Branchburg Township Public Schools

Office of Curriculum and Instruction

Pre-Algebra 6 Math Curriculum

Adopted by the Board of Education October 2022

This curriculum is aligned with the 2016 New Jersey Student Learning Standards in Mathematics

Curriculum Scope and Sequence			
Content Area	**Mathematics**	**Course Title/Grade Level:**	**Pre-Algebra 6**

Topic/Unit Name		Suggested Pacing (Days/Weeks)
Topic/Unit #1	Real Numbers	9 - 10 weeks
Topic/Unit #2	Proportional Relationships	5 - 6 weeks
Topic/Unit #3	Algebraic Expressions, Equations, and Functions	14 - 15 weeks
Topic/Unit #4	Creating, Comparing, and Analyzing Geometric Figures	6 - 7 weeks
Topic/Unit #5	Data Analysis	2 - 3 weeks

Topic/Unit 1 Title	Real Numbers Module 3: Operations with Integers, Module 5: Real Numbers, and Chapter 5: Integers and Graphing (Glencoe)	Approximate Pacing	9 - 10 weeks

STANDARDS

NJSLS (Mathematics)

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.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, New Jersey Student Learning Standards for Mathematics 6 then –(p/q) = (–p)/q = 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.

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 $\sqrt2$, show that $\sqrt2$ is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations.

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.

Standards for Mathematical Practice
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.
6- Attend to Precision
7- Look for and make use of structure.
8- Look for and express regularity in repeated reasoning.

Interdisciplinary Connections:

SL.6.1. B: Follow rules for collegial discussions, set specific goals and deadlines, and define individual roles as needed.
(Students work together to set a schedule for completing the tasks in the shopping project. Each student is assigned individual roles to complete. Students work collegially to get the project done, taking their partner/group member's ideas into consideration.)
R.L. 6.4: Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings.
(Students decipher word problems related to fractions, including negative fractions, to determine which operations to apply to solve.)

Computer Science & Design Thinking	Career Readiness, Life Literacies and Key Skills
8.2.8.ED.3: Develop a proposal for a solution to a real-world problem that includes a model (e.g., physical prototype, graphical/technical sketch). *(Students create bar diagrams to represent the division of a fraction by a fraction. Students explain how they chose to set up their bar diagram and why it makes sense.)*	**9.1.8.EG.2:** Explain why various sources of income are taxed differently. **9.1.8.PB.3**: Explain how to create a budget that aligns with financial goals. *(Students calculate sales tax using decimal operations. The class discusses the different sales tax rates in various states and reviews how to convert the percentages into decimals before multiplying.)*

UNIT/TOPIC ESSENTIAL QUESTIONS AND ENDURING OBJECTIVES/UNDERSTANDINGS

-How are operations with rational numbers related to operations with integers?
-How can decimal operations be used in everyday life?
-How can integers and integer operations be used to represent real world situations?
-Why do we classify numbers?

STUDENT LEARNING OBJECTIVES	
Key Knowledge	**Process/Skills/Procedures/Application of Key Knowledge**
Students will know: absolute value, Additive Inverse Property, additive inverses, bar notation, Distributive Property, Multiplicative Identity Property, multiplicative inverse, Multiplicative Property of Zero, opposites, order of operations, rational number, repeating decimal, terminating decimal, counterexample, cube root, inverse operations, irrational number, natural numbers, perfect cube, perfect square, principal square root, radical sign, real number, square root, ordered pair, quadrants, x-axis, x-coordinate, y-axis, y-coordinate, origin, preimage, image, prime notation, reflection	*Students will be able to:* -add, subtract, multiply, and divide integers -find the distance between two integers on a number line -simplify expressions using the order of operations -evaluating algebraic expressions involving integers -writing fractions as decimals -writing repeating decimals as fractions and mixed numbers -add, subtract, multiply, and divide rational numbers -simplify expressions involving rational numbers using the order of operations -evaluating algebraic expressions involving rational numbers -finding square roots and cube roots -identifying real numbers -describing sets of real numbers -estimating irrational numbers -comparing and ordering real numbers -graphing real numbers on a number line -Plot ordered pairs on the coordinate plane (rational numbers) -Reflect ordered pairs over the x-axis or the y-axis. -Calculate absolute value of integers
ASSESSMENT OF LEARNING	
Summative Assessment (Assessment at the end of the learning period)	Chapter quizzes and tests

