Readington Township Public Schools

Grade 6 Honors Math and Grade 7 Advanced Math

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Approval Date:
August 20, 2024

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Grade Six Honors and Seventh Grade Advanced Mathematics

Overview

This is a fast-paced course where students will cover some of the seventh-grade New Jersey Student Learning Standards (NJSLS) as well as the eighth-grade NJSLS. Topics will include Ratios and Proportional Relationships, The Number System, Expressions and Equations, Functions, Geometry, Statistics and Probability. Through their work in this course, students will understand and apply their knowledge in real-world applications. The Mathematical Practices focus on the development of competencies used by mathematicians in all grades and throughout life.

STUDENT OUTCOMES

(Linked to New Jersey Student Learning Standards for Mathematics 2023)

RATIOS AND PROPORTIONS (7.RP)

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

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.
2. Recognize and represent proportional relationships between quantities.
    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.
    b. Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.
    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.
    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.
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.

THE NUMBER SYSTEM (7.NS)

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

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.
    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?
    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.
    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.
    d. Apply properties of operations as strategies to add and subtract rational numbers.
2. Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers.
    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.

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 q and q are integers, then -(p/q) = (-p)/q = p/(-q). Interpret quotients of rational numbers by describing real-world contexts.
c. Apply properties of operations as strategies to multiply and divide rational numbers.
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.

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.)

THE NUMBER SYSTEM (8.NS)

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

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.
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 2 is between 1 and $\sqrt{2}$, then between 1.4 and 1.5, and explain how to continue on to get better approximations.
3. Understand that the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational.

EXPRESSIONS AND EQUATIONS (7.EE)

A. Use properties of operations to generate equivalent expressions

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

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

3 Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. For example: If a woman making $25 an hour gets a 10% raise, she will make an additional 1/10 of her salary an hour, or $2.50, for a new salary of $27.50. If you want to place a towel bar 9 ¾ inches long in the center of a door that is 27 ½ inches wide, you will need to place the bar about 9 inches from each edge; this estimate can be used as a check on the exact computation.

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.

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?
b. . Solve word problems leading to inequalities of the form px + q> r or px + q<r, where p, q, and r are specific rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem. For example: As a salesperson, you are paid $50 per week plus $3 per sale. This week you want your pay to be at least $100. Write an inequality for the number of sales you need to make, and describe the solutions.

EXPRESSIONS AND EQUATIONS (8.EE)

A. Work with radicals and integer exponents

1. Know and apply the properties of integer exponents to generate equivalent numerical expressions. For example, $3^2 \times 3^{-5} = 3^{-3} = 1/3^3 = 1/27$.
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.
    a. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that $\sqrt{2}$ is irrational.
    b. Simplify numerical radicals, limiting to square roots (i.e. nonperfect squares).
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.
4. Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology.

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

5 Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.

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.

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

7 Solve linear equations in one variable.

    a. Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form x = a, a = a, or a = b results (where a and b are different numbers).
    b. Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.

8 Analyze and solve pairs of simultaneous linear equations.

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

FUNCTIONS (8.F)

A. Define, evaluate and compare functions

1. Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output. (Clarification: Function notation is not required in Grade 8)
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.
3. Interpret the equation $y = mx + b$ as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. For example, the function $A = s^2$ giving the area of a square as a function of its side length is not linear because its graph contains the points (1,1), (2,4) and (3,9), which are not on a straight line.

B. Use functions to model relationships between quantities

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.

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.

GEOMETRY (7.G)

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

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

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

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.

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.

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.

GEOMETRY (8.G)

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

1. Verify experimentally the properties of rotations, reflections, and translations:
   a. Lines are transformed to lines, and line segments to line segments of the same length.
   b. Angles are transformed to angles of the same measure.
   c. Parallel lines are transformed to parallel lines.
2. Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them.
3. Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.

4. Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them.
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.

B. Understand and apply the Pythagorean Theorem

6 Explain a proof of the Pythagorean Theorem and its converse.

7 Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.

8 Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.

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

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

STATISTICS AND PROBABILITY (7.SP)

A. Use random sampling to draw inferences about a population

1. Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences.

2 Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions. For example, estimate the mean word length in a book by randomly sampling words from the book; predict the winner of a school election based on randomly sampled survey data. Gauge how far off the estimate or prediction might be.

B. Draw informal comparative inferences about two populations

3 Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities, measuring the difference between the centers by expressing it as a multiple of a measure of variability. For example, the mean height of players on the basketball team is 10 cm greater than the mean height of players on the soccer team, about twice the variability (mean absolute deviation) on either team; on a dot plot, the separation between the two distributions of heights is noticeable.

