East Newark Public School

Mathematics Curriculum
Grade 8

Revised 2022

Equity Statement:

East Newark Public School District does not discriminate on the basis of race, color, creed, religion, sex, ancestry, or national origin. The East Newark Board of Education ensures that all students enrolled in the schools of this district shall be afforded equal educational opportunities in strict accordance with the law. No student shall be denied access to or benefit from any educational program or activity on the basis of the student's race, color, creed, religion, national origin, ancestry, age, marital status, affectional or sexual orientation, gender, gender identity or expression, socioeconomic status, or disability. The Board directs the Superintendent to allocate faculty, administrators, support staff members, curriculum materials, and instructional equipment supplies among classes of this district in a manner that ensures equivalency of educational opportunity throughout this district. The school district's curricula will eliminate discrimination, promote mutual acceptance and respect among students, and enable students to interact effectively with others, regardless of race, color, creed, religion, national origin, ancestry, age, marital status, affectional or sexual orientation, gender, gender identity or expression, socioeconomic status, or disability.

Course Description:

Grade 8 Mathematics is designed to (1) introduce students to the concept of a function and the use of functions to describe quantitative relationships, (2) strengthen students reasoning about expressions and equations, including modeling an association in bivariate data with a linear equation, and (3) analyze two-and three-dimensional space and figures using distance, angle, congruence, and similarity.

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

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.
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.

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 ind lengths, and to analyze polygons. Students complete their work on volume by solving problems involving cones, cylinders, and spheres.

Course Modifications:

The course instructor will determine, with the assistance of administrators, teacher assistants/aides, educational specialists, and/or special education teachers, what modifications will be made for his/her students. Such examples of modifications can include, but not be limited to:

- Extended time as needed
- Modification of tests and quizzes
- Preferential seating
- Alternative/Formative assessment (projects)
- Effective teacher questioning (ranging from simple recall to higher order critical thinking questions)
- Supplemental materials
- Cooperative learning
- Teacher tutoring
- Peer tutoring
- Differentiated Instruction

Grade 8 Pacing Guide:

UNIT		STANDARDS	PACING
Unit 1			
1A	Functions	8.F.A.1; 8.F.A.2; 8.F.B.5	10 days
1B	Geometric Transformations	8.G.A.1; 8.G.A.2; 8.G.A.3; 8.G.A.4	15 days
1C	Linear Functions	8.EE.B.5; 8.EE.B.6; 8.F.A.3; 8.F.B.4	17 days
Unit 2			
2A	Linear Equations in One Variable	8.EE.C.7	14 days
2B	Angle Relationships	8.G.A.5	8 days
2C	Systems of Equations	8.EE.C.8	18 days
Unit 3			
3A	Exponents and Scientific Notation	8.EE.A.1; 8.EE.A.3; 8.EE.A.4	16 days
3B	The Pythagorean Theorem and Volume	8.NS.A.1; 8.NS.A.2; 8.EE.A.2; 8.G.B.6; 8.G.B.7; 8.G.B.8; 8.G.C.9	18 days
3C	Linear Models	8.SP.A.1; 8.SP.A.2; 8.SP.A.3; 8.SP.A.4	8 days
Unit 4:			
4A	Nonlinear Functions	8.F.A.1; 8.F.A.2; 8.F.A.3; 8.F.B.5	18 days
4B	Logic and Proof	8.G.A.5; 8.G.B.6	14 days
4C	More on Linear Functions	8.EE.B.5; 8.EE.B.6; 8.F.B.4	8 days

