Great Meadows Regional School District
Mathematics
Grade 7

CURRICULUM GUIDE
Approved
August 22, 2017

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This curriculum may be modified through varying techniques,
strategies and materials, as per an individual student's
Individualized Education Plan (IEP).

Approved by the Great Meadows Board of Education
At the regular meeting held on August 22, 2017

And
Aligned with the New Jersey Student Learning Standards

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Philosophy and Rationale

New Jersey Student Learning Standards for Mathematics set the framework for a coherent mathematics curriculum across the grade levels. Students best acquire mathematical skills when they are engaged in activities that enable them to discover, understand and apply mathematical concepts. When students are challenged to use mathematics in meaningful ways, they develop their reasoning and problem solving skills and come to realize the usefulness of mathematics in their lives.

Learning mathematics is not dependent on special abilities but can be achieved by all students. Differentiating instruction, flexible grouping, cooperative learning, individualized and whole class instruction are some strategies that will help students achieve high level expectations. A positive attitude towards mathematics is one of the keys to success. When taught in a supportive, developmentally appropriate environment where decision making, risk taking, self-assessment and self-confidence are encouraged students will thrive.

Preparing students for 21st century careers in our information-based society must involve solving real-world problems, reasoning effectively and making logical connections. Students are encouraged to develop the critical thinking skills required to persevere through a tiered problem solving challenge. This, incorporated with a strong foundation in mathematical operations and number sense, will enable students to produce convincing oral and written mathematical arguments. Infusing technology supports visualization, organization and analysis of data so that students are better able to focus on the "Whys" and "Hows" of mathematical learning.

Through rich and varied educational experiences, students are encouraged to think critically and collaborate with peers; to use mathematics and 21st century skills for effective college and career readiness. Successful completion of this course will prepare students to become contributing members of a global society.

Mission Statement

The Great Meadows Regional School District will provide quality educational opportunities that ensure the individual success of all students within a safe and supportive environment and to build lifelong learners who will meet society's challenges into and beyond the 21st century. To that end, it is anticipated that all students will achieve the New Jersey Student Learning Standards at all grade levels.

Scope and Sequence

Unit 1: The Number System – 35 Days
- Apply and extend previous understanding of integers and absolute value.
- Recognize and use the relationship between a number and its opposite (additive inverse) to solve problems.
- Add subtract, multiply and divide integers.
- Develop and use different models (horizontal and vertical number lines, chip model) for representing addition, subtraction, multiplication and division of integers.
- Use and justify rules for addition, subtraction, multiplication and division of integers.
- Evaluate expressions using integers and absolute value.
- Apply and extend previous understanding of rational numbers.
- Compare and order positive and negative rational numbers (integers, fractions, decimals and zero) and locate them on a number line (horizontal and vertical)
- Add, subtract multiply and divide rational numbers.
- Convert rational numbers to decimals using long division and develop an understanding of terminating, repeating and non-terminating decimals.
- Develop and use horizontal and vertical number line diagrams to represent addition, subtraction, multiplication and division of rational numbers.
- Apply properties of operations as strategies to perform operations with rational numbers.
- Evaluate expressions using rational numbers.
- Solve real-world and mathematical problems involving the four operations with rational numbers.
- Interpret and write mathematical sentences to show relationships and solve problems.
- Interpret sums, differences, products and quotients of rational numbers by describing real-world contexts.

Unit 2: Expressions, Equations and Inequalities – 35 Days
- Apply properties of operations to simplify algebraic expressions.
- Add, subtract, factor and expand linear expressions with rational coefficients.
- Understand that rewriting expressions in different forms can show how the quantities are related.
- Write, graph and solve one-step equations (includes negative numbers).
- Solve two-step equations.
- Compare algebraic solutions to arithmetic solutions.
- Write and graph inequalities.
- Solve one-step inequalities involving integers and rational numbers and graph their solutions.
- Solve multi-step inequalities and graph their solutions.
- Solve real-world and mathematical problems using numerical and algebraic expressions, equations and inequalities.
- Use variables to represent quantities in real-world or mathematical problems and

construct simple equations and inequalities to solve problems.
- Interpret solutions of equations and inequalities by describing real-world contexts.

