Varied questioning strategies * Provide background knowledge * Define key vocabulary, multiple-meaning words, and figurative language * Use audio and visual supports, if available and appropriate * Provide multiple learning opportunities to reinforce key concepts and vocabulary * Meet with small groups to reteach idea/skill * Provide cross-content application of concepts * Presenting ideas through auditory, visual, kinesthetic, & tactile means * Provide graphic organizers and/or highlighted materials * Strategy and flexible groups based on formative assessment     **504 Plans**  Students can qualify for 504 plans if they have physical or mental impairments that affect or limit any of their abilities to:   * walk, breathe, eat, or sleep * communicate, see, hear, or speak * read, concentrate, think, or learn * stand, bend, lift, or work       Examples of accommodations in 504 plans include:   * preferential seating * extended time on tests and assignments * reduced homework or classwork * verbal, visual, or technology aids * modified textbooks or audio-video materials * behavior management support * adjusted class schedules or grading * verbal testing * excused lateness, absence, or missed classwork * pre-approved nurse's office visits and accompaniment to visits * occupational or physical therapy |

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| **Modification Strategies** |
| |  |  | | --- | --- | | • Extended Time | **.** | | • Frequent Breaks | **.** | | • Highlighted Text | **.** | | • Interactive Notebook | **.** | | • Modified Test | **.** | | • Oral Directions | **.** | | • Peer Tutoring | **.** | | • Preferential Seating | **.** | | • Re-Direct | **.** | | • Repeated Drill / Practice | **.** | | • Shortened Assignments | **.** | | • Teacher Notes | **.** | | • Tutorials | **.** | | • Use of Additional Reference Material | **.** | | • Use of Audio Resources | **.** | |

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| **High Preparation Differentiation** |
| |  |  | | --- | --- | | • Alternative Assessments | **.** | | • Choice Boards | **.** | | • Games and Tournaments | **.** | | • Group Investigations | **.** | | • Guided Reading | **.** | | • Independent Research / Project | **.** | | • Interest Groups | **.** | | • Learning Contracts | **.** | | • Leveled Rubrics | **.** | | • Literature Circles | **.** | | • Menu Assignments | **.** | | • Multiple Intelligence Options | **.** | | • Multiple Texts | **.** | | • Personal Agendas | **.** | | • Project Based Learning (PBL) | **.** | | • Stations / Centers | **.** | | • Think-Tac-Toe | **.** | | • Tiered Activities / Assignments | **.** | | • Varying Graphic Organizers | **.** | |

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| **Low Preparation Differentiation** |
| |  |  | | --- | --- | | • Choice of Book / Activity | **.** | | • Cubing Activities | **.** | | • Exploration by Interest (using interest inventories) | **.** | | • Flexible Grouping | **.** | | • Goal Setting With Student | **.** | | • Homework Options | **.** | | • Jigsaw | **.** | | • Mini Workshops to Extend Skills | **.** | | • Mini Workshops to Re-teach | **.** | | • Open-ended Activities | **.** | | • Think-Pair-Share by Interest | **.** | | • Think-Pair-Share by Learning Style | **.** | | • Think-Pair-Share by Learning Style | **.** | | • Think-Pair-Share by Readiness | **.** | | • Use of Collaboration | **.** | | • Use of Reading Buddies | **.** | | • Varied Journal Prompts | **.** | | • Varied Product Choice | **.** | | • Varied Supplemental Materials | **.** | | • Work Alone / Together | **.** | |

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| **Vertical Integration- Discipline Mapping** |
| Statistics and Probability Vertical Alignment  In Grade 7 Students will be able to do...   * Use random sampling to draw inferences about a population. * Draw informal comparative inferences about two populations. * Investigate chance processes and develop, use, and evaluate probability models.   In Grade 8 Students will be able to do...   * Investigate patterns of association in bivariate data.   In High School Math Students will be able to do...  Statistics and Probability  Interpreting Categorical and Quantitative Data   * Summarize, represent, and interpret data on a single count or measurement variable * Summarize, represent, and interpret data on two categorical and quantitative variables * Interpret linear models    Making Inferences and Justifying Conclusions   * Understand and evaluate random processes underlying statistical experiments * Make inferences and justify conclusions from sample surveys, experiments and observational studies   Conditional Probability and the Rules of Probability   * Understand independence and conditional probability and use them to interpret data * Use the rules of probability to compute probabilities of compound events in a uniform probability model   Using Probability to Make Decisions   * Calculate expected values and use them to solve problems * Use probability to evaluate outcomes of decisions |

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| **Additional Materials** |
| LPS Adopted Textbooks and Programs   * Pearson EnVision Grade 8 * Pearson Realize (Computer Based program supplementing Envision)   Edmentum Testing   * Data Analysis Reports   NJSLA (PARCC) Released Items  Khan Academy |

**Unit Specific Interdisciplinary Connections / Materials**

With interdisciplinary instruction, the subject areas are woven together and explored through an overarching theme or concept. We use math to help us solve everyday problems in the kitchen, in the garden, and for many of us at our jobs.

Brain research has shown that information in our brains is organized in schematic structures. These structures are made up of interconnected bits of information and serve as a framework for the knowledge we acquire. When a learner’s knowledge is connected, it is much more likely that they will apply the prior knowledge to a wide variety of new situations. They will acquire new information in a way that is more accessible and will be better able to relate it to previously acquired knowledge.

Students learn about patterns in math, science, social studies, and even literature. Because of this, they are much more likely to “see” these patterns when they encounter new situations. Since patterns are not only studied in math they are able to make the connection and gain the understanding that patterns can be found in many areas of their lives. Interdisciplinary instruction allows students to understand the interconnectedness of the disciplines and makes learning more meaningful and relevant as fascinating connections are made across the subject areas.

**Science**

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.

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.

**Language Arts**

RL.8.1. Cite the textual evidence and make relevant connections that most strongly supports an analysis of what the text says explicitly as well as inferences drawn from the text.

RI.8.1. Cite the textual evidence and make relevant connections that most strongly supports an analysis of what the text says explicitly as well as inferences drawn from the text.

**Social Studies**

6.2.8.GeoHE.4.b: Use geographic models to determine the impact of environmental modifications made by earlier civilizations on the current day environmental challenges.

6.2.8.EconEM.3.a: Analyze the impact of expanding land and sea trade routes as well as a uniform system of exchange in the Mediterranean World and Asia.