Wall Township Public Schools	Board Approval Date: 8/19/2025
Course Title: PreAlgebra	
Course Description: This course varies from the Math 6 course, as it includes both 6, 7th, and 8th Grade standards and standards aligned to Pre-Algebra expectations. Students in the course are required to meet the expectations of all students in grade 6 through the required state assessment. Students are expected to have been exposed and mastered material in preparation to be successful in an Algebra 1 class.	

New Jersey Student Learning Standards - Math

Vision for Mathematics Education in New Jersey

A New Jersey education in Mathematics builds quantitatively and analytically literate citizens prepared to meet the demands of college and career, and to engage productively in an information-driven society. All students will have access to a high-quality mathematics education that fosters a population that:

- leverages data in decision-making and as a lens for discussing, analyzing, and responding to practical questions.
- persists to make sense of and model problems arising in everyday life, society, and the workplace.
- thinks critically and strategically to assess quantitative relationships and to solutions to complex problems.
- employs precise reasoning and constructs viable arguments to deduce conclusions, recognize false statements and assess peers' reasoning.
- interprets, evaluates and critiques the mathematics embedded in social, scientific and commercial systems, as well as the claims made in the private and public sectors.
- communicates precisely when conveying, representing, and justifying both qualitative and quantitative perspectives.

Standards for Mathematical Practice*

The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education. The first of these are the NCTM process standards of problem solving, reasoning and proof, communication, representation, and connections. The second are the strands of mathematical proficiency specified in the National Research Council's report Adding It Up: adaptive reasoning, strategic competence, conceptual understanding (comprehension of mathematical concepts, operations and relations), procedural fluency (skill in carrying out procedures flexibly, accurately, efficiently and appropriately), and productive disposition (habitual inclination to see mathematics as sensible, useful, and worthwhile, coupled with a belief in diligence and one's own efficacy).

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

**See end of document for additional information related to the mathematical practices.*

Inclusion of Climate Change Opportunities

( ) notes opportunities to integrate specific examples of climate change education provided by additional age-appropriate resources

The goal of inclusion of climate change education implementation is to foster generations of New Jersey students that can analyze, question, interpret, to think independently, and bring critical deduction to fulfill, and to lead in jobs created by burgeoning industries of the future green economy.

Course Sequence & Pacing	
Unit Title	**Estimated Number of Instructional Periods****
Unit 1 - The Real Numbers	18-20
Unit 2 - Algebraic Expressions	18-20
Unit 3 - Equations & Inequalities	18-20
Unit 4 - Ratios, Proportions, & Percents	23-25
Unit 5 - Probability	13-15
Unit 6 - Data & Statistics	13-15
Unit 7 - Measurement: Area & Volume	23-25
Unit 8 - Geometry	18-20
Unit 9 - Functions & Linear Relationships	13-15
Total Days	157/175

**Current schedule consists of math instruction everyday for approximately 54 minutes

Unit 1

Desired Results

Unit 1: The Real Numbers

Unit Summary: Students build upon their understanding of the number line and the location of rational numbers on the number line. Students will utilize number lines and mathematical rules to perform operations with integers and rational numbers. Students will look for the relationship between subtraction of integers and rational numbers to adding a negative integer and rational numbers. Students will utilize their understanding of the order of operations and apply their new understanding of operations with positive and negative numbers to simplify numerical expressions. Students will deepen their understanding of exponents and use exponents to represent repeated multiplication. Negative exponents will be introduced and how to use exponents to represent very large or very small rational numbers.

Learning Standards

NJSLS Math:

6.NS The Number System

6.NS.A. Apply and extend previous understandings of multiplication and division to divide fractions by fractions.

6.NS.A.1 Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem.

6.NS.B. Compute fluently with multi-digit numbers & find common factors & multiples

6.NS.B.2 Fluently divide multi-digit numbers using the standard algorithm.

6.NS.B.3 Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.

6.NS.C. Apply and extend previous understandings of numbers to the system of rational numbers

6.NS.C.5 Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation.

6.NS.C.6.a Recognize opposite signs of numbers as indicating locations on opposite sides of 0 on the number line; recognize that the opposite of the opposite of a number is the number itself, e.g., , and that 0 is its own opposite.

6.NS.C.6.b Understand signs of numbers in ordered pairs as indicating locations in quadrants of the coordinate plane; recognize that when two ordered pairs differ only by signs, the locations of the points are related by reflections across one or both axes.

6.NS.C.6.c Find and position integers and other rational numbers on a horizontal or vertical number line diagram; find and position pairs of integers and other rational numbers on a coordinate plane.

6.NS.7 Understand ordering and absolute value of rational numbers.

6.NS.C.7.a Interpret statements of inequality as statements about the relative position of two numbers on a number line diagram. For example, interpret -3 > -7 as a statement that -3 is located to the right of -7 on a number line oriented from left to right.

6.NS.C.7.b Write, interpret, and explain statements of order for rational numbers in real-world contexts. For example, write $-3^{0}c > -7^{0}c$ to express the fact that $-3^{0}c$ is warmer than $-7^{0}c$

6.NS.C.7.c Understand the absolute value of a rational number as its distance from 0 on the number line; interpret absolute value as magnitude for a positive or negative quantity in a real-world situation. For example, for an account balance of -30 dollars, write $|-30| = 30$ to describe the size of the debt in dollars.

6.NS.C.7.d Distinguish comparisons of absolute value from statements about order. For example, recognize that an account balance less than -30 dollars represents a debt greater than 30 dollars.

6.NS.C.8 Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane. Include use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate.

6.EE Expressions and Equations

6.EE A. Apply and extend previous understandings of arithmetic to algebraic expressions

6.EE.A.1 Write and evaluate numerical expressions involving whole-number exponents.

7.NS The Number System

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

7.NS.1 Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram.

7.NS.A.1.a Describe situations in which opposite quantities combine to make 0. For example, in the first round of a game, Maria scored 20 points. In the second round of the same game, she lost 20 points. What is her score at the end of the second round?

7.NS.A.1.b Understand p+q as the number located a distance $|q|$ from p , in the positive or negative direction depending on whether q is positive or negative. Show that a number and its opposite have a sum of 0 (are additive inverses). Interpret sums of rational numbers by describing real-world contexts.

7.NS.A.1.c Understand subtraction of rational numbers as adding the additive inverse, $p-q=p+(-q)$. Show that the distance between two rational numbers on the number line is the absolute value of their difference, and apply this principle in real-world contexts.

7.NS.A.1.d Apply properties of operations as strategies to add and subtract rational numbers.

7.NS.2 Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers.

7.NS.A.2.a Understand that multiplication is extended from fractions to rational numbers by requiring that operations continue to satisfy the properties of operations, particularly the distributive property, leading to products such as (-1)(-1) = 1 and the rules for multiplying signed numbers. Interpret products of rational numbers by describing real-world contexts.

7.NS.A.2.b Understand that integers can be divided, provided that the divisor is not zero, and every quotient of integers (with non-zero divisor) is a rational number. If p and q are integers, then $-\left(\frac{p}{q}\right)=\frac{(-p)}{q}=\frac{p}{(-q)}$. Interpret quotients of rational numbers by describing real world contexts.

7.NS.A.2.c Apply properties of operations as strategies to multiply and divide rational numbers.

7.NS.A.2.d Convert a rational number to a decimal using long division; know that the decimal form of a rational number terminates in 0s or eventually repeats.

7.NS.A.3 Solve real-world and mathematical problems involving the four operations with rational numbers. *(Clarification: Computations with rational numbers extend the rules for manipulating fractions to complex fractions.)*

8.NS The Number System

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

8.NS.A.1 Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion; for rational numbers show that the decimal expansion repeats eventually and convert a decimal expansion which repeats eventually into a rational number.

8.NS.A.2 Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g., Π^2). For example, by truncating the decimal expansion of $\sqrt{2}$, show that $\sqrt{2}$ is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations.

8.EE Expressions and Equations

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

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

8.EE.A.2 - Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that $\sqrt{2}$ is irrational.

8.EE.A.3 - Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other. For example, estimate the population of the United States as 3×10^8 and the population of the world as 7×10^9 , and determine that the world population is more than 20 times larger.

Mathematical Practices

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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

Interdisciplinary Connections

Career Readiness, Life Literacies, & Key Skills *(CLKS)*:

Career Readiness, Life Literacies, and Key Skills Practices describe the habits of the mind that all educators in all content areas should seek to develop in their students. They are practices that have been linked to increase college, career, and life success. These practices should be taught and reinforced in all content areas with increasingly higher levels of complexity and expectation as a student advances through a program of study.

Practices:

Act as a responsible and contributing community members and employee
Attend to financial well-being
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

9.4.8.CT.2: Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option

9.4.8.GCA.2: Demonstrate openness to diverse ideas and perspectives through active discussions to achieve a group goal.
9.4.8.IML.2: Identify specific examples of distortion, exaggeration, or misrepresentation of information.
9.4.8.IML.3: Create a digital visualization that effectively communicates a data set using formatting techniques such as form, position, size, color, movement, and spatial grouping (e.g., 6.SP.B.4, 7.SP.B.8b). •
9.4.8.IML.4: Ask insightful questions to organize different types of data and create meaningful visualizations.
9.4.8.TL.3: Select appropriate tools to organize and present information digitally

Computer Science & Design Thinking (*CS & DT***):**

<u>Computing Systems</u>

Troubleshooting a problem is more effective when knowledge of the specific device along with a systematic process is used to identify the source of a problem.

<u>Data & Analysis</u>

People use digital devices and tools to automate the collection, use, and transformation of data.
8.1.8.CS.1: Recommend improvements to computing devices in order to improve the ways users interact with the devices.
8.2.8.NT.1: Examine a malfunctioning tool, product, or system and propose solutions to the problem.