4 Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations. For example, decide whether the words in a chapter of a seventh-grade science book are generally longer than the words in a chapter of a fourth-grade science book.

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

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 ½ indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.

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 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.

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.

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?

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

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.

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.

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

STATISTICS AND PROBABILITY (8.SP)

A. Investigate patterns of association in bivariate data

1. Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.
2. Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit (e.g. line of best fit) by judging the closeness of the data points to the line.
3. Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. For example, in a linear model for a biology experiment, interpret a slope of 1.5 cm/hr as meaning that an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height.
4. Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables. For example, collect data from students in your class on whether or not they have a curfew on school nights and whether or not they have assigned chores at home. Is there evidence that those who have a curfew also tend to have chores?

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.

Strategies

- Teacher presentation
- Teacher read-aloud
- Group discussion
- Small Group instruction
- Group presentations
- Interactive Smartboard Lessons

- Partner work
- Museum walks
- Math talk (students explain their thinking)
- Small Group Work
- Daily 5 Math
- Centers/ stations

Accommodations

Accommodations and Modification Addendum

Assessments

Formative	Summative
• Independent student work • Ready Classroom Lesson Quizzes • Teacher Observations • Class Participation • Class Discussions • Class Assignments • Homework Assignments • Notebooks • Anecdotal Records	• Mid-Unit Test • Unit Test
Benchmark	**Alternative**
• I-Ready Diagnostic • Performance Assessments	• Live Online Assessment Tools (Kahoot, Brainpop) • Student Projects • Student Presentations • Self-Assessments

Resources

Required/Primary	Supplemental
• *Big Ideas Math 7 and 8* textbook (Ron Larson and Laurie Boswell; published by Big Ideas Learning) • Associated *Big Ideas Record and Practice Journal*	• Brain Pop • IXL • Reflex Math • Online Tutorials (Learnzillion, Khan Academy, Math Antics) • Online Math Games (Math is Fun, Funbrain, Cool Math Games, Math Playground) • Illustrative Mathematics (www.illustratviemathematics.org) • Explore Learning Gizmos • Estimation 180

Essential Questions And Content

Rational Numbers

- How are the properties of operations used to perform operations on rational numbers?
- How can the properties of integer exponents be used to generate equivalent numerical expressions?
- How are the four operations with rational numbers used to solve real-world and mathematical problems?

Proportional Relationships

- How can rates be used to describe real-world problems?
- How can proportional reasoning be used to solve real-world problems?
- How can a unit rate or constant of proportionality be identified in a table, graph, or equation?

Linear Relationships

- How can the properties of operations be used to simplify linear expressions?
- How are the coordinates of a point on a line or in a table related to the equation of the line?
- How can equations with variables on both sides be solved?
- What are the characteristics of a linear equation, and how is a linear equation graph constructed using a table of values or li equations?

Statistics and Probability

- Why is data collected, and how do I work with and represent data in meaningful ways?
- How can the slope and intercept be interpreted in the equation of a linear model to solve problems in the context of bivariate measurement data?
- How can the experimental probability of a chance event be determined?
- How can a probability model be developed and used to find probabilities of events?
- What are possible sources of discrepancy when comparing probabilities from a model to observed frequencies if the agreem not good?
- How can organized lists, tables, tree diagrams, and simulations be used to find probabilities of compound events?

Geometry

- What are the properties and relationships of angles when they are found in polygons, adjacent to each other, formed by inte lines, or created by transversals?
- What formulas can I use to solve real-world problems involving shapes, area, and volume?
- Can I use ratio and proportion concepts to change the scale of a drawing?
- How can I create shapes with specific criteria?
- How do I use the many special properties of triangles to describe them?
- Why are roots and irrational numbers important to geometry?
- How can the Pythagorean Theorem be used to solve real-world and mathematical problems in two and three dimensions?

Pacing and Interdisciplinary Connections

Unit 1 Rational Numbers

Integers and Rational Numbers (4 weeks)

1. Extending the Number System
2. Adding and Subtracting Integers
3. Multiplying and Dividing Integers
4. Properties of Operations
5. Properties of Integer Exponents
6. Scientific Notation and Operations
7. Adding and Subtracting Rational Numbers
8. Multiplying and Dividing Rational Numbers
9. Terminating and Repeating Decimals
10. Problem Solving with Rational Numbers

Interdisciplinary Connections

W.NW.7.3 Write narratives to develop real or imagined experiences or events using effective techniques, relevant descriptive details, and well-structured event sequences.