Formative Assessments (Ongoing assessments during the learning period to inform instruction)	-Chapter pre-test, Ticket-in-the-Door, Ticket-out-the-Door, spot-checking specific homework problems -Online formative assessment websites: www.thatquiz.org, www.kahoot.com , www.quizizz.com, www.edulastic.com, www.edpuzzle.com) -Teacher Observation
Alternative Assessments (Any learning activity or assessment that asks students to *perform* to demonstrate their knowledge, understanding and proficiency)	-Shopping Project: Students redecorate a room of their choice on a budget of $900. Students "shop" for items on store websites, and apply percent skills such as calculating tax, discounts, sale prices, and total cost. Students record their calculations in an "item cost spreadsheet." -Integer Golf: (students in pairs use dice to achieving the goal for each hole up to 18 holes- using all four operations with integers) -Robinson's Family Vacation: Students create/scale a coordinate plane and map the distance traveled on a vacation.
Benchmark Assessments (used to establish baseline achievement data and measure progress towards grade level standards; given 2-3 X per year)	-Fall Math MAP Assessment (used to measure individual student growth over time) -Math reflection sample (used to continually develop students' mathematical reasoning)-"How can you decide if the sum of two numbers is positive, negative, or zero without actually calculating the sum? How can you decide if the difference of two numbers is positive, negative, or zero without actually calculating the difference?"

RESOURCES
Core instructional materials: -Reveal Math: Accelerated Modules 3 and 5 (Operations with Integers and Real Numbers) -ConnectEd Course 1 (McGraw Hill); www.connected.mcgraw-hill.com Chapter 5 (Integers and Graphing)
Supplemental materials: -ConnectEd Course 1 (McGraw Hill); www.connected.mcgraw-hill.com -Explore Learning Gizmos: Adding and Subtracting Integers with Chips, Integers, Opposites, and Absolute Value, Fraction, Decimal, Percent (Area and Grid Models-Activities A-C) -Hands-On Resources: Versatiles, integer chips -Useful websites:www.mathantics.com, www.Khanacademy.com, www.brainpop.com , www.connected.mcgraw-hill.com, www.sheppardsoftware.com, Integer operations Jeopardy **Diversity:** ada, Juan de la Cierva, Curricular Mandates- percentage of US population with a Bachelor's Degree *(graph on page 8)*
Modifications for Learners
See appendix

Topic/Unit 2 Title	Proportional Relationships Module 1: Proportional Relationships and Module 2: Solve Percent Problems	Approximate Pacing	5 - 6 weeks

STANDARDS
NJSLS (Mathematics)

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 common factor."

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 1/2 mile in each 1/4 hour, compute the unit rate as the complex fraction 1/2/1/4 miles per hour, equivalently 2 miles per hour.

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.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."

7.EE.B.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 3/4 inches long in the center of a door that is 27 1/2 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.

Standards for 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.
6 Attend to Precision
7 Look for and make use of structure.
8 Look for and express regularity in repeated reasoning.

Interdisciplinary Connections:

Science Cross-Cutting Concept: Stability and Change
Small changes in one part of a system might cause large changes in another part.
(Students use ratio and rate reasoning to solve real-world problems involving fractional quantities that change in relation to one another.)
RL.6.1: Cite textual evidence and make relevant connections to support analysis of what the text says explicitly as well as inferences drawn from the text.
(When students solve word problems related to proportions, students must extract the relevant details of the text to determine how to approach the problem.)