Learning Targets	
Unit Essential Questions:	**Unit Enduring Understandings:**

How can I use models, words and expanded formats to order and compare numbers? What are the characteristics of rational and irrational numbers? What is the relationship between opposites, absolute value, and distance? What are the properties of exponents? What applications offer contextual examples of adding two integers with different signs? What are the properties to follow when performing operations involving rational numbers?	Numerical expressions using numbers of any form can be used to solve real world problems. Every real number is either a rational number or an irrational number. Number lines can be used to describe the location of rational numbers and their distance from zero The properties of exponents are used to simplify expressions. Properties of operations can be used to simplify and write equivalent numerical expressions. Numerical expressions using numbers of any form can be used to solve real world problems. Properties should be followed when performing operations involving rational numbers.
Vocabulary: Base, Exponent, Power, Absolute value, Opposites, Negative integers,Positive integers, Rational number, Irrational number, Terminating decimal, Repeating decimal, Origin, Quadrant, Ordered pair, Perfect Square, Perfect Cube, Scientific Notation	

Students will be able to:

Lesson 1: Integer and Absolute Value: Compare and order integers and understand absolute value of rational numbers. (*6.NS.C.7.a-d*, *6.NS.C.5*, *6.NS.C.6.a,b*, *6.NS.C.8*, *7.NS.A.1.a*)

Lesson 2: Coordinate Plane, Distance between points, reflections: Plotting points on the coordinate plane, find the distance between two points, reflect points across the x and y axes. (*6.NS.C.6.b-c*, *6.NS.C.8)*

Lesson 3: Integer operations: Perform integer operations (*7.NS.A.1.b*-d, *7.NS.A.2.a*-c*)*

Lesson 4: Simplifying Fractions, Converting Mixed Numbers & Improper Fractions, & Converting Fractions, Decimals, and Percents: Simplify fractions and convert between fractions, decimals, and percents. (*7.NS.A.2.d*)

Lesson 5: Adding & Subtracting Rational Numbers: Add and subtract rational numbers. (6.NS.A.1, 6.NS.A.2, 6.NS.A.3, *7.NS.A.1.b*-d, *7.NS.B.3)*

Lesson 6: Multiplying & Dividing Rational Numbers: Multiply and divide rational numbers. (6.NS.A.1, 6.NS.A.2, 6.NS.A.3, *7.NS.A.2.a*-c, *7.NS.B.3)*

Lesson 7: Exponents, Zero Exponent, Negative Exponents: Use and apply exponents, zero exponents, and negative exponents. (*8.EE.A.1)*

Lesson 8: Perfect Squares, Square Roots, Non-Perfect Squares, Perfect Cubes and Cube Roots: identify perfect squares, square roots, non-perfect squares, perfect cubes, and cube roots (*8.NS.A.2*, *8.EE.A.2)*

Lesson 9: Scientific Notation, Comparing and Ordering Number Forms: use scientific notation to represent very large and very small numbers *(8.EE.A.3)*

Lesson 10: Order of Operations: use order of operations to simplify numerical expressions (*6.EE.A.1*)

Lesson 11: The Real Number System: understand the real number system and properties of real numbers (*8.NS.A.1)*

Learning Activities: *Suggested or Potential Learning Activities*

- **Math IXL Skill Practice and Group Jams based on each lesson.**
  - Students will work in Math IXL completing recommended skills from their teacher and based on their diagnostic results.

- **Delta Math Standards Created Assignments**

- **Number Sense Activities**

Education.com Aligned Practice Worksheets

- **Lesson 1:**
  - Introduction to Integers
  - Understanding Integers in the Real World
  - Comparing and Ordering Integers Parts 1-2
  - Absolute Value Word Problems
  - Finding Absolute Value
  - Opposite Numbers
  - Opposites and Absolute Values
  - Understanding Absolute Value
- **Lesson 2:**
  - Coordinate Plane & Quadrants
  - Rational Numbers on the Coordinate Plane
  - Zoo to You Coordinate Plane
  - Coordinate Plane Treasure Hunt Challenge
  - Sink the Ship
- **Lesson 3:**
  - Integer Addition Rules
  - Integer Subtraction Rules
  - Integer Multiplication and Division Rules
  - Integer Operations #1-3
  - Mixed Integer Operations Maze
  - Integer Addition Matching Sums

    - Integer Multiplication and Division Matching
    - Integer Operations Matching
- **Lesson 4:**
    - Steer & Simplify #1-5
    - Mixed Fractions
    - Improper Fractions
    - Fraction, Decimal, Percent #1-3
- **Lesson 5:**
    - Climate Change Example: Students may solve real-world problems involving the four operations with rational numbers related to the relationship between altitude and the temperature above sea level.
    - Add and Subtract Positive and Negative Fractions
    - Add and Subtract Positive and Negative Fractions & Mixed Numbers
    - Add and Subtract Positive and Negative Mixed Numbers
- **Lesson 6:**
    - Climate Change Example: Students may solve real-world problems involving the four operations with rational numbers related to the relationship between altitude and the temperature above sea level.
    - Multiply and Divide Positive and Negative Fractions & Mixed Numbers
    - Multiply and Divide Positive and Negative Mixed Numbers
- **Lesson 7:**
    - Negative Exponents & Zero Exponent
- **Lesson 8:**
    - Square Roots & Cube Roots
    - Evaluating Square Roots
    - Square Roots of Perfect Squares

    - Cube Roots of Perfect Cubes
    - Square Roots & Cube Roots Practice
- **Lesson 9:**
    - Scientific Notation
    - Scientific Notation Handout
    - Numbers in Scientific Notation
- **Lesson 11:**
    - Real Numbers Card Sort
    - Classify Real Numbers
- **Additional Supplemental Activities:**
    - Plotting Points on Coordinate Plane Drag and Drop Slides Activity
    - Rational Numbers Coordinate Grid Practice worksheet
    - Understanding integers and opposites slides activity
    - Opposites & Absolute Value slides activity
    - Graphing rational numbers slides activity
    - Comparing and ordering rational numbers maze
    - Distance on coordinate plane slides activity
    - Distance between points worksheet
    - Powers & Exponents maze
    - Adding integers pixel art
    - Adding and subtracting integers escape room
    - Integer operations digital maze
    - Order of operations digital matching
    - Positive & Negative decimal operations drag and drop
    - Add and Subtract rational numbers worksheet
    - Multiply and divide rational numbers worksheet
    - Rational Numbers operation mystery message worksheet

Assessment Evidence
Formative Assessments: Quizzes, IXL quizzes, Delta Math, Warm-Ups, Exit Passes, teacher observation
Summative Assessments: Unit Assessments, Unit Projects, Cumulative Assessments & Projects
Common Benchmark Assessments: Cumulative Benchmark Assessments
Alternative Assessments: Modified Assessments & Projects, IXL, and Delta Math Assessments

Core Instructional & Supplemental Materials
***Core Instruction Program*: Desmos Math, Holt McDougal Larson Pre-Algebra textbook, education.com**
***Intervention Support*: Math IXL Suggested Skills, Math IXL Diagnostic, Targeted small group instruction**
Math IXL, Delta Math, Khan Academy, Math Manipulatives

Accommodations and Modifications: Students with Disabilities, English Language Learners, Students at Risk of Failure, Students with 504s, Gifted & Talented Students

Specific Strategies and Practices that Support Students with Disabilities:

Students receiving Special Education programming have specific goals and objectives, as well as accommodations and modifications outlined within their Individualized Education Plans (IEP) due to an identified disability and/or diagnosis. In addition to exposure to the general education curriculum, the instruction is differentiated based upon the student's needs. The IEP acts as a supplemental curriculum guide inclusive of instructional strategies that support each learner.

- Small group/One to one - Additional time - Review of directions - Student restates information - Space for movement or breaks - Extra visual and verbal cues and prompts - Preferential seating - Follow a routine/schedule - Rest breaks - Verbal and visual cues regarding directions and staying on task - Checklists - Immediate feedback

Alternate or reduced work within Digital Platforms such as Math IXL, Delta Math, and Link It assignments

Specific Strategies and Practices that Support English Language Learners

English language learner (ELL) is a national-origin-minority student who is limited-English-proficient. This term is often preferred over limited-English-proficient (LEP) as it highlights accomplishments rather than deficits.

- Pre-teaching of vocabulary and concepts - Personal Glossary - Extended Time - Simplified/Verbal Instructions - Frequent Breaks - Visual learning, including graphic organizers - Use of cognates to increase comprehension - Teacher modeling - Pairing students with beginning English language skills with students who have more advanced English language skills - Scaffolding - Word walls - Think-pair-share - Cooperative learning groups
Alternate or reduced work within Digital Platforms such as Math IXL, Delta Math, and Link It assignments

Students at Risk of Failure

- Home/School Connection - Alternative Assessments - Learning Contracts - Homogenous Grouping - Supplemental Instruction - Think-Pair-Share by Readiness - Homework Options - Differentiated Online Practice - Leveled Rubrics - Tiered Level of Supports - Tiered Activities - Small Group Instruction - Work Alone Choice - Group Work Choice
Alternate or reduced work within Digital Platforms such as Math IXL, Delta Math, and Link It assignments - Opportunities for make-up work or reduce number of assignments - Provide access to extra help when possible

Students with 504 Plans

Teachers are responsible for implementing designated services and strategies identified on a student's 504 Plan.
504 plans are formal plans that schools develop to give kids the support they need and covers any condition that limits daily activities in a major way. Students' accommodations are outlined in their individual 504 plan.

Specific Strategies and Practices that Support Gifted & Talented Students

It is critical that all teachers are able to recognize a high-ability student who may need more depth and complexity in instruction.

-Homogenous Grouping - Small Group In-Depth Instruction - Differentiated Online Practice - Alternative Assessments - Pre-Assess to provide Differentiated Instruction to Accelerate Learning
-Enrichment/Extension Activities within Digital Platforms such as Math IXL, Delta Math, and Link It assignments

Unit 2

Desired Results

Unit 2: Algebraic Expressions

Unit Summary: Students understand the use of variables in mathematical expressions. They write expressions that correspond to given situations, evaluate expressions, and use expressions to solve problems. Students understand that expressions in different forms can be equivalent, and they use the properties of operations to rewrite expressions in equivalent forms. Students will use rules of exponents to generate equivalent expressions.