Marking Period	Unit Title	Recommended Instructional Days
1-2	**Unit 1**	42

Domain:		**Recommended Activities, Investigations, Interdisciplinary Connections, and/or Student Experiences to Explore NJSLS-CLKS within Unit**
Strand:	***Progress Indicator:***	**Essential Question/s:**
Functions	• **8.F.A.1:** Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output. • **8.F.A.2:** Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change. • **8.F.A.3:** Interpret the equation y=mx+b as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. For example, the function $A = s2$ giving the area of a square as a function of its side length is not linear because its graph contains the points (1,1), (2,4) and (3,9), which are not on a straight line. • **8.F.B.4:** Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate or change and initial value of a linear function in	1. How can a function be represented verbally, numerically, graphically, and algebraically? How are the characteristics of functions observed in each type of representation? 2. What are the characteristics of different types of functions? 3. How can one determine whether a relationship is a function? 4. How can geometric transformations be used to show that two figures are congruent? How can geometric transformations be used to show that two figures are similar? 5. What are the properties of geometric transformations? 6. In what contexts are geometric transformations used in the real world? 7. What are the similarities and differences between proportional relationships and linear functions? 8. How is the equation of a line derived using proportional relationships and similar triangles? 9. How are real-world situations modeled with linear functions? **Activity Description**: • *Are You Ready?* activities (Into Math) • Lesson Review (Into Math) • Assessment Forms (Into Math) • Convert among the verbal, numerical, graphical, and algebraic representations of a relation. • Interpret a relation represented verbally, numerically, graphically, and algebraically in context.

	terms of the situation it models, and in terms of its graph or a table of values. • **8.F.B.5:** Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch the graph that exhibits the qualitative features of a function that has been described verbally.	• Determine whether a relation represented verbally, numerically, graphically, or algebraically is a function. • Identify input-output pairs that can be added to a function such that it remains a function or is no longer a function. • Identify the domain and range of a function represented verbally, numerically, graphically, and algebraically. • Identify the features of a graph: the intervals in which the function is increasing, decreasing, and constant; the intervals in which a function is linear and nonlinear; and the domain and range of a function. • Describe a sequence of rigid transformations that exhibits the congruence between two figures • Describe a sequence of rigid and non-rigid transformations that exhibits the similarity between two figures. • Perform translations, reflections, rotations, and dilations in the coordinate plane. • Describe the effect of translations, reflections, and rotations on two-dimensional figures using coordinates. • Represent translations, reflections, rotations, and dilations algebraically. • Compare two different proportional relationships represented in different ways--verbally, numerically, graphically, and algebraically. • Determine whether a point is a solution to a linear equation in two variables. • 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. • Derive the equation y=mx+b for a line intercepting the vertical axis at b. • Graph a line in the coordinate plane given its equation in slope-intercept form. • Graph a line in the coordinate plane given its equation in standard form. • Write the equation of a line given its graph in the coordinate plane. • Explain whether a function represented verbally, numerically, graphically, or algebraically is linear or nonlinear. • Construct a function to model a linear relationship between two quantities. • Determine the rate of change and initial value of a linear function represented verbally, numerically, graphically, or algebraically. • Interpret the meaning of rate of change and initial value in terms of the situation it models.
Geometry	• **8.G.A.1:** Verify experimentally the properties of rotations, reflections, and translations: **a.** Lines are transformed to lines, and line segments to line segments of the same length. **b.** Angles are transformed to angles of the same measure. **c.** Parallel lines are transformed to parallel lines. • **8.G.A.2:** Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them. • **8.G.A.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.	
Expressions and Equations	• **8.EE.B.5:** Graph proportional relationships, interpreting unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater	

	speed. ● **8.EE.B.6:** Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation y=mx for a line through the origin and the equation y=mx+b for a line intercepting the vertical axis at b.	**Interdisciplinary Connections: Content: ;NJSLS#:** 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-PS4-1 Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave. Technology - ● 8.1.8.DA.1: Organize and transform data collected using computational tools to make it usable for a specific purpose.
Mathematics Practices ● Make sense of problems and persevere in solving them. ● Reason abstractly and quantitatively. ● Construct viable arguments and critique the reasoning of others. ● Model with mathematics. ● Use appropriate tools strategically. ● Attend to precision. ● Look for and make use of structure. ● Look for and express regularity in repeated reasoning.		
Social and Emotional Learning: ***Competencies***	**Social and Emotional Learning:** ***Sub-Competencies***	
● Self-Awareness ● Self-Management ● Responsible Decision Making ● Social Awareness ● Relationship Skills ● Motivation	● Emotional Awareness ● Internal Regulation ● Behavior Control ● Goal Pursuance ● Appreciating Social and Environment Diversity ● Adaptive Behavior ● Communication ● Social Engagement ● Constructive Thinking ● Consequence Evaluation ● Respect for Self and Others ● Enthusiasm ● Initiative ● Resilience	
Assessments (Formative) ***To show evidence of meeting the standard/s, students will successfully engage within:***		**Assessments (Summative)** ***To show evidence of meeting the standard/s, students will successfully complete:***