Computer Science & Design Thinking	Career Readiness, Life Literacies and Key Skills
8.2.8.ITH.1: Explain how the development and use of technology influences economic, political, social, and cultural issues. *(Students learn proper etiquette for using Google classroom and other online platforms for safety and appropriateness.)*	**9.1.8.CP.1**: Compare prices for the same goods or services. *(Students use unit costs involving whole numbers to compare prices of similar products to determine the most ideal purchase based on cost per unit, quality, and quantity of the item.)*

UNIT/TOPIC ESSENTIAL QUESTIONS AND ENDURING OBJECTIVES/UNDERSTANDINGS

-How can using the greatest common factor and least common multiple be used to solve real-world problems?
-How do unit rates help us compare quantities (costs, for example)?
-What does it mean for two quantities to be in a proportional relationship?
-How can percent describe the change of the quantity?

STUDENT LEARNING OBJECTIVES

Key Knowledge	Process/Skills/Procedures/Application of Key Knowledge

Students will know:	Students will be able to:
constant of proportionality, non-proportional, proportional, proportion, proportional reasoning, unit rate, greatest common factor, least common multiple, amount of error, commission, discount, fee, gratuity, interest, markdown, markup, percent error, principal, sales tax, selling price, simple interest, percent of change, percent of decrease, tip, percent of increase, wholesale cost	-computing unit rates involving ratios of fractions -determining whether a relationship is proportional by looking at a table of values -determining whether a relationship is proportional by looking at a graph -finding and interpreting the constant of proportionality -interpreting the points (0, 0) and (1, r) on the graph of a proportional relationship -representing proportional relationships with equations -solving problems involving proportional relationships -finding percent of change -solving problems involving taxes -solving problems involving tips and markups -solving problems involving discounts -solving problems involving interest -solving problems involving commissions and fees -finding percent error

ASSESSMENT OF LEARNING

Summative Assessment (Assessment at the end of the learning period)	Chapter quizzes and Tests
Formative Assessments (Ongoing assessments during the learning period to inform instruction)	-Chapter pre-test, Ticket-in-the-Door, Ticket-out-the-Door, spot-checking specific homework problems -Online formative assessment websites: www.thatquiz.org, www.kahoot.com, www.quizizz.com, www.edulastic.com, www.edpuzzle.com) -Teacher Observation
Alternative Assessments (Any learning activity or assessment that asks students to *perform* to demonstrate their knowledge,	-How Far Is It? Mapping Activity (Students act as local tour guides and design a tour route through four cities in New Jersey. Students use a map scale and solve proportions to find the total distance in miles that their tour route covers. Students also calculate gas mileage and research interesting attractions in each city)

understanding and proficiency)	-Ratios and Rates Choice Board (Students choose from 4 different activities to demonstrate their learning about ratios, rates, and proportional reasoning. Activities highlight different learning styles including written, visual, and artistic)
Benchmark Assessments (used to establish baseline achievement data and measure progress towards grade level standards; given 2-3 X per year)	-Winter Math MAP Assessment (used to measure individual student growth over time) -Mid Year Cumulative Math Assessment (used to assess students' retention of math concepts) -Math reflection sample (a writing sample used to pinpoint students' starting points in explaining mathematical reasoning): "Write a word problem that can be solved using a proportion. Then solve your problem."

RESOURCES

Core instructional materials:
-Reveal Mathematics: Accelerated - Module 1 (Proportional Relationships) and Module 2 (Solve Percent Problems)

Supplemental materials:
-ConnectEd Course 1 (McGraw Hill); www.connected.mcgraw-hill.com
-Explore Learning Gizmos: Factor Trees (Activity C), Beam to Moon, Percents and Proportions (Activities A and B)
-Hands-On Resources: Versatiles, grocery ads to relate to the real world (unit pricing)
-Useful websites:https://www.mathplayground.com/Decention, simplifying fractions, What is a ratio?, www.Khanacademy.com, www.brainpop.com, www.connected.mcgraw-hill.com, www.sheppardsoftware.com

Modifications for Learners

See appendix

Topic/Unit 3 Title	Algebraic Expressions, Equations, and Functions Module 6: Algebraic Expressions, Module 7: Solve Equations, and Chapter 8: Functions and inequalities (Glencoe)	Approximate Pacing	14 - 15 weeks

STANDARDS

NJSLS (Math)

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

7.EE.B.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 3/4 inches long in the center of a door that is 27 1/2 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.

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 fluently. 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.4.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.

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).