Learning Standards

NJSLS Math:

6.NS The Number System

6.NS.B Compute fluently with multi-digit numbers and find common factors and multiples.

6.NS.B.4 Find the greatest common factor of two whole numbers less than or equal to 100 and the least common multiple of two whole numbers less than or equal to 12. Use the distributive property to express a sum of two whole numbers 1-100 with a common factor as a multiple of a sum of two whole numbers with no factors.

6.EE Expressions and Equations

6.EE.A Apply and extend previous understandings of arithmetic to algebraic expressions.

6.EE.A 2. Write, read, and evaluate expressions in which letters stand for numbers.

6.EE.A.2.c Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations). For example, use the formulas and to find the volume and surface area of a cube with sides of length. For example, use the formulas $V = s^3$ and $A = 6s^2$ to find the volume and surface area of a cube with sides of length $s = ½$.

6.EE.A.2.a Write expressions that record operations with numbers and with letters standing for numbers. For example, express the calculation “Subtract from 5” as 5 - y.

6.EE.A.2.b Identify parts of an expression using mathematical terms (sum, term, product, factor, quotient, coefficient); view one or more parts of an expression as a single entity. For example, describe the expression 2 (8 + 7) as a product of two factors; view (8 + 7) as both a single entity and a sum of two terms.

6.EE.A.3 Apply the properties of operations to generate equivalent expressions. For example, apply the distributive property to the expression to produce the equivalent expression apply the distributive property to the expression to produce the equivalent expression; apply properties of operations to to produce the equivalent expression. For example, apply the distributive property to the expression 3(2 + x) to produce the equivalent expression 6 + 3x; apply the distributive property to the expression 24x + 18y to produce the equivalent expression 6(4x + 3y); apply properties of operations to y + y + y to produce the equivalent expression 3y

6.EE.A.4 Identify when two expressions are equivalent (i.e., when the two expressions name the same number regardless of which value is substituted into them). For example, the expressions are equivalent because they name the same number regardless of which number stands for. For example, the expressions y + y + y and 3y are equivalent because they name the same number regardless of which number y stands for.

6.EE.B Reason about and solve one-variable equations and inequalities.

6.EE.B.6 Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set.

6.EE.C. Represent and analyze quantitative relationships between dependent and independent variables.

6.EE.C.9 Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. For example, in a problem involving motion at constant speed, list and graph ordered pairs of distances and times, and write the equation to represent the relationship between distance and time. For example, in a problem involving motion at constant speed, list and graph ordered pairs of distances and times, and write the equation d = 65t to represent the relationship between distance and time.

7.EE Expressions and Equations

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

7.EE.A.1 Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.

7.EE.A.2 Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related. For example, a + 0.05a = 1.05a means that "increase by 5%" is the same as "multiply by 1.05."

8.EE Expressions and Equations

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

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

Mathematical Practices

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
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Work productively in teams while using cultural/global competence

9.4.8.CT.2: Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option
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9.4.8.IML.4: Ask insightful questions to organize different types of data and create meaningful visualizations.
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Computer Science & Design Thinking (*CS & DT***):**
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Troubleshooting a problem is more effective when knowledge of the specific device along with a systematic process is used to identify the source of a problem.

Data & Analysis

People use digital devices and tools to automate the collection, use, and transformation of data.

8.1.8.CS.1: Recommend improvements to computing devices in order to improve the ways users interact with the devices.
8.2.8.NT.1: Examine a malfunctioning tool, product, or system and propose solutions to the problem.

Learning Targets

Unit Essential Questions:	**Unit Enduring Understandings:**
What strategies can be used to simplify expressions with rational coefficients?	Properties of operations can be used to simplify and write equivalent variable expressions.
How do we translate verbal ideas to the language of mathematics?	Algebraic expressions using numbers of any form can be used to solve real world problems.
How can I write and evaluate algebraic expressions to represent a situation?	Rules of exponents can be used to simplify and write equivalent numerical and variable expressions.
How can I use rules of exponents to create equivalent expressions?	

Vocabulary: Numerical expression, Variable, Variable expression, Term, Coefficient, Constant term, Like terms, Exponent, Base, Sum, Product, Factor, Quotient, Coefficient, Equivalent expression, Evaluate, Monomial

Students will be able to:

Lesson 1: Evaluating Expressions - Evaluate expressions given the value of the variable. (*6.EE.A.2.c*, *6.EE.A.3*, *6.EE.B.6*, *6.EE.C.9)*

Lesson 2: Translate Expressions - Write expressions from word form. (*6.EE.A.2.a*, *6.EE.B.6*, *7.EE.A.2)*

Lesson 3: Combine Like Terms - Combine like terms with the same variable and exponent. Use the distributive property to simplify expressions. (6.NS.B.4, *6.EE.A.2.b*, *6.EE.A.3*, *6.EE.A.4*, *7.EE.A.1*)

Lesson 4: Factoring Linear Expressions - Use the greatest common factor to create an equivalent expression. (6.NS.B.4, *6.EE.A.3*, *6.EE.A.4*, *7.EE.A.1*)

Lesson 5: Product Rule - Add, Subtract, and Multiply Monomials. Use and apply the product rule. (*8.EE.A.1)*

Lesson 6: Quotient Rule - Divide Monomials. Use and apply the quotient rule. (*8.EE.A.1)*

Lesson 7: Power Rule - Powers of Monomials. Use and apply the power rule. (*8.EE.A.1)*

Lesson 8: Exponent Rule Review (*8.EE.A.1)*

Learning Activities: *Suggested or Potential Learning Activities*

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- **Delta Math Standards Created Assignments**
- **Number Sense Activities**

Education.com Aligned Practice Worksheets

- Lesson 1
  - Evaluating Algebraic Expressions
  - Writing and Evaluating Algebraic Expressions

    - Evaluating Expressions with two or more variables (1-3)
    - Evaluate Variable Expressions with decimals (1-3)
- Lesson 2
    - Writing Algebraic Expressions
    - Writing Expressions with Variables
- Lesson 3
    - Combining Like Terms (1-3)
- Lesson 4
    - Factoring Linear Expressions
    - Identify Equivalent Linear Expressions
    - Practice Factoring Linear Expressions (1-2)
- Lessons 5-8
    - Product of Powers
    - Properties of Exponents Matching
    - Quotient of Powers
    - Power of a Power
    - Properties of Exponents True or False
    - Properties of Exponents Practice
- **Other Supplemental Activities:**
    - Translating algebraic expressions matching activity
    - Writing algebraic expressions slides activity
    - Evaluating algebraic expressions maze
    - Parts of an expression digital matching
    - Distributive property drag and drop
    - Distributive property color by number

- Factoring GCF pixel art
- Combining like terms digital matching
- Combining like terms maze

Assessment Evidence
Formative Assessments: Quizzes, IXL quizzes, Delta Math, Warm-Ups, Exit Passes, teacher observation
Summative Assessments: Unit Assessments, Unit Projects, Cumulative Assessments & Projects
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Accommodations and Modifications: Students with Disabilities, English Language Learners, Students at Risk of Failure, Students with 504s, Gifted & Talented Students
Specific Strategies and Practices that Support Students with Disabilities: Students receiving Special Education programming have specific goals and objectives, as well as accommodations and modifications outlined within their Individualized Education Plans (IEP) due to an identified disability and/or diagnosis. In addition to exposure to the general education curriculum, the instruction is differentiated based upon the student's needs. The IEP acts as a supplemental curriculum guide inclusive of instructional strategies that support each learner.

- Small group/One to one - Additional time - Review of directions - Student restates information - Space for movement or breaks - Extra visual and verbal cues and prompts - Preferential seating - Follow a routine/schedule - Rest breaks - Verbal and visual cues regarding directions and staying on task - Checklists - Immediate feedback
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Students at Risk of Failure

- Home/School Connection - Alternative Assessments - Learning Contracts - Homogenous Grouping - Supplemental Instruction - Think-Pair-Share by Readiness - Homework Options - Differentiated Online Practice - Leveled Rubrics - Tiered Level of Supports - Tiered Activities - Small Group Instruction - Work Alone Choice - Group Work Choice
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Students with 504 Plans

Teachers are responsible for implementing designated services and strategies identified on a student's 504 Plan.
504 plans are formal plans that schools develop to give kids the support they need and covers any condition that limits daily activities in a major way. Students' accommodations are outlined in their individual 504 plan.

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It is critical that all teachers are able to recognize a high-ability student who may need more depth and complexity in instruction.

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-Enrichment/Extension Activities within Digital Platforms such as Math IXL, Delta Math, and Link It assignments

Unit 3

Desired Results

Unit 3: Equations & Inequalities

Unit Summary: Students understand the use of variables in mathematical equations and inequalities. They write equations/inequalities that correspond to given situations, solve equations and inequalities, and formulas to solve problems. Students know that the solutions of an equation and inequality are the values of the variables that make the equation and inequality true. Students use properties of operations and the idea of maintaining the equality of both sides of an equation/inequality to solve.

Learning Standards

NJSLS Math:

6.EE Expressions and Equations

6.EE.B Reason about and solve one-variable equations and inequalities.

6.EE.B.5 Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true.

6.EE.B.7 Solve real-world and mathematical problems by writing and solving equations of the form and for cases in which, and are all nonnegative rational numbers.

6.EE.B.8. Write an inequality of the form x > c or x < c to represent a constraint or condition in a real-world or mathematical problem. Recognize that inequalities of the form x > c or x < c have infinitely many solutions; represent solutions of such inequalities on number line diagrams.

6.EE.C. **Represent and analyze quantitative relationships between dependent and independent variables**

6.EE.C.9 Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. For example, in a problem involving motion at constant speed, list and graph ordered pairs of distances and times, and write the equation to represent the relationship between distance and time. For example, in a problem involving motion at constant speed, list and graph ordered pairs of distances and times, and write the equation d = 65t to represent the relationship between distance and time.

7.EE Expressions and Equations

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

7.EE.4. Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.