Activity: Students will write a story using all for operations of rational numbers.

Unit 2 Proportional Reasoning

Ratios and Proportions (4 weeks)

1. Ratios and Proportions
2. Rates and Unit Rates

3. Comparing and Scaling Rates
4. Writing and Solving Proportions
5. Unit Rate and Constant of Proportionality
6. Graphing Proportional Relationships

Percent (3 weeks)

1. The Percent Proportion
2. The Percent Equation
3. Percent of Increase and Decrease
4. Discounts and Tax
5. Markups and Markdowns
6. Gratuities and Commissions
7. Simple Interest
8. Percent Error

Interdisciplinary Connections:

English Language Arts

RL.IT.7.3 Analyze how particular elements of text interact including how a text makes connections and distinctions among individuals, events, and ideas.

Activity: Students will read an excerpt from *Gulliver's Travels* and use information from the story to create a graph between two quantities that vary directly.

Science

MS-PS4-2-Develop and use a model to describe that waves are reflected, absorbed, or transmitted through various materials.

Activity: Students will compare the amount of UV rays reflected by various surfaces.

Unit 3 Linear Relationships

Walking Rates (1 week)

1. Finding and Using Rates
2. Tables, Graphs, and Equations
3. Linear Patterns of Change
4. Recognizing Linear Relationships

Exploring Linear Relationships with Graphs and Tables (1 week)

1. Finding the Point of Intersection
2. Using Tables, Graphs, and Equations
3. Comparing Relationships
4. Connecting Tables, Graphs, and Equations

Expressions and Equations (3 weeks)

1. Simplifying Linear Expressions
2. Adding and Subtracting Linear Expressions
3. Factoring and Expanding Linear Expressions
4. Solving Equations Using Tables and Graphs
5. Exploring Equality
6. Writing Equations
7. Solving Linear Equations

Interdisciplinary Connections:

NJSLS Science

MS-ESS2-5-Collect data to provide evidence for how the motions and complex interactions of air masses result in changing weather conditions.

Activity: Students will watch a STEM video on hurricanes and graph linear equations of wind speed of storms in the Gulf of Mexico and determine when storms become tropical storms or hurricanes.

Inequalities (1 week)

1. Writing and Graphing Inequalities
2. Solving Inequalities Using Addition or Subtraction

3. Solving Inequalities Using Multiplication or Division
4. Solving Two-Step Inequalities

Interdisciplinary Connections:

NJSLS English Language Arts

W.IW.7.2-Write informative/explanatory texts to examine a topic and convey ideas, concepts, and information through the selection, organization, and analysis of relevant content.

Activity: Students will write a lesson on simplifying an algebraic expression.

NJSLS Science

MS-LS2-2- Construct an explanation that predicts patterns of interactions among organisms across multiple ecosystems.

Activity: Students will write inequalities comparing the pounds of fish a killer whale eats in captivity versus its normal ecosystem.

Exploring Slope (2 weeks)

1. Using Rise and Run
2. Finding the Slope of a Line
3. Similar Triangles
4. Exploring Patterns With Lines (parallel and perpendicular)
5. Comparing Linear Relationships Represented in Different Ways

Graphing (1 week)

1. Graphing Linear Equations
2. Graphing Proportional Relationships
3. Slope-Intercept Form

Unit 4 Statistics and Probability

Samples and Populations (2 weeks)

1. Representative Samples
2. Random Samples
3. Comparing Populations
4. Making Predictions
5. Measures of Center and Measures of Variability

Interdisciplinary Connections:

NJSLS Science

MS-LS3-2 Develop and use a model to describe why asexual reproduction results in offspring with identical genetic information and sexual reproduction results in offspring with genetic variation.

Activity: Students will create punnett squares and find probabilities of various gene combinations.

Bivariate Data (1 week)

1. Scatter plots
2. Patterns of Association including clustering and outliers
3. Line of Best Fit
4. Using Linear Models to Solve Problems

Interdisciplinary Connections:

NJSLS Science

MS-ESS3-3-Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.

Activity: Students will analyze, interpret, and choose the best method to display roadkill data and then come up with ways to reduce the number of animals killed by vehicles.

NJSLS Language Arts

W.WR.7.5 Conduct short research projects to answer a question, drawing on several sources and generating additional related, focused questions for further research and investigation.

Activity: Students will use the internet to write a report about an animal species that is endangered and include graphical displays of the data.