Formative Assessments: • Check for Understanding Questions • Quizzes • Class activities/participation • Exit tickets	**Benchmarks:** • Module Assessment • iReady scores **Summative Assessments:** • Module Test • Unit Assessment

Differentiated Student Access to Content:
Teaching and Learning *Resources/Materials*

Core Resources	**Alternate Core Resources** ***IEP/504/At-Risk/ESL***	**ELL Core Resources**	**Gifted & Talented Core Resources**
• *Into Math* Textbook, Modules 1-2, 5-6 • Student Activity Cards • Teacher Activity Cards • Numeral Cards • Dot Cards • White Boards • Connecting Cubes • Number Cubes • Visual Representations of Numbers and Number of Objects • Counters	• *Into Math* Textbook, Modules 1-2, 5-6 • Extra Practice pages • Anchor charts • Scaffolded explanations of topics • Manipulatives • Visual aids • Hands-on learning activities	• *Into Math* Textbook, Modules 1-2, 5-6 • Visual aids • Manipulatives • Vocabulary with images and examples • Hands-on learning activities • Extra Practice pages • Anchor charts	• *Into Math* Textbook, Modules 1-2, 5-6 • Student Activity Cards • Teacher Activity Cards • Numeral Cards • Dot Cards • White Boards • Connecting Cubes • Number Cubes • Visual Representations of Numbers and Number of Objects • Counters

Supplemental Resources

Technology:
- SmartBoards
- Chromebooks
- IXL
- Teacher Online Resources
- Applicable educational videos
- Illustrative Mathematics
- Kahoot
- PhET
- Desmos

Differentiated Student Access to Content:
Recommended *Strategies & Techniques*

Core Resources	Alternate Core Resources *IEP/504/At-Risk/ESL*	ELL Core Resources	Gifted & Talented Core
• Small group instruction • Peer tutoring • Modeling • Visual demonstrations • Encourage creative expression and thinking	• Provide additional manipulatives to support instruction • Allow for alternative strategies to solve algorithms or tasks • Provide the steps needed to complete the task • Model frequently • Use visuals to demonstrate/model the processes • Extra time for work • Modified assignments • Small group work for more individualize attention	• Use of translate materials and simplified language • Provide additional manipulatives to support instruction • Allow for alternative strategies to solve algorithms or tasks • Provide the steps needed to complete the task • Model frequently • Use visuals to demonstrate/model the processes • Extra time for work • Modified assignments • Small group work for more individualize attention	• Enrichment book • Higher-level questions • Leading group work

NJSLS CAREER READINESS, LIFE LITERACIES & KEY SKILLS	**Disciplinary Concept:**	
	Core Ideas:	An individual's strengths, lifestyle goals, choices, and interests affect employment and income.
	Performance Expectation/s:	• 9.2.8.CAP.2: Develop a plan that includes information about career areas of interest. • 9.2.8.CAP.3: Explain how career choices, educational choices, skills, economic conditions, and personal behavior affect income. • 9.2.8.CAP.4: Explain how an individual's online behavior (e.g., social networking, photo exchanges, video postings) may impact opportunities for employment or advancement.
	Career Readiness, Life Literacies, & Key Skills Practices	
	• Act as a responsible and contributing community members and employee. • Attend to financial well-being. • Consider the environmental, social and economic impacts of decisions. • Demonstrate creativity and innovation. • Utilize critical thinking to make sense of problems and persevere in solving them. • Model integrity, ethical leadership and effective management. • Use technology to enhance productivity increase collaboration and communicate effectively. • Work productively in teams while using cultural/global competence.	