7.EE.B.4.a Solve word problems leading to equations of the form px + q = r and p(x + q) = r, where p, q, and r are specific rational numbers. Solve equations of these forms with accuracy and efficiency. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach. For example, the perimeter of a rectangle is 54 cm. Its length is 6 cm. What is its width?

7.EE.*B.4b* Solve word problems leading to inequalities of the form $px + q > r$ or $px + q < r$, where p, q, and r are specific rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem.

8.EE Expressions and Equations

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

8.EE.A.2 Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$, where p is a positive rational number.

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

8.EE.7 Solve linear equations in one variable.

8.EE.C.7b. Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.

8.EE.C.7.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 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).

Mathematical Practices

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

Interdisciplinary Connections

Career Readiness, Life Literacies, & Key Skills *(CLKS)*:

Career Readiness, Life Literacies, and Key Skills Practices describe the habits of the mind that all educators in all content areas should seek to develop in their students. They are practices that have been linked to increase college, career, and life success. These practices should be taught and reinforced in all content areas with increasingly higher levels of complexity and expectation as a student advances through a program of study.

<u>Practices</u>:

Act as a responsible and contributing community members and employee

Attend to financial well-being

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

9.4.8.CT.2: Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option
9.4.8.GCA.2: Demonstrate openness to diverse ideas and perspectives through active discussions to achieve a group goal.
9.4.8.IML.2: Identify specific examples of distortion, exaggeration, or misrepresentation of information.
9.4.8.IML.3: Create a digital visualization that effectively communicates a data set using formatting techniques such as form, position, size, color, movement, and spatial grouping (e.g., 6.SP.B.4, 7.SP.B.8b). •
9.4.8.IML.4: Ask insightful questions to organize different types of data and create meaningful visualizations.
9.4.8.TL.3: Select appropriate tools to organize and present information digitally

Computer Science & Design Thinking (*CS & DT***):**
Computing Systems
Troubleshooting a problem is more effective when knowledge of the specific device along with a systematic process is used to identify the source of a problem.

Data & Analysis
People use digital devices and tools to automate the collection, use, and transformation of data.

8.1.8.CS.1: Recommend improvements to computing devices in order to improve the ways users interact with the devices.
8.2.8.NT.1: Examine a malfunctioning tool, product, or system and propose solutions to the problem.

Learning Targets	
Unit Essential Questions: How can writing equations and inequalities help solve mathematical and real life problems? How can we interpret the solution of an inequality by graphing it? Can the same problem be solved arithmetically and algebraically? Why does an inequality symbol need to be reversed when solving an inequality?	**Unit Enduring Understandings:** Inequalities can be written to solve mathematical problems. The solution set of an inequality can be graphed to interpret it is in the context of the problem Solving multi-step equations allows them to solve real-world problems about rafting, shopping, skiing, advertising, and amusement parks. Inequalities heard outside of math class “at least” or “no more than” can be solved and graphed algebraically.
Vocabulary: Equation, Solution of an equation, Solving an equation, Inverse operations, Equivalent operations, Multiplicative Inverse, Inequality, Solution of an inequality, Equivalent inequalities, Square roots, Cube roots, Perfect square, Perfect cube	
Students will be able to:	

Lesson 1: Solve One-Step Equations - solve one-step equations with integers and rational numbers. (*6.EE.C.9*, *6.EE.B.5*, *6.EE.B.7)*

Lesson 2: Solve Two-Step Equations - solve two-step equations with integers and rational numbers. (*6.EE.B.7*, *7.EE.B.4.a)*

Lesson 3: Solve Equations by using Square Roots - solve equations with square roots. *(8.EE.A.2)*

Lesson 4: Solve Multi-step Equations - solve multi-step equations with variables on one side. (*7.EE.B.4.a*, 8.EE.C.7b)

Lesson 5: Solve Multi-step Equations - solve multi-step equations with variables on both sides. (*7.EE.B.4.a*, 8.EE.C.7b)

Lesson 6: Solve Equations with Special Cases - solve special case equations with infinite solutions and no solution. (*8.EE.C.7.a)*

Lesson 7: Solve Equations with Fractions - solve equations with fractions using the LCM to clear out fractions. (*7.EE.B.4.a*, 8.EE.C.7b)

Lesson 8: Translate & Solve Equations - translate and solve equations (*6.EE.C.9)*

Lesson 9: Applications of Equations 1 - solve one and two step equations in real life applications (*6.EE.C.9*, *6.EE.B.7*, *7.EE.B.4.a)*

Lesson 10: Application of Equations 2 - solve multi-step equations in real life applications (*7.EE.B.4.a*, 8.EE.C.7b)

Lesson 11: Introduction to Inequalities - Write, solve, and graph one-step inequalities (*6.EE.B.5*)

Lesson 12: Two-Step Inequalities - Write, solve, and graph two-step inequalities (7.EE.B.4b)

Lesson 13: Multi-Step Inequalities - Write, solve, and graph multi-step inequalities (7.EE.B.4b)

Lesson 14: Applications of Inequalities - solve one, two, and multi-step inequalities in real life applications (7.EE.B.4b)

Learning Activities: *Suggested or Potential Learning Activities*

- **Math IXL Skill Practice and Group Jams based on each lesson.**
  - Students will work in Math IXL completing recommended skills from their teacher and based on their diagnostic results.
  - **6.EE.B.7 Climate Change Example: Students may solve real-world problems by writing and solving one-variable equations related to deforestation and/or increasing livestock farming as contributors to climate change.**
  - **6.EE.C.9 Climate Change Example: Students may analyze and use variables to represent the relationship between greenhouse emissions and livestock farming when representing relationships among contributors to climate change.**

- **Delta Math Standards Created Assignments**
- **Number Sense Activities**

Education.com Aligned Practice Worksheets

- **Lesson 1**
    - Climate Change Example: Students may solve real-world problems by writing and solving one-variable equations related to deforestation and/or increasing livestock farming as contributors to climate change.
    - Climate Change Example: Students may analyze and use variables to represent the relationship between greenhouse emissions and livestock farming when representing relationships among contributors to climate change.
    - Algebra Riddle: One-Step Equations
    - One-Step Addition and Subtraction Equations (1-3)
    - One-Step Equation Multiplication and Division Equations (1-3)
    - Solving One-Step Equations Maze
- **Lesson 2**
    - Solve Two-Step Equations (1-3)
- **Lesson 3**
    - Solve Square Root Equations
    - Solving Equations with Cube Roots
    - Solve Cube Root Equations

    - Solving Equations with Square Roots
- **Lessons 4-5**
    - Solve Equations with Like Terms (1-2)
    - Solve Multi-Step Equations (1-3)
- **Lesson 6**
    - Solutions to Linear Equations
    - Linear Equations: One Solution, No Solution, Infinitely Many Solutions Card Sort
    - Linear Equations: Number of Solutions
- **Lessons 9-10**
    - Write and Solve Equations from Word Problems
- **Lessons 11-13**
    - Solve One-Step Inequalities (1-3)
    - One-Step Inequalities Word Problems
    - Graph Inequalities
    - Writing Inequalities
    - Graph Inequalities Matching Activity
    - Writing Inequalities Matching Activity
    - Write Inequalities From Number Lines (1-3)
    - Solutions to Inequalities
    - Solve Two-Step Inequalities (1-3)
    - Two-Step Inequalities Word Problems
- **Other Supplemental Activities:**
    - Solving one step equations w/ fractions & decimals google form
    - Two-step equations pixel art
    - Two-step equations maze

- Multi step equations escape room
- Translating inequalities pixel art
- Two truths and a lie: multi step inequalities

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Unit 4

Desired Results

Unit 4: Ratios, Proportions, & Percents

Unit Summary: Students use multiple forms of ratio language and ratio notation, and formalize understanding of equivalent ratios. Students bridge their understanding of ratios to the value of a ratio, and then to a rate and unit rate. Students will use their understanding of ratios and rates to analyze proportional relationships and use them to solve real-world and mathematical problems. Students will learn about the relationship between equivalent ratios, proportions and similar figures. Students will use their knowledge of proportional relationships to solve for missing side lengths of similar figures. Students will bridge their understanding of proportions to solve for the missing part, whole, or percent in a basic percent problem. Students will then apply their knowledge of basic percentages to solve percent application problems such as percent of change, tax, tip, discount, and interest.

Learning Standards

NJSLS Math:

6.RP Ratios and Proportional Relationships

6.RP.A Understand ratio concepts and use ratio reasoning to solve problems.

6.RP.A.1 Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. For example, "The ratio of wings to beaks in the bird house at the zoo was 2:1, because for every 2 wings there was 1 beak." "For every vote candidate A received, candidate C received nearly three votes."

6.RP.A.2 Understand the concept of a unit rate a/b associated with a ratio a:b with b ≠ 0, and use rate language in the context of a ratio relationship. For example, "This recipe has a ratio of 3 cups of flour to 4 cups of sugar, so there is 3/4 cup of flour for each cup of sugar." "We paid $75 for 15 hamburgers, which is a rate of $5 per hamburger.

6.RP.3 Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations.

6.RP.A.3.a Make tables of equivalent ratios relating quantities with whole number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane. Use tables to compare ratios.

6.RP.A.3.b Solve unit rate problems including those involving unit pricing and constant speed. For example, if it took 7 hours to mow 4 lawns, then at that rate, how many lawns could be mowed in 35 hours? At what rate were lawns being mowed?

6.RP.A.3.c Find a percent of a quantity as a rate per 100 (e.g., 30% of a quantity means 30/100 times the quantity); solve problems involving finding

6.RP.A.3.d Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.

7.RP Ratios and Proportional Relationships

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

7.RP.A.1 Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. For example, if a person walks ½ mile in each ¼ hour, compute the unit rate as the complex fraction ½/¼ miles per hour, equivalently 2 miles per hour.

7.RP.2 Recognize and represent proportional relationships between quantities.

7.RP.A.2.a Decide whether two quantities are in a proportional relationship, e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin.

7.RP.A.2.b Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.