Probability (4 weeks)

1. Experimental Probabilities
2. Equally Likely Events
3. Theoretical Probabilities
4. Probability Models
5. Sample Space
6. Tree Diagrams
7. Compound Events
8. Making Predictions
9. Designing and Using a Simulation
10. Expected Value
11. Independent and Dependent Events

Unit 5 Geometry

Angle Measure, Constructions and Scale Drawings (2 weeks)

1. Adjacent and Vertical Angles
2. Complementary and Supplementary Angles
3. Parallel Lines and Transversals
4. Angles of Triangles
5. Angles of Polygons
6. Constructing Triangles
7. Scale Drawings

***Interdisciplinary Connections*:**

NJSLS English Language Arts

SL.II.7.2 Analyze the main ideas and supporting details presented in diverse media and formats (e.g., visually, quantitatively, orally) and explain how the ideas clarify a topic, text, or issue under study.

Activity: Students will listen to *Sir Cumference and the First Round Table* by Cindy Neuschwander and explain how the main ideas and supporting details in the story clarify their understanding of pi.

Area, Surface Area, and Volume (4 weeks)

1. Circumference of Circles
2. Areas of Circles
3. Areas of Composite Figures
4. Surface Area of Prisms
5. Surface Area of Pyramids
6. Surface Area of Cylinders
7. Volume of Prisms
8. Volume of Pyramids
9. Volume of Cylinders
10. Volume of Cones
11. Volume of Spheres
12. Solve Problems Involving Area, Surface Area, and Volume

Interdisciplinary Connections:

NJSLS Science

MS-ESS3-5-Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.

Activity: Students will research camouflage packaging and explore the environmental effects in terms of resources, production, and shipping. Students will calculate packaging waste on selected products and design alternative packaging.

Transformations (1 week)

1. Congruent Figures
2. Translations
3. Reflections
4. Rotations
5. Similar Figures
6. Dilations

The Pythagorean Theorem (2 weeks)

1. Finding Square Roots
2. The Pythagorean Theorem
3. Approximating Square Roots
4. Using the Pythagorean Theorem

Interdisciplinary Connections:

NJSLS Language Arts

SL.PE.7.1-Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 8 topics, texts, and issues, building on other's ideas and expressing their own clearly.

Activity: Students will analyze the converses of statements, provide examples and counterexamples, and explore the converse of the Pythagorean Theorem with a partner or small group.

Career, Computer Science, and Key Skills

The Number System

- **Career Ready Practices**
  - Communicate clearly and effectively and with reason.
    Utilize critical thinking to make sense of problems and persevere in solving them.
    Activity: Students will utilize the Standards for Mathematical Practices to explore the rates at which objects fall and apply the given formula. Students will then conduct an experiment to see if basketballs fall at the rate they calculated.

- **9.2 Career Awareness, Exploration, and Preparation**
  - **9.2.8.B.3** Evaluate communication, collaboration, and leadership skills that can be developed through school, home, work, and extracurricular activities for use in a career.
    Activity: Students will discover how periscopes are used in the military and will calculate the visibility distances in nautical miles based on various periscope heights.
- **9.4 Life Literacies and Key Skills**
  - **9.4.8.TL.2:** Gather data and digitally represent information to communicate a real-world problem
  - **9.4.8.DC.8**: Explain how communities use data and technology to develop measures to respond to the effects of climate change (e.g., smart cities)
  - **9.4.8.IML.9**: Distinguish between ethical and unethical uses of information and media.
  - **9.4.8.TL.6**: Collaborate to develop and publish work that provides perspectives on a real-world problem.
    Activity: Students will research and create a digital chart of the high and low temperatures in their town for each month of the year; including the range of temperatures. Students will compare the temperatures to the historical data.
- **Computer Science**
  - **8.1.8.A.4.** Graph and calculate data within a spreadsheet and present a summary of the results.
    Activity: Students will approximate irrational numbers by reviewing fractions and decimals and will present this data in a spreadsheet.

Expressions and Equations

- **Career Ready Practices**
  - Apply appropriate academic and technical skills
    Communicate clearly and effectively and with reason.
    Utilize critical thinking to make sense of problems and persevere in solving them.
    Work productively in teams while using cultural global competence.
    Activity: Students will utilize the Standards for Mathematical Practices to graph linear equations in standard form through real-life situations and will communicate and explain their reasoning.