<table>
<tr><th>Marking Period</th><th>Unit Title</th><th>Recommended Instructional Days</th></tr>
<tr><td>2-3</td><td>Unit 2</td><td>40 days</td></tr>
<tr><td colspan="2">Domain:</td><td rowspan="3">Recommended Activities, Investigations, Interdisciplinary Connections, and/or Student Experiences to Explore NJSLS-CLKS within Unit

<u>Essential Question/s:</u>

1. Why do some equations have one solution, other equations have two solutions, other equations have no solution, and other equations have infinitely many solutions?
2. How can geometric relationships be proven?
3. What real-world situations can be modeled with linear functions? What does modeling real-world situations with linear functions reveal about the situation?
4. How can real-world situations and mathematical problems be represented and solved using systems of linear equations?
5. In which contexts is each method of solving systems of linear equations more advantageous?

<u>Activity Description</u>:

● Are You Ready? activities (Into Math)
● Lesson Review (Into Math)
● Assessment Forms (Into Math)
● Classify numbers--represented as decimal expansions, fractions, roots, etc.--s as rational or irrational.
● Convert a decimal expansion which repeats eventually into a rational number.
● Approximate irrational numbers by using standard rational approximations.
● Approximate irrational numbers and locate them approximately on a number line
● Solve simple equations using square roots and cube roots.</td></tr>
<tr><td>Strand:</td><td>Progress Indicator:</td></tr>
<tr><td>The Number System</td><td>● 8.NS.A.1: Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion; for rational numbers show that the decimal expansion repeats eventually, and convert a decimal expansion which repeats eventually into a rational number.
● 8.NS.A.2: Use rational approximations of irrational numbers to compare the size of irrational numbers and locate them approximately on a number line diagram, and estimate the value of expressions (e.g. π2). For example, by truncating the decimal expansion of 2, show that 2 is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations.</td></tr>
<tr><td>Expressions and Equations</td><td>● 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.
● 8.EE.C.7: Solve linear equations in one variable.
a. 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</td></tr>
</table>

	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). **b.** Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and combining like terms. ● **8.EE.C.8:** Analyze and solve pairs of simultaneous linear equations. **a.** 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. **b.** Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection. For example, 3x + 2y = 5 and 3x + 2y = 6 have no solution because 3x + 2y cannot simultaneously be 5 and 6. **c.** Solve real-world and mathematical problems leading to two linear equations in two variables. For example, given coordinates for two pairs of points, determine whether the line through the first pair of points intersects the line through the second pair.	● Evaluate square roots of small perfect squares and cube roots of small perfect cubes. ● Use inverse operations, combining like terms, and the distributive property to solve multi-step equations in one variable. ● Determine the number of solutions that exist to a linear equation in one variable. ● Understand and explain the relationships between the interior angles of a triangle and the exterior angles of a triangle. ● Write and solve equations to find the measures of unknown angles in triangles using the Triangle Sum Theorem and the Exterior Angle Theorem. ● Understand and explain the relationships between the angle-pairs created when parallel lines are cut by a transversal. ● Write and solve equations to find the measures of unknown angles formed when parallel lines are cut by a transversal. ● Understand and explain the angle-angle criterion for similarity of triangles. ● Prove that two triangles are similar using the angle-angle criterion and angle-pair relationships. ● Graph a pair of linear equations. ● Interpret graphs of systems of linear equations. ● Interpret the point of intersection of the graph of a system of linear equations. ● Solve a pair of linear equations by graphing. ● Solve a system of equations using substitution. ● Solve a system of equations using elimination. ● Explain the significance of the steps of the elimination method in context. ● Determine the number of solutions to a system of equations by graphing. ● Determine the number of solutions to a system of equations by inspection (when both equations are in standard form or when both equations are in slope intercept form.) ● Represent real-world situations with a system of linear equations in two variables. ● Check that a solution to a system of linear equations is correct. ● Determine the rate of change and initial value of a linear function represented verbally, numerically, graphically, or algebraically. ● Interpret the meaning of rate of change and initial value in terms of the situation it models. ● Compare the rates of change and intercepts of two or more linear functions.
Geometry	● **8.G.A.5:** Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. For example, arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so.	

Mathematics Practices

- Make sense of problems and persevere in solving them.
- Reason abstractly and quantitatively.
- Construct viable arguments and critique the reasoning of others.
- Model with mathematics.
- Use appropriate tools strategically.
- Attend to precision.
- Look for and make use of structure.
- Look for and express regularity in repeated reasoning.