7.RP.A.2.c Represent proportional relationships by equations. For example, if total cost t is proportional to the number n of items purchased at a constant price p, the relationship between the total cost and the number of items can be expressed as t = pn.

7.RP.A.2.d Explain what a point (x, y) on the graph of a proportional relationship means in terms of the situation, with special attention to the points (0, 0) and (1, r) where r is the unit rate.

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

7.G Geometry

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

7.G.A.1 Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.

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8.1.8.CS.1: Recommend improvements to computing devices in order to improve the ways users interact with the devices.
8.2.8.NT.1: Examine a malfunctioning tool, product, or system and propose solutions to the problem.

Learning Targets	
Unit Essential Questions: What are ratios and rates and how can they be used?	**Unit Enduring Understandings:**

How can I create and solve ratio problems by creating equivalent ratios? How can I use ratios to compare different quantities and solve unit rates problems? How can proportions be used to solve scale drawings? How can you solve problems involving proportional relationships? How can I use the given information to find the missing part, whole, or percent? How can you calculate percent change? How can you solve problems involving percents in real-world problems?	You can use ratios and rates to describe the relationship between two quantities. Equivalent ratios can be determined with tables, double number lines, decimals, and common denominators. Proportions can be used to solve problems involving scale drawings. You can determine whether quantities are proportional by testing for equivalent ratios. Equations can be used to solve problems involving proportional relationships Percents and fractions have a proportional relationship and can be used to solve for unknown amounts. Percents are found in real-world situations such as tax, tip, discounts, and percent changes.
Vocabulary: Ratio, Rate, Unit rate, Unit Price, Equivalent Ratios, Constant Speed, Proportion, Cross product, Similar figures, Corresponding parts, Scale model, Proportional relationship, Constant of proportionality, Scale drawing, Percent, Part, Whole, Simple interest, Tax, Markup, Markdown, Gratuity, Commission, Percent increase, Percent decrease, Percent error	

Students will be able to:

Lesson 1: Ratios - Write and solve ratio problems. Write and generate equivalent ratios. (*6.RP.A.1*, *6.RP.A.3.a)*

Lesson 2: Rates & Unit Rates - Understand rates and use rates to find and compare unit rates (*6.RP.A.2*, *6.RP.A.3.b*, *7.RP.A.1*, *7.RP.A.2.b*)

Lesson 3: Proportional vs. Nonproportional Relationships - Understand the difference between proportional and non proportional relationships (*7.RP.A.2.a*, *7.RP.A.2.d*)

Lesson 4: Solving Proportions - Set up and solve proportions to find unknown amounts (*7.RP.A.2.c*, *7.RP.A.2.d*)

Lesson 5: Proportion Word Problems - Use proportions to solve word problems (*7.RP.A.2.c*, *7.RP.A.2.d*)

Lesson 6: Scale Drawings & Models - Understand how proportions relate to scale drawings and scale models (*7.G.A.1*)

Lesson 7: Similar Figures - Use proportions with similar figures to find unknown side lengths (*7.G.A.1*)

Lesson 8: Indirect Measurement - Use understanding on similar figures and proportions to solve indirect measurement problems (6.RP.A.3d, *7.G.A.1*)

Lesson 9: Percent Proportion - Use percent proportions and percent equations to solve for the missing part, whole, or percent (*6.RP.A.3.c*, *7.RP.A.3)*

Lesson 10: Percent Equation - Solve real life percent application problems such as Discount, Mark Up, Sales Tax, and Tip (*6.RP.A.3.c*, *7.RP.A.3*

Lesson 11: Percent of Change - Find the percent of change *(7.RP.A.3)*

Lesson 12: Simple Interest - Evaluate interest using the simple interest formula (*7.RP.A.3)*

Learning Activities: *Suggested or Potential Learning Activities*

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    - Students will work in Math IXL completing recommended skills from their teacher and based on their diagnostic results.

- **Delta Math Standards Created Assignments**

- **Number Sense Activities**

Education.com Aligned Practice Worksheets

- **Lesson 1**
  - Ratios
  - Writing Ratios
  - Equivalent Ratios
  - Identify Equivalent Ratios (1-2)
- **Lesson 2**
  - Unit Rate Word Problems
  - Calculating Unit Prices
  - Calculating Unit Rates (1-3)
  - Write Equivalent Ratios (1-2)
  - Comparing Unit Rates: Word Problems
- **Lesson 3**
  - Graphing Proportional Relationships
  - Identify Proportional Relationships
- **Lesson 4-5**
  - Solve Proportions (1-3)
  - Solving Proportions
  - Do the Ratios Form a Proportion
- **Lessons 6-7**
  - Find the scale factor (1-3)
  - Scale Drawings: Find the Missing Side Length (1-3)
  - Find Dimensions from Scale Drawings: Word Problems
  - Riley's Renovation: Scale Drawing, Area, and Circumference Performance Task
- **Lesson 8**

    - Convert Customary Units: Customary, Weight, Length
    - Convert Metric Units: Weight, Capacity, Length
    - Convert Between Customary and Metric
- **Lessons 9-10**
    - Percent Word Problems
- **Lesson 11**
    - Percent of Change Word Problems
- **Lesson 12**
    - Simple Interest Word Problems
- **Other Supplemental Activities:**
    - Ratios Bingo
    - Ratios Escape room
    - Ratio tables pixel art
    - Ratio tables slides activity
    - Better Buy Tacos - Digital Activity
    - Unit rate slides
    - Solving proportions pixel art
    - Solving algebraic proportions pixel art
    - Proportional relationships digital matching
    - Similar figures pixel art
    - Fraction, decimal, percent maze
    - Fraction, decimal, percent drag and drop
    - Percent Bingo
    - Part-Whole-Percent maze
    - Part-Whole-Percent Pixel art
    - Percent application slides
    - Tax, tip, discount escape room

- Tax, tip, discount drag and drop
- Interest drag and drop

Assessment Evidence
Formative Assessments: Quizzes, IXL quizzes, Delta Math, Warm-Ups, Exit Passes, teacher observation
Summative Assessments: Unit Assessments, Unit Projects, Cumulative Assessments & Projects
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Unit 5

Desired Results

Unit 5: Probability

Unit Summary: This unit focuses on the foundational concepts of probability, exploring how to calculate and understand the likelihood of events occurring. Students will learn about simple probability, theoretical and experimental probability, the counting principle, and compound probability. These concepts form the building blocks for more advanced topics in probability and statistics. The unit also emphasizes the connection between theoretical models and real-world experiments.

Learning Standards

NJSLS Math:

7.SP Statistics and Probability

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

7.SP.5 - Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around 1/2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.

7.SP.6 - Approximate the probability of a chance event by collecting data on the chance process that produces it and observing its long-run relative frequency, and predict the approximate relative frequency given the probability. For example, when rolling a number cube 600 times, predict that a 3 or 6 would be rolled roughly 200 times, but probably not exactly 200 times.

7.SP.7 - Develop a probability model and use it to find probabilities of events. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy.

7.SP.7.a - Develop a uniform probability model by assigning equal probability to all outcomes, and use the model to determine probabilities of events. For example, if a student is selected at random from a class, find the probability that Jane will be selected and the probability that a girl will be selected.

7.SP.7.b - Develop a probability model (which may not be uniform) by observing frequencies in data generated from a chance process. For example, find the approximate probability that a spinning penny will land heads up or that a tossed paper cup will land open-end down. Do the outcomes for the spinning penny appear to be equally likely based on the observed frequencies?

7.SP.8 - Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation.

7.SP.8.a - Understand that, just as with simple events, the probability of a compound event is the fraction of outcomes in the sample space for which the compound event occurs.

7.SP.8.b - Represent sample spaces for compound events using methods such as organized lists, tables and tree diagrams. For an event described in everyday language (e.g., “rolling double sixes”), identify the outcomes in the sample space which compose the event.

Mathematical Practices

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5. Use appropriate tools strategically
6. Attend to precision

7. Look for and make use of structure
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Interdisciplinary Connections

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Learning Targets

Unit Essential Questions:	**Unit Enduring Understandings:**
How can the likelihood of the occurrence of an event be expressed?	The likelihood of the occurrence of an event can be expressed by a number between 0 and 1.
How can we determine the likelihood of an event happening in a random experiment?	Theoretical probability is based on known possible outcomes, while experimental probability is based on actual results.

What is the difference between theoretical and experimental probability? How do experimental and theoretical probabilities compare after conducting multiple trials? What is the relationship between the counting principle and compound probability?	Understanding and using sample spaces helps in calculating probabilities accurately. In compound events, the probability of multiple outcomes depends on whether the events are independent or dependent.
Vocabulary: Probability, Likelihood, Relative Frequency, Theoretical Probability, Experimental Probability, Tree Diagram, Counting Principle, Compound Probability, Independent Events, Dependent Events	
Students will be able to: **Lesson 1: Simple Probability -** Determine the probability of one event. (*7.SP.5*, *7.SP.6)* **Lesson 2: Theoretical vs. Experimental Probability -** Determine the difference between theoretical and experimental probability (*7.SP.6*, *7.SP.7*) **Lesson 3: Counting Outcomes -** Use tree diagrams and the counting principle to determine outcomes (*7.SP.7*, *7.SP.7.a*, *7.SP.7.b*, *7.SP.8)* **Lesson 4: Compound Probability -** Determine the probabilities of compound events (*7.SP.8*, *7.SP.8.a*, *7.SP.8.b)*	
Learning Activities: *Suggested or Potential Learning Activities* ● **Math IXL Skill Practice and Group Jams based on each lesson.** ○ Students will work in Math IXL completing recommended skills from their teacher and based on their diagnostic results.	