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

Standards for Mathematical Practice
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:

Science Cross-Cutting Concept: Patterns
Patterns can be used to identify cause and effect relationships.
(Students write 2-step equations, graph relationships, and create tables using independent and dependent variables.)

Computer Science & Design Thinking	Career Readiness, Life Literacies and Key Skills
8.2.8.ED.2: Identify the steps in the design process that could be used to solve a problem. **8.1.8.AP.2**: Create clearly named variables that represent *(When solving equations, students identify which steps they must take to isolate the variable and solve for the unknown depending on which operations are present in the equation.)*	**9.1.8.PB.6**: Construct a budget to save for short-term, long-term, and charitable goals. *(Students write algebraic expressions and equations to represent real-world situations.)*

UNIT/TOPIC ESSENTIAL QUESTIONS AND ENDURING OBJECTIVES/UNDERSTANDINGS

-How are numerical expressions and algebraic expressions similar and different?
-What does it mean to "solve" an equation?
-Why is it useful to represent real-life situations algebraically?
-How do you represent functions in different ways?
-How are inequalities and equations related?
-How can equations be used to solve everyday problems?

STUDENT LEARNING OBJECTIVES

Key Knowledge	Process/Skills/Procedures/Application of Key Knowledge
Students will know: coefficient, constant, factor, greatest common factor, like terms, numerical expressions, algebraic expressions, factored form, simplest form, Addition Property of Equality, Addition Property of	***Students will be able to:*** -simplifying algebraic expressions by combining like terms -using the Distributive Property to expand linear expressions -adding linear expressions

Inequality, Subtraction Property of Equality, Subtraction Property of Inequality, Multiplication Property of Equality, Multiplication Property of Inequality, Division Property of Equality, Division Property of Inequality, order of operations, inequality, two-step equation, two-step inequality, Associative Property, Commutative Property, evaluate, Distributive Property, Identity property, like terms, substitute (in an equation or inequality), function, input, output, function rule	-subtracting linear expressions -finding the greatest common factors of monomials -factoring linear expressions -simplifying linear expressions -writing and solving two-step equations in the form of $px + q = r$ -writing and solving two-step equations in the form of $p(x + q) = r$ -writing and solving equations with variables on each side -writing and solving multi-step equations-creating and solving equations with infinitely many solutions -creating and solving equations with no solution -graphing inequalities -writing and solving one-step addition and subtraction inequalities -writing and solving one-step multiplication and division inequalities -writing and solving two-step inequalities

ASSESSMENT OF LEARNING

Summative Assessment (Assessment at the end of the learning period)	Chapter quizzes and tests
Formative Assessments (Ongoing assessments during the learning period to inform instruction)	Chapter pre-test, Ticket-in-the-Door, Ticket-out-the-Door, spot-checking specific homework problems -Online formative assessment websites: www.thatquiz.org, www.kahoot.com , www.quizizz.com, www.edulastic.com, www.edpuzzle.com) -Teacher Observation
Alternative Assessments (Any learning activity or assessment that asks students to *perform* to	-Expressions/Equations Choice Project: Students choose from one of six projects to showcase their learning of expressions and equations. Projects range from writing and performing raps, creating video tutorials or skits, and more. Students may use Reveal Math (Modules 6 and 7) or

demonstrate their knowledge, understanding and proficiency)	Connected math (Common Core Additional Investigations-Inv. 2) as a reference tool, in addition to the internet. -Performance Task: Cross Country Tryouts (Students calculate the perimeter of a football field using an algebraic expression and simplify their expression)
Benchmark Assessments (used to establish baseline achievement data and measure progress towards grade level standards; given 2-3 X per year)	-Math reflection sample (used to continually develop students' mathematical reasoning)-

RESOURCES

Core instructional materials:
-Reveal Mathematics: Accelerated Module 6 (Algebraic Expressions) and Module 7 (Solve Equations)
-ConnectEd Course 1 (McGraw Hill); www.connected.mcgraw-hill.com Chapter 8 (Functions and Inequalities)