Social and Emotional Learning: ***Competencies***	**Social and Emotional Learning:** ***Sub-Competencies***
• Self-Awareness • Self-Management • Responsible Decision Making • Social Awareness • Relationship Skills • Motivation	• Emotional Awareness • Internal Regulation • Behavior Control • Goal Pursuance • Appreciating Social and Environment Diversity • Adaptive Behavior • Communication • Social Engagement • Constructive Thinking • Consequence Evaluation • Respect for Self and Others • Enthusiasm • Initiative • Resilience

- Interpret comparisons of rates of change and intercepts of two or more linear functions in context.

Interdisciplinary Connections: Content: ;NJSLS#:

Science -

- MS-PS1-5 - Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved.
- MS-LS1-2 - Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function.
- MS-LS4-1 - Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past.
- MS-ESS2-2 - Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.
- MS-ESS2-3 - Analyze and interpret data on the distribution of fossils and rocks, continental shapes and seafloor structures to provide evidence of the past plate motions.
- MS-ESS3-4 - Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.

Technology -

- 8.1.8.DA.1: Organize and transform data collected using computational tools to make it usable for a specific purpose.

Assessments (Formative) ***To show evidence of meeting the standard/s, students will successfully engage within:***	**Assessments (Summative)** ***To show evidence of meeting the standard/s, students will successfully complete:***
Formative Assessments: • Check for Understanding Questions • Quizzes • Class activities/participation • Exit tickets	**Benchmarks:** • Module Assessment • iReady scores **Summative Assessments:** • Module Test • Unit Assessment

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Supplemental Resources			
Technology: • SmartBoards • Chromebooks • IXL • Teacher Online Resources • Applicable educational videos • Illustrative Mathematics • PhET • PBS Learning Media • National Council of Teachers of Mathematics • Virutal Manipulatives • Desmos • Kahoot			
Differentiated Student Access to Content: Recommended *Strategies & Techniques*			
Core Resources	**Alternate Core Resources *IEP/504/At-Risk/ESL***	**ELL Core Resources**	**Gifted & Talented Core**
• Small group instruction • Peer tutoring • Modeling	• Provide additional manipulatives to support instruction	• Use of translate materials and simplified language	• Enrichment book • Higher-level questions • Leading group work

• Visual demonstrations • Encourage creative expression and thinking	• Allow for alternative strategies to solve algorithms or tasks • Provide the steps needed to complete the task • Model frequently • Use visuals to demonstrate/model the processes • Extra time for work • Modified assignments • Small group work for more individualize attention	• Provide additional manipulatives to support instruction • Allow for alternative strategies to solve algorithms or tasks • Provide the steps needed to complete the task • Model frequently • Use visuals to demonstrate/model the processes • Extra time for work • Modified assignments • Small group work for more individualize attention	

NJSLS CAREER READINESS, LIFE LITERACIES & KEY SKILLS	**Disciplinary Concept:**	
	Core Ideas:	An individual's strengths, lifestyle goals, choices, and interests affect employment and income.
	Performance Expectation/s:	• 9.2.8.CAP.2: Develop a plan that includes information about career areas of interest. • 9.2.8.CAP.3: Explain how career choices, educational choices, skills, economic conditions, and personal behavior affect income. • 9.2.8.CAP.4: Explain how an individual's online behavior (e.g., social networking, photo exchanges, video postings) may impact opportunities for employment or advancement.
	Career Readiness, Life Literacies, & Key Skills Practices	
	• Act as a responsible and contributing community members and employee. • Attend to financial well-being. • Consider the environmental, social and economic impacts of decisions. • Demonstrate creativity and innovation. • Utilize critical thinking to make sense of problems and persevere in solving them. • Model integrity, ethical leadership and effective management • Plan education and career paths aligned to personal goals. • Use technology to enhance productivity increase collaboration and communicate effectively. • Work productively in teams while using cultural/global competence.	

<table>
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<tr><td>3-4</td><td>Unit 3</td><td>42 days</td></tr>
<tr><td colspan="2">Domain:</td><td rowspan="3">Recommended Activities, Investigations, Interdisciplinary Connections, and/or Student Experiences to Explore NJSLS-CLKS within Unit

<u>Essential Question/s:</u>

1. How can real-world problems with very large numbers and very small numbers be solved?
2. How can distances be calculated that are difficult or impossible to be measured directly?
3. How can area, surface area, and volume be used to solve real-world problems?
4. How can relationships between two quantitative variables be modeled algebraically?
5. How are real-world situations modeled with linear functions?