- **9.2 Career Awareness, Exploration, and Preparation**
  - **9.2.8.B.3** Evaluate communication, collaboration, and leadership skills that can be developed through school, home, work, and extracurricular activities for use in a career.
    Activity: Students will write and graph linear equations to calculate when an online business will become profitable through ad clicks.

- **9.4 Life Literacies and Key Skills**

9.4.8.TL.2: Gather data and digitally represent information to communicate a real-world problem
9.4.8.TL.1: Construct a spreadsheet in order to analyze multiple data sets, identify relationships, and facilitate data-based decision-making.
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).
9.4.8.DC.6: Analyze online information to distinguish whether it is helpful or harmful to reputation.
Activity: Students gather data about the real-world cost of three different styles of floor tiles, write equations modeling the costs, make comparisons, and share their findings digitally.

- **Computer Science**
  - **8.1.8.A.1.** Demonstrate knowledge of a real-world problem using digital tools.
    Activity: Students will use graphing calculators to write and graph linear equations in real-world situations.

Functions

- **Career Ready Practices**
  - Apply appropriate academic and technical skills
    Communicate clearly and effectively and with reason.
    Utilize critical thinking to make sense of problems and persevere in solving them.
    Activity: Students will utilize the Standards for Mathematical Practices to analyze graphs of real-life situations and will communicate and explain their reasoning.

- **9.2 Career Awareness, Exploration, and Preparation**
  - **9.2.8.B.1** Research careers within the 16 Career Clusters and determine attributes of career success.
    Activity: Students will write and graph linear functions comparing the salaries of different types of employees as well as the impact of education levels on earnings.

- **9.4 Life Literacies and Key Skills**
  - **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.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.
    Activity: Students will analyze the relationship between two quantities using graphs and will sketch graphs to represent the relationship between two quantities.

- **Computer Science**
  - **8.1.8.E.1.** Effectively use a variety of search tools and filters in professional public databases to find information to solve a real-world problem.
    Activity: Students will make a mapping diagram and graph of scuba diving depths and pressures. Students will then use search engines to research common depths of experienced versus novice divers, as well as popular locations and associated costs.

Geometry

- **Career Ready Practices**
  - Communicate clearly and effectively and with reason**.**
    Demonstrate creativity and innovation
    Utilize critical thinking to make sense of problems and persevere in solving them.
    Use technology to enhance productivity.
    Work productively in teams while using cultural global competence.
    Activity: Students will work collaboratively with a partner/small group to use geometry software, protractors, and indirect measurement to determine whether triangles are similar.

- **9.2 Career Awareness, Exploration, and Preparation**
  - **9.2.8.B.3** Evaluate communication, collaboration, and leadership skills that can be developed through school, home, work, and extracurricular activities for use in a career.

Activity: Students will work with a partner and make a table of the relationship between an original figure and its image under four types of transformations. Students will explore how enlarging/reducing figures in a technical drawing is important in a career such as drafting.

- **9.4 Life Literacies and Key Skills**
  - **9.4.8.TL.2:** Gather data and digitally represent information to communicate a real-world problem
    Activity: Students will use geometry software to draw triangles with two given angle measures.

- **Computer Science**
  - **8.1.8.A.3** Use and/or develop a simulation that provides an environment to solve a real-world problem or theory.
    Activity: Students will use geometry software to draw parallel lines intersected by a transversal to explore angle measures and will use that knowledge to solve problems involving the construction of buildings.

Statistics and Probability

- **Career Ready Practices**
  - **CRP4.** Communicate clearly and effectively and with reason.
    CRP6. Demonstrate creativity and innovation.
    CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
    Activity: Students will work with a partner/small group to read, make, and interpret two-way tables and use data from the tables to make purchasing decisions.

- **9.2 Career Awareness, Exploration, and Preparation**
  - **9.2.8.B.3** Evaluate communication, collaboration, and leadership skills that can be developed through school, home, work, and extracurricular activities for use in a career.
    Activity: Students will work with a partner/small group to find lines of best fit and use lines of fit to solve problems about biologists studying wildlife populations.

- **9.4 Life Literacies and Key Skills**
  - **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.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.TL.1:** Construct a spreadsheet in order to analyze multiple data sets, identify relationships, and facilitate data-based decision-making.
    Activity: Students will find the number of possible outcomes of one or more events using password security.

- **Computer Science**
  - **8.1.8.F.1** Explore a local issue, by using digital tools to collect and analyze data to identify a solution and make an informed decision.
    Activity: Students will review data relating to absences and final grades in courses. Students will collect data digitally and then discuss solutions and reasons why attendance may or may not relate to final grades.