- **Delta Math Standards Created Assignments**

- **Number Sense Activities**

Education.com Aligned Practice Worksheets

- **Lesson 1**
  - Probability of Simple Events
  - What is the Probability?
  - Probability Models
  - Probability Dice
  - Probability Jelly Beans
- **Lesson 2-3**
  - Make Predictions Using Theoretical Probability
  - Make Predictions Using Experimental Probability
  - Experimental Probability
  - Experimental Probability Models
- **Lesson 4**
  - Sample Spaces of Compound Events
  - Possibilities of Compound Events
- **Other Supplemental Activities:**
  - Probability escape room
  - Mean, median, mode, range maze
  - Mean, median, mode, range scratch off
  - Mean, median, mode, range drag and drop
  - Box plot slides
  - Histogram slides activity
  - MAD self checking google sheets activity

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Unit 6

Desired Results

Unit 6: Data & Statistics

Unit Summary: Students build on and reinforce their understanding of numbers; students begin to develop the ability to think statistically. Students recognize that a data distribution may not have a definite center and that different ways to measure center yield different values. The median measures center in the sense that it is roughly the middle value. The mean measures center in the sense that it is the value that each data point would take on if the total of the data values were redistributed equally, and also in the sense that it is a balance point. Students recognize that a measure of variability can also be useful for summarizing data because two very different sets of data can have the same mean and median yet be distinguished by their variability.

Learning Standards

NJSLS Math:

6.SP Statistics and Probability

6.SP.A Develop understanding of statistical variability.

6.SP.A.1 Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers.

6.SP.A.2 Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape.

6.SP.A.3 Recognize that a measure of center for a numerical data set summarizes all of its values with a single number, while a measure of variation describes how its values vary with a single number.

6.SP.B Summarize and describe distributions.

6.SP.B.4 Display numerical data in plots on a number line, including dot plots, histograms, and box plots.

6.SP.5 Summarize numerical data sets in relation to their context, such as by:

6.SP.B.5.a Reporting the number of observations

6.SP.B.5.b Describing the nature of the attribute under investigation, including how it was measured and its units of measurement.
6.SP.B.5.c. Giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered.
6.SP.B.5.d Summarize numerical data sets in relation to their context, such as by: d. Relating the choice of measures of center and variability to the shape of the data distribution and the context in which the data were gathered.

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Learning Targets	
Unit Essential Questions: How can the collection, organization, interpretation, and display of data be used to answer questions? How can I use the measures of center and variability to interpret data?	**Unit Enduring Understandings:** Students will understand that distributions of data can be summarized and described in various ways. Students will understand that measures of center and variability can be used to interpret data.
Vocabulary: Measures of center, Mean, Median, Mode, Range, Interquartile range, Mean absolute deviation, Center, Spread, Dot plot, Histogram, Box plot	
Students will be able to: **Lesson 1: Statistical Questions & Dot Plots -** Interpret & create dot plots and understand what is meant by the term statistical question (*6.SP.A.1*, *6.SP.A.2*, *6.SP.B.4*, *6.SP.B.5.a-d)* **Lesson 2: Measures of Center & Range -** Find the mean, median, mode, and range of a data set (*6.SP.B.5.c*, *6.SP.B.5.d)* **Lesson 3: Mean Absolute Deviation -** Calculate the mean absolute deviation (MAD) of a data set and make sense of MAD as a measure of spread. (*6.SP.B.5.a-d)* **Lesson 4: Box-and-Whisker Plots -** Interpret & create box-and-whisker plots including finding the interquartile range (IQR) (*6.SP.B.5.d*, *6.SP.B.4*)	

Lesson 5: Histograms - Interpret & create histograms from a set of data (*6.SP.B.4*, *6.SP.B.5*)

Learning Activities:

Learning Activities: *Suggested or Potential Learning Activities*

- **Math IXL Skill Practice and Group Jams based on each lesson.**
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  - **6.SP.B4 Climate Change Example: Students may display numerical data related to deforestation and increasing livestock farming as contributors to climate change in plots on a number line, including dot plots, histograms, and box plots.**

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  - Climate Change Example: Students may display numerical data related to deforestation and increasing livestock farming as contributors to climate change in plots on a number line, including dot plots, histograms, and box plots.

  - Recognize Statistical Questions
  - Statistical Questions Card Sort
  - Dot Plots

    - Describing Distributions In Dot Plots
- **Lessons 2-3**
    - Mean, Median, and Mode
    - Mean, Median, and Mode Practice
    - Find the Mean, Median, and Mode
    - Baseball Math: Mean, Median, and Mode
    - Describing Data Using Mean, Median, Mode, and Range
    - Mean Absolute Deviation
- **Lesson 4** 
    - Climate Change Example: Students may display numerical data related to deforestation and increasing livestock farming as contributors to climate change in plots on a number line, including dot plots, histograms, and box plots.
    - Interquartile Range
    - Finding the Range
    - Box and Whisker Plots
- **Lesson 5** 
    - Climate Change Example: Students may display numerical data related to deforestation and increasing livestock farming as contributors to climate change in plots on a number line, including dot plots, histograms, and box plots.
    - Describing data in histograms

- Summarizing Data From a Frequency Table

- **Other Supplemental Activities:**
  - Mean, median, mode, range lotto ticket
  - Measure of center drag and drop
  - Mean, median, mode, range maze
  - Histogram Digital Activity
  - Dot Plot slides activity
  - Box plot slides activity
  - Box Plot Digital Activity
  - Analyzing Digital Activity
  - Bow and Whisker Plot Digital Activity
  - Box Plot Maze
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Unit 7

Desired Results

Unit 7: Measurement: Area & Volume

Unit Summary: Students deepen their understanding of measurement by learning how to calculate area, surface area, and volume of various two-dimensional (2D) and three-dimensional (3D) figures. Students will review common

area formulas and apply these concepts to more complex figures, including composite shapes. Students will explore how to calculate the surface area and volume of solids. Students also investigate how volume measures the space a shape occupies and how it differs from surface area.

Learning Standards

NJSLS Math:

6.G Geometry

6.G.A Solve real-world and mathematical problems involving area, surface area, and volume.

6.G.A.1 Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems

6.G.A.2 Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths and show that the volume is the same as would be found by multiplying the edge lengths of the prism. Apply the formulas V = l w h and V = B h to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems.

6.G.A.3 Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate. Apply these techniques in the context of solving real-world and mathematical problems.

6.G.A.4 Represent three-dimensional figures using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures. Apply these techniques in the context of solving real-world and mathematical problems.

7.G Geometry

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

7.G.B.4 Know the formulas for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle.

7.G.B.6 Solve real-world and mathematical problems involving area, volume and surface area of two and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.

8.G Geometry

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

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

problems 

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9.4.8.IML.3: Create a digital visualization that effectively communicates a data set using formatting techniques such as form, position, size, color, movement, and spatial grouping (e.g., 6.SP.B.4, 7.SP.B.8b). •
9.4.8.IML.4: Ask insightful questions to organize different types of data and create meaningful visualizations.
9.4.8.TL.3: Select appropriate tools to organize and present information digitally

Computer Science & Design Thinking (*CS & DT***):**

<u>Computing Systems</u>

Troubleshooting a problem is more effective when knowledge of the specific device along with a systematic process is used to identify the source of a problem.

<u>Data & Analysis</u>

People use digital devices and tools to automate the collection, use, and transformation of data.

8.1.8.CS.1: Recommend improvements to computing devices in order to improve the ways users interact with the devices.
8.2.8.NT.1: Examine a malfunctioning tool, product, or system and propose solutions to the problem.

Learning Targets

Unit Essential Questions:	**Unit Enduring Understandings:**
How can we solve real-world problems involving area, surface area, and volume? How can I put shapes together and take them apart to form other shapes?	Area, surface area, and volume can be used to solve real-world and mathematical problems. Geometric formulas can be used to solve mathematical problems for two and three dimensional figures.

Vocabulary:
Area, Perimeter, Volume, Surface area, Circumference

Students will be able to:

Lesson 1: Area of Plane Figures - Find the area of right triangles and other triangles by composing into rectangles (6.G.A.1)
Lesson 2: Plane Figures on the Coordinate Plane - Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate. Apply these techniques in the context of solving real-world and mathematical problems. (6.G.A.3)
Lesson 3: Area & Circumference of Circles - Know the formulas for area and circumference of a circle, solve problems using the formula for circumference of a circle and for the area of a circle (7.G.B.4)
Lesson 4: Area of Composite Figures - Find the area of special quadrilaterals and polygons by composing into rectangles or decomposing into triangles and other shapes, and informally derive the relationship between the circumference and area of a circle (6.G.A.1, 7.G.B.4)
Lesson 5: Area of Shaded Regions - Apply the techniques of finding area of polygons by composition or decomposition to solve real-world and mathematical problems *(6.G.A.1)*
Lesson 6: Nets & Classifying Polyhedra - Analyze and define the features of prisms and pyramids using precise vocabulary and on a grid, practice identifying polyhedra from their nets. (6.G.A.4)
Lesson 7: Volume of Prisms & Cylinders - Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes, show that volume of a right rectangular prism is the same when multiplying edge lengths or

packing it with unit cubes & find volumes of right rectangular prisms with fractional edge lengths applying the volume formulas V = l w h and V = B h in real-world or mathematical problems. (6.G.A.2, 6.G.A.4, 7.G.B.6)
Lesson 8: Volume of Pyramids & Cones -apply the formulas for volume of a cone, cylinder, or sphere in a real-world context, calculate the volume of a cone, cylinder, or sphere, and find a missing dimension of a cone, cylinder or sphere given its volume (*8.G.C.9)*
Lesson 9: Surface Area of Prisms & Cylinders - Understand surface area as a measure of three-dimensional solids and calculate the surface areas of prisms and cylinders from images. (6.G.A.4, 7.G.B.6)
Lesson 10: Surface Area of Pyramids & Cones - Understand surface area as a measure of three-dimensional solids and calculate the surface areas of pyramids and cones from images. (6.G.A.4, 7.G.B.6)
Lesson 11: Volume & Surface Area of Spheres - Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems. (8.G.C.9)
Lesson 12: Perimeter & Area of Similar Figures - Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale. (7.G.A.1)
Lesson 13: Volume & Surface Area of Similar Figures - Solve problems involving scale drawings of geometric figures, including computing actual surface areas and volumes from a scale drawing and reproducing a scale drawing at a different scale. (7.G.B.6)

Learning Activities:

Learning Activities: *Suggested or Potential Learning Activities*

- **Math IXL Skill Practice and Group Jams based on each lesson.**
    - Students will work in Math IXL completing recommended skills from their teacher and based on their diagnostic results.