Unit 3: Rates, Ratios, Proportional Relationships and Percents – 35 Days
- Apply and extend previous understanding of ratios, rates and unit rate.
- Find unit rates associated with ratios of fractions, areas and other quantities in like or different units.
- Compute and interpret unit rates of various quantities involving ratios of fractions that contain like and different units.
- Use equivalent ratios and the Cross Products Property to determine whether two ratios form a proportion.
- Apply and extend previous understanding of graphing ordered pairs in all four quadrants of the coordinate plane.
- Decide whether two quantities are proportional using ratio tables and graphs.
- Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams and verbal descriptions.
- Interpret graphs of proportional relationships.
- Represent proportional relationships with equations.
- Explain what a point (x,y) means on a proportional graph in context, particularly (0,0) and (1,r) where r is the unit rate.
- Relate the unit rate and constant of proportionality to an equation, graph or table describing a proportional situation.
- Analyze proportional relationships and use them to solve real-world problems.
- Find the slope of a straight line on a graph as the ratio of vertical change to horizontal change and interpret the slopes of lines as rates.
- Identify direct variation from graphs or equations and solve real-world problems.
- Convert decimals to percents and percents to decimals.
- Compare and order fractions, decimals and percents.
- Use proportionality to solve percent problems.
- Use the percent proportion and equation to solve real-world problems.
- Solve multi-step percent problems involving percents of increase and decrease, simple interest, tax, markups and discounts, gratuities and commissions, fees and percent of error.
- Interpret solutions by describing real-world context.

Unit 4: Two-Dimensional Geometry – 29 Days
- Identify angle relationships as supplementary, complementary, vertical and adjacent angles and use those angle relationships to find the unknown angle measure.
- Draw, construct and measure vertical, adjacent, complementary and supplementary angles (with technology, with ruler and protractor, as well as freehand) geometric shapes with given conditions.
- Use facts about supplementary, complementary, vertical and adjacent angles to write and solve simple equations.
- Solve multi-step mathematical problems by writing and solving simple algebraic

equations based on the relationships between the properties of angles (supplementary, complementary, vertical and adjacent).
- Apply and extend their understanding of how to classify triangles and quadrilaterals and the attributes and properties they possess.
- Draw (with technology, with ruler and protractor, as well as freehand) geometric shapes with given conditions, focusing on triangles and quadrilaterals.
- Calculate the missing angle measure in triangles and quadrilaterals by constructing and solving an equations for the unknown value.
- Find the scale factor.
- Solve problems involving scale drawings of geometric figures, including actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.
- Know the formulas for the area and circumference of a circle and use them to solve problems.
- Understand the concept of Pi.
- Understand the characteristics of basic geometric shapes and how those properties can be used to find the perimeters and areas of composite figures.

Unit 5: Three-Dimensional Geometry – 20 Days
- Calculate the surface areas of rectangular and triangular prisms, pyramids, cylinders and composite solids using models, nets and formulas.
- Calculate the volumes of prisms, pyramids, and composite solids using models, nets and formulas.
- Solve real-world problems involving surface areas and volumes of objects composed of prisms, pyramids and cylinders.
- Analyze three dimensional shapes (pyramids and prisms) by examining and describing all of the 2-dimensional figures that result from slicing it at various angles.

Unit 6: Statistics and Probability – 20 Days
- Distinguish between representative and non-representative samples of a population.
- Apply statistics to gain information about a population from a sample of the population.
- Generalize that random sampling tends to produce representative samples and support valid inferences.
- Use random sampling to produce a representative sample.
- Develop inferences about a population using data from a random sample and assess the variation in estimates after generating multiple samples of the same size.
- Identify and calculate the measures of central tendency (mean, median and mode) in data distribution.
- Draw comparative inferences about populations using their measures of central tendency (mean, median and mode) in data distribution.
- Identify and calculate the measures of variation including upper quartile, lower quartile, upper extreme-maximum, lower extreme-minimum, range, interquartile

range and mean absolute deviation of two distributions that have similar variability (i.e. box and whisker plots, dot plots, stem and leaf plots).
- Compare and draw inferences about the two populations using their measures of variation including upper quartile, lower quartile, upper extreme-maximum, lower extreme-minimum, range, interquartile range and mean absolute deviation of two distributions that have similar variability (i.e. box and whisker plots, dot plots, stem and leaf plots).
- Understand that probability is the likelihood of an event occurring, expressed as a number from 0 to 1 and find the probabilities of events.
- Compare experimental and theoretical probabilities use them to make predictions and to find quantities.
- Predict the relative frequency (experimental probability) of an event based on the theoretical probability.
- Discuss and develop an understanding of experimental probability, theoretical probability and relative frequency.
- Explore and develop probability models to determine the probabilities of the events. Analyze the models and justify why it is uniform or explain the discrepancy if it is not.
- Find probabilities of compound events by using organized lists, tables, tree diagrams and analyze the outcomes.
- Design and use a simulation to generate frequencies for compound events.

Unit 1: The Number System

Topics: Absolute Value, Integers and Rational Numbers

Stage 1: Desired Results

Content Standards

7.NS.A.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.
  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.

7.NS.A.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 division is not zero, and every quotient of integers (with non-zero divisor) is a rational number. If p 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.