<u>Activity Description</u>:

● Are You Ready? activities (Into Math)
● Lesson Review (Into Math)
● Assessment Forms (Into Math)
● Derive the five exponent rules by writing powers as repeated multiplication.
● Understand zero and negative exponents by investigating patterns.
● Simplify expressions by applying the exponent rules.
● Convert between standard, or decimal, form and scientific notation.
● Express how many times as much one quantity is than the other.
● Add, subtract, multiply, and divide numbers in scientific notation.
● Choose units of appropriate size for measurement of very large or very small quantities.
● Interpret scientific notation that has been generated by technology.
● Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical contexts in two dimensions.</td></tr>
<tr><td>Strand:</td><td>Progress Indicator:</td></tr>
<tr><td>Expressions and Equations</td><td>● 8.EE.A.1: Know and apply the properties of integer exponents to generate equivalent numerical expressions. For example, 32 × 3–5 = 3–3 = 1/33 = 1/27.
● 8.EE.A.3: Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other. For example, estimate the population of the United States as 3×10^8 and the population of the world as 7×10^9, and determine that the world population is more than 20 times larger.
● 8.EE.A.4: Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurement 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.</td></tr>
<tr><td>Geometry</td><td>● 8.G.B.6: Explain a proof of the Pythagorean Theorem and its converse.
● 8.G.B.7: Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.
● 8.G.B.8: Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.</td></tr>
</table>

	• **8.G.C.9:** Know the formulas for the volumes of cones, cylinders, and spheres.	• Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical contexts in three dimensions. • Apply the Pythagorean Theorem to find the distance between two points in a coordinate system. • Derive the formula for volume of a cylinder. S2. Derive the formula for volume of a cone. • Apply the formulas for volumes of cylinders, cones, and spheres to calculate volume, including volume of composite figures. • Apply the formulas for volumes of cylinders, cones, and spheres to calculate radius or height. • Construct and interpret scatter plots for bivariate measurement data. • Describe patterns in scatter plots such as clustering, outliers, positive or negative association, and linear or nonlinear association. • Sketch a straight line to model data with a linear association. Evaluate whether a particular straight line is a good model of data with a linear association. • Determine the equation of a straight line used to model data. Interpret the meaning of the slope and y-intercept of that line in context. • Use the equation of a straight line used to model data to solve problems. • Construct and interpret a two-way table for bivariate categorical data. • Calculate and use relative frequencies calculated for rows or columns to describe possible association between two variables. **Interdisciplinary Connections: Content: ;NJSLS#:** Science - • MS-PS1-5 - Develop and use a model to describe how the total number of atoms does not change in a chemical reaction and thus mass is conserved. • 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-PS3-4 - Plan an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample. • MS-PS4-1 - Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave.
Statistics and Probability	• **8.SP.A.1:** Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association. • **8.SP.A.2:** Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally it a straight line, and informally assess the model it (e.g. line of best it) by judging the closeness of the data points to the line. • **8.SP.A.3:** Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting slope and y-intercept. For example, in a linear model for a biology experiment, interpret a slope of 1.5 cm/hr as meaning that an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height. • **8.SP.A.4:** Understand the 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.	
Mathematics Practices		
• Make sense of problems and persevere in solving them. • Reason abstractly and quantitatively. • Construct viable arguments and critique the reasoning of others. • Model with mathematics.		

- Use appropriate tools strategically.
- Attend to precision.
- Look for and make use of structure.
- Look for and express regularity in repeated reasoning.