- **Delta Math Standards Created Assignments**

- **Number Sense Activities**

Education.com Aligned Practice Worksheets

- **Lessons 1-2**
    - Area of Parallelograms Practice
    - Area of Parallelograms
    - Finding the Area of a Triangle
    - Area of a Triangle #1-2
    - Find the Missing Base
    - Find the Missing Height
    - *Enrichment: Geometry Detective #1-2
    - Area of Trapezoids
    - Perimeter on the Coordinate Plane (1-3)
    - Polygons on the Coordinate Plane
- **Lesson 3**
    - Area of Circles
    - Circumference of Circles
    - Area of Semi-Circles (1-3)
    - Area of Quarter Circles (1-3)
    - Perimeter of Quarter Circles (1-3)
    - Area & Circumference of Circles
    - Finding Area of Circles
    - Finding Circumference of Circles
- **Lessons 4-5**
    - Decomposing Polygons to Find Area
    - Area of Compound Figures
- **Lessons 7-8 & 11**

- Climate Change Example: Students may solve real-world problems involving area, surface area, and volume related to deforestation and increasing livestock farming as key contributors to climate change.

- Climate Change Example: Students may use the formula for the volume of a sphere to approximate the volume of hailstones to consider how climate change may affect the size of hailstones over time.

- Volume of Rectangular Prisms and Cubes with Fractions
- Understanding Volume with Fractions
- Volume of Right Prisms
- Volume of Cylinders, Cones, and Spheres (1-3)
- Volume of Cones
- Volume of Cylinders
- Volume of Spheres

- **Lessons 9-12**
  - Climate Change Example: Students may solve real-world problems involving area, surface area, and volume related to deforestation and increasing livestock farming as key contributors to climate change.

  - An Introduction to Surface Area #1-2
  - Surface Area of a Rectangular Prism
  - Surface Area Practice: Prisms and Pyramids
  - Surface Area of Prisms
  - Surface Area of Pyramids
  - Calculating Surface Area #1-5
  - Surface Area Word Problems
  - Surface Area: A Cube
  - Finding Surface Area Using Nets #1-3

- **Lesson 12: Perimeter & Area of Similar Figures**
- **Lesson 13: Volume & Surface Area of Similar Figures**
    - Climate Change Example: Students may solve real-world problems involving area, surface area, and volume related to deforestation and increasing livestock farming as key contributors to climate change.

- **Other Supplemental Activities:**
    - Area slides activity
    - Area - Polly's Pizza Google form activity
    - Area and circumference drag and drop
    - Area and circumference self checking google sheets
    - Surface area pixel art
    - Volume slides activity
    - Volume maze
    - Volume Scavenger Hunt
    - Complementary and supplementary slides activity
    - Parallel lines cut by transversal escape room
    - Area of Parallelograms Maze
    - Area of Triangles Maze
    - Area of Parallelograms & Triangles Drag & Drop
    - Area of Parallelograms and Triangles Digital Matching Activity
    - Area of Parallelograms and Triangles Scavenger Hunt
    - Area of Polygons Maze
    - Surface Area of Prisms Matching
    - Surface Area of Rectangular Prisms
    - Surface Area of Rectangular Prisms Maze
    - Surface Area of Nets Slides
    - Surface Area Murder Mystery

- Surface Area Digital Activity
- Surface Area and Nets Rectangular Prisms Self-Check Activity
- 6th Grade Math Surface Area

Assessment Evidence
Formative Assessments: Quizzes, IXL quizzes, Delta Math, Warm-Ups, Exit Passes, teacher observation
Summative Assessments: Unit Assessments, Unit Projects, Cumulative Assessments & Projects
Common Benchmark Assessments: Cumulative Benchmark Assessments
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Math IXL, Delta Math, Khan Academy, Math Manipulatives

Accommodations and Modifications: Students with Disabilities, English Language Learners, Students at Risk of Failure, Students with 504s, Gifted & Talented Students

Specific Strategies and Practices that Support Students with Disabilities:

Students receiving Special Education programming have specific goals and objectives, as well as accommodations and modifications outlined within their Individualized Education Plans (IEP) due to an identified disability and/or diagnosis. In addition to exposure to the general education curriculum, the instruction is differentiated based upon the student's needs. The IEP acts as a supplemental curriculum guide inclusive of instructional strategies that support each learner.

- Small group/One to one - Additional time - Review of directions - Student restates information - Space for movement or breaks - Extra visual and verbal cues and prompts - Preferential seating - Follow a routine/schedule - Rest breaks - Verbal and visual cues regarding directions and staying on task - Checklists - Immediate feedback

Alternate or reduced work within Digital Platforms such as Math IXL, Delta Math, and Link It assignments

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English language learner (ELL) is a national-origin-minority student who is limited-English-proficient. This term is often preferred over limited-English-proficient (LEP) as it highlights accomplishments rather than deficits.

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Students at Risk of Failure

- Home/School Connection - Alternative Assessments - Learning Contracts - Homogenous Grouping - Supplemental Instruction - Think-Pair-Share by Readiness - Homework Options - Differentiated Online Practice - Leveled Rubrics - Tiered Level of Supports - Tiered Activities - Small Group Instruction - Work Alone Choice - Group Work Choice

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Teachers are responsible for implementing designated services and strategies identified on a student's 504 Plan.
504 plans are formal plans that schools develop to give kids the support they need and covers any condition that limits daily activities in a major way. Students' accommodations are outlined in their individual 504 plan.

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It is critical that all teachers are able to recognize a high-ability student who may need more depth and complexity in instruction.

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-Enrichment/Extension Activities within Digital Platforms such as Math IXL, Delta Math, and Link It assignments

Unit 8

Desired Results

Unit 8: Geometry

Unit Summary: Students explore a variety of angle relationships and how they are used to solve problems in both mathematical and real-world contexts. Students begin by identifying and classifying angle pairs and their relationships to each other. Building on this foundation, students examine what happens when parallel lines are cut by a transversal. They discover consistent patterns in the angle pairs formed and learn to identify these relationships and use them to find unknown angle measures. Throughout the unit, students use diagrams, algebraic expressions, and reasoning to solve problems. They apply their understanding of angles to justify their solutions and make logical arguments.

Learning Standards

NJSLS Math:

7.G Geometry

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

7.G.B.5 Use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure.

8.G Geometry

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

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.

Mathematical Practices

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

Interdisciplinary Connections

Career Readiness, Life Literacies, & Key Skills *(CLKS)*:

Career Readiness, Life Literacies, and Key Skills Practices describe the habits of the mind that all educators in all content areas should seek to develop in their students. They are practices that have been linked to increase college, career, and life success. These practices should be taught and reinforced in all content areas with increasingly higher levels of complexity and expectation as a student advances through a program of study.

<u>Practices</u>:

Act as a responsible and contributing community members and employee
Attend to financial well-being
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

9.4.8.CT.2: Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option

9.4.8.GCA.2: Demonstrate openness to diverse ideas and perspectives through active discussions to achieve a group goal.
9.4.8.IML.2: Identify specific examples of distortion, exaggeration, or misrepresentation of information.
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Learning Targets	
Unit Essential Questions:	**Unit Enduring Understandings:**

How can you identify and classify angle pairs such as complementary, supplementary, vertical, and adjacent angles? What strategies can you use to find missing angle measures using angle relationships? How are angle relationships affected when two parallel lines are cut by a transversal?	Angle relationships help us determine unknown angle measures using logic and mathematical rules. Complementary angles have a sum of 90°, while supplementary angles have a sum of 180°. When a transversal crosses parallel lines, specific angle pairs (like alternate interior, alternate exterior, and corresponding angles) are always congruent or supplementary.
Vocabulary: Supplementary angles, Complementary angles, Vertical angles, Adjacent angles, Transversal, Corresponding angles, Alternate interior angles, Alternate exterior angles	
Students will be able to: **Lesson 1: Introduction to Angles -** Know the parts of an angle, types of angles, and find angle measures. (7.G.B.5) **Lesson 2: Basic Angle Relationships -** supplementary angles are two angles whose sum is 180 degrees and complementary angles are two angles whose sum is 90 degrees, vertical angles, the pairs of opposite angles made by two intersecting lines, have equal measures, and adjacent angles are two angles that share a vertex and a side. (7.G.B.5) **Lesson 3: Angle Relationships & Algebra** Use facts about supplementary, complementary, vertical and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure(*7.G.B.5)* **Lesson 4: Parallel lines cut by a transversal -** 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. (8.G.A.5) ▪ the sum of the interior angles of a triangle is 180 degrees (*8.G.A.5)* ▪ the measure of an exterior angle of a triangle is equal to the sum of the two remote interior angles (*8.G.A.5)* ▪ when parallel lines are cut by a transversal, corresponding, alternate interior, and alternate exterior angles are congruent	

(*8.G.A.5)*
▪ if two sets of corresponding angles in two triangles are congruent, then the triangles are similar (*8.G.A.5)*
▪ use facts about angles to construct an informal argument (*8.G.A.5)*

Learning Activities:

Learning Activities: *Suggested or Potential Learning Activities*

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Education.com Aligned Practice Worksheets

- **Lesson 1, 2, & 3:**
  - Solving Problems Using Angle Relationships #1, #2
  - Identifying Complementary, Supplementary, Vertical, and Adject Angles
  - Complementary and Supplementary Angles #1, #2, #3
- **Lesson 4:**
  - Parallel Lines Cut by a Transversal
  - Transversals of Parallel Lines
  - Transversals of Parallel Lines: Angle Relationships
- **Other Supplemental Activities:**
  - Angle sum self checking google sheets
  - Complementary and supplementary slides activity
  - Parallel lines cut by transversal escape room

Assessment Evidence
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Standards for Mathematical Practice
1. Make sense of problems and persevere in solving them

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

2. Reason abstractly and quantitatively

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to *decontextualize*—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to *contextualize*, to pause as needed during the manipulation process to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

3. Construct viable arguments and critique the reasoning of others

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it

is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

4. Model with mathematics

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

5. Use appropriate tools strategically

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

6. Attend to precision

Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

7. Look for and make use of structure

Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7×8 equals the well-remembered$7 \times 5 + 7 \times 3$, in preparation for learning about the distributive property. In the expression $x^2 + 9x + 14$ older students can see the 14 as $2 \times 7$and the 9 as $2 + 7$. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see $5 - 3(x - y)^2$ as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.