7.NS.A.3 Solve real-world and mathematical problems involving the four operations with rational numbers.

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.

Essential Questions

- How can you use integers to represent the velocity and the speed of an object?
- How are rational numbers used in our world?

Enduring Understandings

- Absolute value is the measure of the distance from any rational or irrational number to zero on the number line.
- Every mathematical operation has an inverse.
- Rational numbers can be compared, ordered and located on a number line. They can also be used to indicate a distance or difference between points on a number line. Number lines are useful models for solving problems with rational numbers.
- Rational numbers can be written as fractions with integers as the numerator and the denominator (excluding zero in the denominator). They can also be written as decimals that either terminate or repeat. Rational numbers can take different forms.
- Properties of operations (such as Order of Operations, Commutative Property and Distributive Property) extend to all rational numbers and understanding these

properties is helpful in solving problems.
- Mathematical sentences, with or without variables, can model real-world problems. Sometimes rewriting a problem using a different operation can be helpful in finding the solution.

Knowledge and Skills (SWBAT embedded course proficiencies)
- find the absolute value of an integer
- compare and order absolute values from least to greatest and greatest to least using a number line (horizontal and vertical)
- simplify expressions containing absolute value
- use horizontal and vertical number lines to model the absolute value of two or more rational numbers to determine which has the greatest distance and explain their reasoning
- solve real-world problems using absolute value
- construct a number line (vertical and horizontal) to illustrate the distance between two integers
- relate direction and distance to the number line
- recognize and use the relationship between opposite quantities that when combined form 0 (additive inverse) to solve problems
- explain and give real-world examples of the Additive Inverse Property
- Model addition and subtraction of integer algorithms (same signs and different signs) on a number line (horizontal and vertical) and with integer counters
- describe how the Commutative and Associative Properties of Addition can help find the sum of integers mentally
- apply properties to add and subtract integers
- generate rules for multiplying and dividing integers using counters and number lines
- apply the rules to multiply and divide integers
- simplify expressions containing integers
- apply Order of Operations to expressions with integers
- apply the Distributive Property to simplify expressions and solve problems
- solve real-world and mathematical problems involving integers
- convert rational numbers to decimals using long division
- determine whether decimal is terminating or repeating
- convert rational numbers to fractions
- plot rational numbers on the real number line between two integers to indicate which is larger
- construct a number line to model the absolute value of two rational numbers to determine which has a greater distance
- show that the distance between two rational numbers on the number line is the absolute value of their difference
- compare and order rational numbers from least to greatest and greatest to least using a number line
- apply the rules of the four basic mathematical operations (addition, subtraction, multiplication and division) on rational numbers
- use models and rational numbers to represent and solve problems

- apply Order of Operations to add, subtract, multiply and divide rational numbers
- interpret sums and differences of rational numbers in real-world situations
- solve problems involving rational numbers using number lines and the additive inverse
- identify and apply the commutative, associative and identity properties to simplify rational numbers
- apply the distributive property to multiplying rational numbers
- divide integers and recognize when a quotient is undefined
- write a rational number as a quotient of integers
- simplify complex fractions involving rational numbers
- interpret the products and quotients using real-world contexts
- solve real-world problems involving more than one operation with rational numbers
- apply operations with rational numbers to real-world situations
- interpret and write mathematical sentences to show relationships and solve problems
- solve multi-step real-life problems using rational numbers in any form
- justify solutions to word problems and support reasoning with facts and knowledge
- assess the reasonableness of answers by using estimation skills

Stage 2: Evidence of Understanding, Learning Objectives and Expectations

Benchmarks (embedded student proficiencies) administered quarterly
Assessment Methods (formative, summative, other evidence and/or student self-assessment)

Formative
- Teacher Observation/Anecdotal notes
- Graphic organizers
- Do Now
- Journal writing
- Exit Tickets
- Daily homework
- Group work
- Discussion (large group, small group and partner share)
- Problem of the Week Solutions
- Quizzes

Summative
- Chapter Tests
- Unit Tests
- Short and Extended Constructed Responses
- Technology based Math Assessments
- Individual Student Unit Projects with Rubric
- Benchmark Assessments

Other evidence and/or student self-assessment

- Math Journal reflections
- Journal opened-ended, multiple-step responses
- Self-evaluations with individual whiteboards
- Self-assessment checklists
- Group Projects with self-assessment and group rubrics
- Student generated practice activities
- Student Constructed Assessments (peer evaluations)
- Student Reflection and corrections on Assessments

Stage 3: Learning Plan

Integers provide us with a way to represent situations that involve such concepts as winning/losing, above/below, left/right and positive/negative. In this unit, students read and write integers that correspond to positive and negative situations. However, most of their attention focuses on using and justifying the rules for adding, subtracting, multiplying and dividing integers. This skill building provides the foundation for students to apply integer rules to all rational numbers.