Social and Emotional Learning: ***Competencies***	**Social and Emotional Learning:** ***Sub-Competencies***
• Self-Awareness • Self-Management • Responsible Decision Making • Social Awareness • Relationship Skills • Motivation	• Emotional Awareness • Internal Regulation • Behavior Control • Goal Pursuance • Appreciating Social and Environment Diversity • Adaptive Behavior • Communication • Social Engagement • Constructive Thinking • Consequence Evaluation • Respect for Self and Others • Enthusiasm • Initiative • Resilience

- MS-LS1-2 - Develop and use a model to describe the function of a cell as a whole and ways parts of cells contribute to the function.
- MS.LS1-5 - Construct a scientiic explanation based on evidence for how environmental and genetic factors inluence the growth of organisms.
-
- MS-LS2-4 - Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.
- MS-LS4-1 - Analyze and interpret data for patterns in the fossil record that document the existence, diversity, extinction, and change of life forms throughout the history of life on Earth under the assumption that natural laws operate today as in the past.
- MS-ESS2-2 - Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.
- MS-ESS2-3 - Analyze and interpret data on the distribution of fossils and rocks, continental shapes and seafloor structures to provide evidence of the past plate motions.
- MS-ESS3-4 - Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.

Technology -

- 8.1.8.DA.1: Organize and transform data collected using computational tools to make it usable for a specific purpose.

Assessments (Formative) ***To show evidence of meeting the standard/s, students will successfully engage within:***	**Assessments (Summative)** ***To show evidence of meeting the standard/s, students will successfully complete:***
Formative Assessments: • Check for Understanding Questions • Quizzes • Class activities/participation • Exit tickets	**Benchmarks:** • Module Assessment • iReady scores **Summative Assessments:** • Module Test • Unit Assessment

Differentiated Student Access to Content:
Teaching and Learning *Resources/Materials*

Core Resources	**Alternate Core Resources**	**ELL Core Resources**	**Gifted & Talented Core Resources**

	IEP/504/At-Risk/ESL		
• *Into Math* Textbook, Modules 8-9, 10-13 • Student Activity Cards • Teacher Activity Cards • Numeral Cards • Dot Cards • White Boards • Connecting Cubes • Number Cubes • Visual Representations of Numbers and Number of Objects • Counters	• *Into Math* Textbook, Modules 8-9, 10-13 • Extra Practice pages • Anchor charts • Scaffolded explanations of topics • Manipulatives • Visual aids • Hands-on learning activities	• *Into Math* Textbook, Modules 8-9, 10-13 • Visual aids • Manipulatives • Vocabulary with images and examples • Hands-on learning activities • Extra Practice pages • Anchor charts	• *Into Math* Textbook, Modules 8-9, 10-13 • Student Activity Cards • Teacher Activity Cards • Numeral Cards • Dot Cards • White Boards • Connecting Cubes • Number Cubes • Visual Representations of Numbers and Number of Objects • Counters

Supplemental Resources

Technology:

- SmartBoards
- Chromebooks
- IXL
- Teacher Online Resources
- Applicable educational videos
- Illustrative Mathematics
- Interactive Maths
- GeoGebra
- PBS Learning Media
- Google Sheets
- PhET

Differentiated Student Access to Content:
Recommended *Strategies & Techniques*

Core Resources	**Alternate Core Resources** ***IEP/504/At-Risk/ESL***	**ELL Core Resources**	**Gifted & Talented Core**
• Small group instruction • Peer tutoring • Modeling • Visual demonstrations • Encourage creative expression and thinking	• Provide additional manipulatives to support instruction • Allow for alternative strategies to solve algorithms or tasks • Provide the steps needed to complete the task • Model frequently	• Use of translate materials and simplified language • Provide additional manipulatives to support instruction • Allow for alternative strategies to solve algorithms or tasks • Provide the steps needed to complete the task	• Enrichment book • Higher-level questions • Leading group work

	● Use visuals to demonstrate/model the processes ● Extra time for work ● Modified assignments ● Small group work for more individualize attention	● Model frequently ● Use visuals to demonstrate/model the processes ● Extra time for work ● Modified assignments ● Small group work for more individualize attention	