8. Look for and express regularity in repeated reasoning

Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation $\frac{(y-2)}{(x-1)} = 3$. Noticing the regularity in the way terms cancel when expanding $(x - 1)(x + 1)$, $(x - 1)\left(x^2 + x + 1\right)$ and $(x - 1)\left(x^3 + x^2 + x + 1\right)$ might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

Unit 9

Desired Results

Unit 9: Functions & Linear Equations

Unit Summary: Students will gain an understanding of functions and identifying functions in both tables and graphs. Students will be exposed to the foundation of a linear equation and graphing a linear equation; identifying the slope and y-intercept.

Learning Standards

NJSLS Math:

8.EE Expressions and Equations

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

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.

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

8.F.A.2 Compare properties (e.g. rate of change, intercepts, domain and range) of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For example, given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change

8.F Functions

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

8.F.B.4 Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (x, y) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.

8.F.B.5 Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is

increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally.

Mathematical Practices

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Attend to financial well-being
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

9.4.8.CT.2: Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option
9.4.8.GCA.2: Demonstrate openness to diverse ideas and perspectives through active discussions to achieve a group goal.
9.4.8.IML.2: Identify specific examples of distortion, exaggeration, or misrepresentation of information.
9.4.8.IML.3: Create a digital visualization that effectively communicates a data set using formatting techniques such as form, position, size, color, movement, and spatial grouping (e.g., 6.SP.B.4, 7.SP.B.8b). •
9.4.8.IML.4: Ask insightful questions to organize different types of data and create meaningful visualizations.
9.4.8.TL.3: Select appropriate tools to organize and present information digitally

Computer Science & Design Thinking (*CS & DT***):**

<u>Computing Systems</u>

Troubleshooting a problem is more effective when knowledge of the specific device along with a systematic process is used to identify the source of a problem.

<u>Data & Analysis</u>

People use digital devices and tools to automate the collection, use, and transformation of data.

8.1.8.CS.1: Recommend improvements to computing devices in order to improve the ways users interact with the devices.
8.2.8.NT.1: Examine a malfunctioning tool, product, or system and propose solutions to the problem.

Learning Targets

Unit Essential Questions:	**Unit Enduring Understandings:**
What does the slope of a line indicate about the line? What information does the equation of a line give you? How are equations and graphs related?	Ratios can be used to show a relationship between changing quantities, such as vertical and horizontal change. A line on a graph can be represented by a linear equation. The relationship between two lines can be determined by comparing their slopes and y-intercepts.

Vocabulary: Linear, Slope, Rate of change, Y-intercept, Initial value, Domain, Range,Intercepts, Slope-intercept form

Students will be able to:

Lesson 1: Relations & Functions: Determine the difference between a relation and a function by identifying the domain and range and looking for the relationship between them (*8.F.A.2*, *8.F.B.4*)
Lesson 2: Graphing Linear Equations: Use a table of values to graph linear equations (*8.F.B.4*, *8.F.B.5*)
Lesson 3: Slope: Find the slope of a line from a graph and use the slope formula (*8.EE.B.6*)
Lesson 4: Slope-Intercept Form: Graph equations using slope-intercept form (*8.EE.B.6*, *8.F.B.5*)

Learning Activities:

Learning Activities: *Suggested or Potential Learning Activities*

- **Math IXL Skill Practice and Group Jams based on each lesson.**
  - Students will work in Math IXL completing recommended skills from their teacher and based on their diagnostic results.

- **Delta Math Standards Created Assignments**

- **Number Sense Activities**

Education.com Aligned Practice Worksheets

- **Lesson 1: Relations & Functions:**
  - Check for the Functions
  - Is the Relation a Function?
  - Identify functions From Graphs
  - Identify Functions From Tables
  - Identify Functions from Ordered Pairs
- **Lesson 2: Graphing Linear Equations:**
  - Graph Linear Functions Using Tables
  - Sorting Representations of Linear Functions
- **Lesson 3: Slope:**
  - Rate of Change: Graphs
  - Rate of Change: Tables
  - Finding Slope from Two Points
  - Slope Review
  - Slope Review: Graphs
  - Slope Review: Points
  - Finding Slope From Two Points: Practice
- **Lesson 4: Slope-Intercept Form:**
  - Slope-Intercept Form: Graphing Lines
  - Slope-Intercept Form: Writing Equations
  - Graphing Linear Equations in Slope-Intercept Form

- Write Equations in Slope-Intercept Form From Tables
- Write Equations in Slope-Intercept Form From Graphs
- Write Equations in Slope-Intercept Form: Tables
- Write Equations in Slope-Intercept form: Review

- **Other Supplemental Activities:**
  - Functions drag and drop
  - Slope escape room
  - Function Form slides activity
  - Writing equations in y=mx+b self checking google sheets
  - Identify slope and y-intercept slides

Assessment Evidence
Formative Assessments: Quizzes, IXL quizzes, Delta Math, Warm-Ups, Exit Passes, teacher observation
Summative Assessments: Unit Assessments, Unit Projects, Cumulative Assessments & Projects
Common Benchmark Assessments: Cumulative Benchmark Assessments
Alternative Assessments: Modified Assessments & Projects, IXL, and Delta Math Assessments

Core Instructional & Supplemental Materials
***Core Instruction Program*: Desmos Math, Holt McDougal Larson Pre-Algebra textbook, education.com**
***Intervention Support*: Math IXL Suggested Skills, Math IXL Diagnostic, Targeted small group instruction**
Math IXL, Delta Math, Khan Academy, Math Manipulatives

Accommodations and Modifications: Students with Disabilities, English Language Learners,

Students at Risk of Failure, Students with 504s, Gifted & Talented Students

Specific Strategies and Practices that Support Students with Disabilities:

Students receiving Special Education programming have specific goals and objectives, as well as accommodations and modifications outlined within their Individualized Education Plans (IEP) due to an identified disability and/or diagnosis. In addition to exposure to the general education curriculum, the instruction is differentiated based upon the student's needs. The IEP acts as a supplemental curriculum guide inclusive of instructional strategies that support each learner.

- Small group/One to one - Additional time - Review of directions - Student restates information - Space for movement or breaks - Extra visual and verbal cues and prompts - Preferential seating - Follow a routine/schedule - Rest breaks - Verbal and visual cues regarding directions and staying on task - Checklists - Immediate feedback

Alternate or reduced work within Digital Platforms such as Math IXL, Delta Math, and Link It assignments

Specific Strategies and Practices that Support English Language Learners

English language learner (ELL) is a national-origin-minority student who is limited-English-proficient. This term is often preferred over limited-English-proficient (LEP) as it highlights accomplishments rather than deficits.

- Pre-teaching of vocabulary and concepts - Personal Glossary - Extended Time - Simplified/Verbal Instructions - Frequent Breaks - Visual learning, including graphic organizers - Use of cognates to increase comprehension - Teacher modeling - Pairing students with beginning English language skills with students who have more advanced English language skills - Scaffolding - Word walls - Think-pair-share - Cooperative learning groups

Alternate or reduced work within Digital Platforms such as Math IXL, Delta Math, and Link It assignments

Students at Risk of Failure

- Home/School Connection - Alternative Assessments - Learning Contracts - Homogenous Grouping - Supplemental Instruction - Think-Pair-Share by Readiness - Homework Options - Differentiated Online Practice - Leveled Rubrics - Tiered Level of Supports - Tiered Activities - Small Group Instruction - Work Alone Choice - Group Work Choice

Alternate or reduced work within Digital Platforms such as Math IXL, Delta Math, and Link It assignments - Opportunities for make-up work or reduce number of assignments - Provide access to extra help when possible

Students with 504 Plans

Teachers are responsible for implementing designated services and strategies identified on a student’s 504 Plan.

504 plans are formal plans that schools develop to give kids the support they need and covers any condition that limits daily activities in a major way. Students' accommodations are outlined in their individual 504 plan.

Specific Strategies and Practices that Support Gifted & Talented Students
It is critical that all teachers are able to recognize a high-ability student who may need more depth and complexity in instruction.

-Homogenous Grouping - Small Group In-Depth Instruction - Differentiated Online Practice - Alternative Assessments - Pre-Assess to provide Differentiated Instruction to Accelerate Learning
-Enrichment/Extension Activities within Digital Platforms such as Math IXL, Delta Math, and Link It assignments

Standards for Mathematical Practice

1. Make sense of problems and persevere in solving them

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

2. Reason abstractly and quantitatively

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to *decontextualize*—to abstract

a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to *contextualize*, to pause as needed during the manipulation process to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

3. Construct viable arguments and critique the reasoning of others

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

4. Model with mathematics

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

5. Use appropriate tools strategically

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

6. Attend to precision

Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

7. Look for and make use of structure

Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7×8 equals the well-remembered$7 \times 5 + 7 \times 3$, in preparation for learning about the distributive property. In the expression $x^2 + 9x + 14$ older students can see the 14 as $2 \times 7$and the 9 as $2 + 7$. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For

example, they can see $5 - 3(x - y)^2$ as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.

8. Look for and express regularity in repeated reasoning

Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation $\frac{(y-2)}{(x-1)} = 3$. Noticing the regularity in the way terms cancel when expanding $(x - 1)(x + 1)$, $(x - 1)\left(x^2 + x + 1\right)$ and $(x - 1)\left(x^3 + x^2 + x + 1\right)$ might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.