Supplemental materials:
-ConnectEd Course 1 (McGraw Hill); www.connected.mcgraw-hill.com
-Explore Learning Gizmos: Modeling 1-step equations (#1-5), Modeling and solving 2-step equations, Simplifying Algebraic Expressions I (#1-14) and II, Equivalent Algebraic Expressions I, Solving Linear Inequalities in 1-Variable, Function Machines 3
-Hands-On Resources: Versatiles, algebra tiles, equation balance scale
-Useful websites:www.mathantics.com (Exponents/complete notes sheet), www.Khanacademy.com, www.brainpop.com , www.connected.mcgraw-hill.com, www.sheppardsoftware.com, 2-step equations basketball, Solving multi-step inequalities
Diversity: Equations for Equality

Modifications for Learners

See appendix

Topic/Unit 4 Title	Creating, Comparing, and Analyzing Geometric Figures Module 12 (Area, Surface Area, and Volume), Module 13 (Transformations)	Approximate Pacing	6 - 7 weeks

STANDARDS
NJSLS (Math)

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

8.G.A.1 Verify experimentally the properties of rotations, reflections, and translations:

8.G.A.1.A Lines are transformed to lines, and line segments to line segments of the same length.

8.G.A.1.B Angles are transformed to angles of the same measure.

8.G.A.1.C Parallel lines are transformed to parallel lines

8.G.A.2 Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them.

8.G.A.3 Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.

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

8.G.A.5 Use informal arguments to establish facts about the angle sum and exterior 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.

Standards for Mathematical Practice
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:

W.6.2 D: Use precise language and domain-specific vocabulary to inform about or explain a topic.
(Students explain how nets represent 3-dimensional figures(both prisms and pyramids with varying base shapes) using correct mathematical language and representation. Students must visually represent the concept using precise measurements.)

Computer Science & Design Thinking	Career Readiness, Life Literacies and Key Skills
8.2.8.ED.6: Analyze how trade-offs can impact the design of a product. **8.2.8.ED.7:** Design a product to address a real-world problem and document the iterative design process, including decisions made as a result of specific constraints and trade-offs (e.g., annotated sketches). *[Students sketch triangles given two dimensions (area, base, and/or height). If students use the area formulas incorrectly, they must revisit and revise their work.]*	**9.4.8.TL.6:** Collaborate to develop and publish work that provides perspectives on a real-world problem *[Students work in teams to create nets of three-dimensional figures (rectangular and triangular prisms). They must delegate tasks and communicate how they will approach the task.]*

UNIT/TOPIC ESSENTIAL QUESTIONS AND ENDURING OBJECTIVES/UNDERSTANDINGS

-How does finding the area of a figure differ from finding the surface area of a figure? In what real-world situations would you use area formulas to solve? In what real-world situations would you use surface area formulas to solve?
-How can you solve equations to find missing dimensions in area and volume problems?
-How can we measure objects to solve problems?
-What does it mean to perform a transformation on a figure?

STUDENT LEARNING OBJECTIVES

Key Knowledge	Process/Skills/Procedures/Application of Key Knowledge

Students will know:	Students will be able to:
area, center, circle, circumference, composite figure, composite solid, cone, cylinder, diameter, face, hemisphere, lateral face, pi, prism, pyramid, radius, regular pyramid, volume, surface area, sphere, slant height, semicircle, translation, transformation, similar, reflection, preimage, line of reflection, dilation, composition of transformations, center of rotation, center of dilation, indirect measurement, image, scale factor, rotation	-finding circumferences of circles -using circumference of circles to find missing dimensions -finding area of circles -using circumferences of circles to find area -finding areas of composite figures -finding volumes of prisms and pyramids -using volumes of prisms and pyramids to find missing dimensions -finding surface areas of prisms and pyramids -finding volumes cylinders -finding volumes of cones -finding volumes of spheres and hemispheres -finding volumes and surface areas of composite solids -translating, reflecting, rotating, dilating figures on the coordinate plane -using coordinate notation to describe translations, reflections, rotations, and dilations -determining whether figures are congruent -identifying which sequence of transformations maps one figure onto a congruent figure -determining whether figures are similar -identifying which sequence of transformations maps one figure onto a similar figure -solving problems using direct measurement