NJSLS CAREER READINESS, LIFE LITERACIES & KEY SKILLS	**Disciplinary Concept:**	
	Core Ideas:	An individual's strengths, lifestyle goals, choices, and interests affect employment and income.
	Performance Expectation/s:	● 9.2.8.CAP.2: Develop a plan that includes information about career areas of interest. ● 9.2.8.CAP.3: Explain how career choices, educational choices, skills, economic conditions, and personal behavior affect income. ● 9.2.8.CAP.4: Explain how an individual's online behavior (e.g., social networking, photo exchanges, video postings) may impact opportunities for employment or advancement.
	Career Readiness, Life Literacies, & Key Skills Practices	
	● Act as a responsible and contributing community members and employee. ● Attend to financial well-being. ● Consider the environmental, social and economic impacts of decisions. ● Demonstrate creativity and innovation. ● Utilize critical thinking to make sense of problems and persevere in solving them. ● Model integrity, ethical leadership and effective management ● Plan education and career paths aligned to personal goals. ● Use technology to enhance productivity increase collaboration and communicate effectively. ● Work productively in teams while using cultural/global competence.	

Marking Period	Unit Title	Recommended Instructional Days
4	**Unit 4**	42

Domain:		**Recommended Activities, Investigations, Interdisciplinary Connections, and/or Student Experiences to Explore NJSLS-CLKS within Unit**
Strand:	***Progress Indicator:***	**Essential Question/s:**
Functions	• **8.F.A.1:** Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output. • **8.F.A.2:** Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change. • **8.F.A.3:** Interpret the equation y = mx + b as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. For example, the function A = s2 giving the area of a square as a function of its side length is not linear because its graph contains the points (1,1), (2,4) and (3,9), which are not on a straight line. • **8.F.B.4:** Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values. • **8.F.B.5:** Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing,	1. How are functions classified according to their key features? 2. How are functions used to solve problems? 3. How can you make inferences from given information? 4. How can arguments be constructed to convince an audience of one's position? 5. How are real-world situations modeled with linear functions? 6. Why is it useful to study linear equations in different forms? **Activity Description**: • *Are You Ready?* activities (Into Math) • Lesson Review (Into Math) • Assessment Forms (Into Math) • Determine whether a relation represented verbally, numerically, graphically, or algebraically is a function. • Identify the domain and range of a function represented verbally, numerically, graphically, and algebraically. • Identify the features of a graph: the intervals in which the function is increasing, decreasing, and constant; the intervals in which a function is linear and nonlinear; and the domain and range of a function. • Identify key features of y = |x|, including the domain, range, vertex, axis of symmetry, and end behavior, from a graph or table. • Distinguish between and explain situations modeled with linear functions and with exponential functions. • Use function notation, evaluate functions, and interpret statements in context. • Explain the definition of a function, including the relationship between the domain and range. • Explain the difference between inductive and deductive reasoning. • Explain the significance of a counterexample. • Provide counterexamples to prove conjectures false.

	linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally.	• Identify statements and use logical connectives. • Create and interpret truth tables for negations, conjunction, and disjunction. • Create truth tables for conditionals and biconditionals. • Evaluate whether two statements are equivalent using truth tables. • Graph linear equations in point-slope form given the slope and a point. • Write and apply equations for linear functions from graphs, tables, verbal descriptions, and sets of ordered pairs in point-slope form. • Graph linear equations in point-slope form given the slope and a point. • Create and apply a linear model for a real world context. • Write the equation of a line given the graph, equation or points of a parallel line. • Write the equation of a line given the graph, equation or points of a perpendicular line. • Classify lines as parallel, perpendicular or neither. • **Interdisciplinary Connections: Content: ;NJSLS#:** Technology - • 8.1.8.DA.1: Organize and transform data collected using computational tools to make it usable for a specific purpose.
Geometry	• **8.G.A.5:** Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. For example, arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so. • **8.G.A.6:** Explain a proof of the Pythagorean Theorem and its converse.	
Expressions and Equations	• **8.EE.B.5:** Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed. • **8.EE.B.6:** Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation y = mx for a line through the origin and the equation y = mx + b for a line intercepting the vertical axis at b.	
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New Jersey Legislative Statutes and Administrative Code (place an "X" before each law/statute if/when present within the curriculum map)									
	Amistad Law: *N.J.S.A. 18A 52:16A-88*		Holocaust Law: *N.J.S.A. 18A:35-28*		LGBT and Disabilities Law: *N.J.S.A. 18A:35-4.35*		Diversity & Inclusion: *N.J.S.A. 18A:35-4.36a*		Standards in Action: *Climate Change*