ASSESSMENT OF LEARNING	
Summative Assessment (Assessment at the end of the learning period)	Chapter quizzes and tests

Formative Assessments (Ongoing assessments during the learning period to inform instruction)	-Chapter pre-test, Ticket-in-the-Door, Ticket-out-the-Door, spot-checking specific homework problems -Online formative assessment websites: www.thatquiz.org, www.kahoot.com, www.quizizz.com, www.edulastic.com, www.edpuzzle.com) -Would You Rather (Perimeter of a bedroom)- independently, then share with a partner -Teacher Observation
Alternative Assessments (Any learning activity or assessment that asks students to *perform* to demonstrate their knowledge, understanding and proficiency)	Moving Time Activity: Students determine the amount of boxes that can fit in a moving truck (volume) based on given dimensions. Additionally, students calculate the amount of paper needed to cover certain boxes (surface area). -Composite Figures Activity: Students find the area of 8 composite figures (including those with circular portions) and show how they deconstructed each figure. -Measuring Circles: Students measure multiple circles around the classroom to understand how the diameter of a circle relates to pi -Area of Circles: Students use cut outs of circles to derive the formula to calculate the area of a circle.
Benchmark Assessments (used to establish baseline achievement data and measure progress towards grade level standards; given 2-3 X per year)	-End of Year Cumulative Math Assessment (used to assess students' retention of math concepts) -Math reflection (used to continually develop students' mathematical reasoning)

RESOURCES
Core instructional materials: -Reveal Mathematics:Accelerated Module 12 (Area, Surface Area, and Volume) and Module 13 (Transformations)
Supplemental materials: -Explore Learning Gizmos: Circumference and Area of Circles, Volume of Prisms and Cylinders, Pyramids and Cones, Surface and Lateral Area of Pyramids and Cones, Surface and Lateral Areas of Prisms -Hands-On Resources: Versatiles, 3-dimensional models with foldable nets -Useful websites:www.mathantics.com, www.Khanacademy.com, www.brainpop.com , www.connected.mcgraw-hill.com, www.sheppardsoftware.com **Diversity:** Equations for Equality

Using the LGBTQ++ flag to find the area of composite figures
Modifications for Learners
See [appendix](#)

Topic Unit 5 Title	Data Analysis Chapter 11: Statistical Measures and Chapter 12: Statistical Displays (Glencoe)	Approximate Pacing	2 - 3 weeks

STANDARDS
NJSLS (Math)

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

6.SP.B.5.A: Report the number of observations.

6.SP.B.5.B: Describe the nature of the attribute under investigation, including how it was measured and its units of measurement.

6.SP.B.5.C: Give 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: Relate the choice of measures of center and variability to the shape of the data distribution and the context in which the data were gathered.

7.SP.A.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.

7.SP.A.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.

7.SP.B.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.

7.SP.B.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.

Standards for Mathematical Practice
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.
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:

Science and Engineering Practice: Analyzing and Interpreting Data
Analyze and interpret data to provide evidence for phenomena.
(Students conduct a "jumping jack" experiment to see how many jumps each classmate can do in a minute. Students analyze the data by creating various statistical displays and interpret their class' findings)

Science and Engineering Practice: Constructing Explanations and Designing Solutions
Construct an explanation that includes qualitative or quantitative relationships between variables that predict phenomena.
(In the Polling: Neighborhood Gizmo, students make inferences about a population from a sample. They explain their answer using the data collected from the simulation).

9.1.8.PB.5: Identify factors that affect one's goals, including peers, culture, location, and past experiences.
9.4.8.IML.4: Ask insightful questions to organize different types of data and create meaningful visualizations.
(Students work in groups to complete a data analysis project. They must delegate tasks and communicate how they will approach the task.)

Computer Science & Design Thinking	Career Readiness, Life Literacies and Key Skills
8.2.8.ED.6: Analyze how trade-offs can impact the design of a product. **8.2.8.ED.7:** Design a product to address a real-world problem	**CRP 6:** Demonstrate creativity and innovation. *(Students create an original statistical question on which to collect their own data. Students decide the best way to collect*

and document the iterative design process, including decisions made as a result of specific constraints and trade-offs (e.g., annotated sketches). *(Students develop a real-world, statistical question and poll a specific amount of people to summarize responses in a report).*	*their data and how to represent their data using a variety of graphical representations.* **CRP 4:** Communicate effectively and with reason. *(Students share the results of their data project with their classmates in a timed "inner circle/outer circle" activity. Students must clearly and concisely communicate the most important information in an understandable way to their classmates)*

UNIT/TOPIC ESSENTIAL QUESTIONS AND ENDURING OBJECTIVES/UNDERSTANDINGS

-Why is it important to choose the appropriate display for a set of data?
-How do you determine which measure of center best describes a given data set?
-What do measures of variation (range, interquartile range, mean absolute deviation) tell you about a data set?
-How can data from a small sample help you make predictions about a larger population?

STUDENT LEARNING OBJECTIVES

Key Knowledge	Process/Skills/Procedures/Application of Key Knowledge
Students will know: average, first quartile, third quartile, interquartile range, mean*,* mean absolute deviation, measure of center, measures of variation, median,mode, outliers, quartiles, range, statistical question, box plot, cluster, distribution, dot plot, frequency distribution, histogram, line graph, line plot, sample, population	*Students will be able to:* -Calculate various measures of center (mean, median, mode) and variation(range, interquartile range) -Identify which measurement of central tendency best represents a data set -Write and recognize a statistical question -Calculate the Interquartile range and explain what it tells about the variation of the data. -Describe the difference between measures of center and measures of variation. -Calculate the mean absolute deviation of a data set and explain what it tells about the variation of the data -Explain how an outlier affects the mean, median, and mode of a data set

	-Explain how the information you can learn from a box plot is different from what you can learn from the same set of data shown in a line plot -Explain why the choice of measure of center and spread vary based on the type of data display -Construct and analyze line plots, histograms, and box and whisker plots -Explain how to make inferences about a population based on data from a sample

ASSESSMENT OF LEARNING	
Summative Assessment (Assessment at the end of the learning period)	-Chapter quizzes and tests -End of Year Cumulative Math Assessment (used to assess students' retention of math concepts)
Formative Assessments (Ongoing assessments during the learning period to inform instruction)	-Chapter pre-test, Ticket-in-the-Door, Ticket-out-the-Door, spot-checking specific homework problems -Online formative assessment websites: www.thatquiz.org, www.kahoot.com , www.quizizz.com, www.edulastic.com, www.edpuzzle.com) -Teacher Observation
Alternative Assessments (Any learning activity or assessment that asks students to *perform* to demonstrate their knowledge, understanding and proficiency)	-Data Project: Students collect data to answer a statistical question they come up with. Then, students display their results in a variety of graphical representations (box and whisker plot, histogram, line plot) and analyze their data using mean absolute deviation. -Statistics Escape room: Students apply problem-solving skills to find the mean, median, mode and range. Students work to solve each level to find the ultimate code to the escape room. -"Movie Mogul" 21st century math project: Students analyze movie statistics, calculate measures of center and variation, and compare/analyze 2 or more sets of data.
Benchmark Assessments (used to establish baseline achievement data and measure progress towards grade level standards; given 2-3 X per year)	-Spring Math MAP Assessment (used to measure individual student growth over time)

RESOURCES	

Core instructional materials:
-ConnectEd Course 1 (McGraw Hill); www.connected.mcgraw-hill.com Chapter 11 (Statistical Measures), Chapter 12 (Statistical Displays)

Supplemental materials:
-Reveal Mathematics: Module 10 (Sampling and Statistics)
-Explore Learning Gizmos: Reaction Time I and II, Polling: Neighborhood, Polling: City, Spin the Big Wheel (Probability)
-Hands-On Resources: Versatiles
-Useful websites: www.meta-chart.com, www.mathantics.com, www.Khanacademy.com, www.brainpop.com(statistics), www.connected.mcgraw-hill.com, www.sheppardsoftware.com, histogram tutorial, Online Box Plot Maker
-**Diversity** - Holocaust - using information to make histograms and analyze the data

Modifications for Learners
See appendix