This unit will also focus on developing an understanding of rational numbers and their different forms. Students will express fractions as decimals and decimals as fractions. As with integers, students learn how to add, subtract, multiply and divide fractions and decimals making sure to apply the integer rules to each situation. Students will use their knowledge of integers and rational numbers to solve algebraic expressions and real-world problems.

The activities in this unit will provide students the opportunity to be actively engaged (e.g. manipulatives, Scavenger Hunts, QR code reader activities, Interactive SMARTBoard activities, individual whiteboards, flexible grouping to share ideas and formulate solutions; cross curricular activities and projects; online computer activities as well as supplemental games on the IPads and Chromebooks that can be tracked and monitored). Through the use of multiple learning style activities (visual, auditory, kinesthetic and tactile), students will explore and develop an understanding of the skills and concepts in this unit. Differentiation will be embedded into the unit in the form of graphic organizers, partner work, cooperative learning groups, tiered instruction and tiered stations (centers), peer reviews, choice options, teacher and peer tutoring, and independent study.

Each of the 8 Standards for Mathematical Practice will be embedded in this unit of instruction.
Standards for Mathematical Practice:
MP.1 Make sense of problems and persevere in solving them.
MP.2 Reason abstractly and quantitatively.
MP.3 Construct viable arguments and critique the reasoning of others.
MP.4 Model with mathematics.
MP.5 Use appropriate tools strategically.

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

In this unit, students will engage in the following 21st Century Skills.
Creativity and Innovation
- Compare different ways of approaching traditional mathematical problems
- Find innovative solutions, using practical examples where appropriate
- Listen to and evaluate others' reasoning and offer improvements and corrections with supporting arguments
- Listen to others' feedback and modify solutions as needed
- Learn from mistakes and make repeated attempts at solving problems
- Look for patterns and make generalizations from patterns observed

Critical Thinking and Problem Solving
- Identify and ask significant questions about mathematics and engage in analyzing each other's answers
- Analyze how parts of a whole interact with each other in mathematics
- Make judgments and solve problems in both conventional and innovative ways

Communication and Collaboration
- Articulate mathematical thoughts and ideas using oral and written communication skills
- Analyze others' reasoning and construct viable arguments using reasoning with attention to mathematical fact
- Listen respectfully to the reasoning of others'
- Communicate respectfully in diverse teams articulating mathematical thoughts and ideas effectively

Information, Media and Technology Literacy
- Explore and share with others new areas of mathematics and its applications
- Learn about mathematics from reliable websites and share knowledge with others
- Evaluate information critically and competently
- Use technology as a tool to research, organize, evaluate and communicate information

Life and Career Skills
- Demonstrate the ability to work in pairs and small groups to solve mathematical problems with flexibility, adaptability and respect for others ideas and cultural differences
- Set goals, establish priorities and timelines to complete short-term and long-term project

Integration of Digital Tools
- Google Classroom, Big Ideas Math (online site), various websites and online

resources will be used with the Chromebooks, IPads, Interactive SMARTBoard

Time Allotment
35 days

Resources
Suggested resources will include but are not limited to the following:
- District approved Math textbook and materials series (Big Ideas Math)
- Assessments
- Interactive Websites
- Videos
- Informational Websites
- STEM/STEAM activities
- Teacher collected Resources

Unit 2: Expressions, Equations and Inequalities

Topics: Algebraic Expressions, Linear Expressions, Equations and Inequalities

Stage 1: Desired Results

Content Standards

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 can shed light on the problem and how the quantities in it are related.

7.EE.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.
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 rare 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.
    b. Solve word problems leading to inequalities of the form $px + q > r$ or $px + q$

< r, where p, q and rare specific rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem.

Essential Questions

- How can algebraic equations and inequalities be used to model, analyze and solve real-world problems?
- How can you use an inequality to describe the dimensions of a figure?

Enduring Understandings

- Rewriting an expression in different forms in a problem context can shed light on the problem.
- Algebraic expressions containing rational numbers and multiple variables can be simplified, expanded or factored to write equivalent expressions.
- Verbal descriptions can be translated into algebraic expressions with multiple variable and parentheses.
- An equation is an expression equated with some quantity. A variable holds the place of an unknown number in an expressions or equation. A variable can represent any number; however in an equation, a variable cannot represent more than one value at a given time.
- There are many ways to solve algebraic equations and inequalities, but specific rules and properties must be followed to find a solution.
- An inequality can be used to represent that a problem has multiple solutions and can be graphed on a number line.
- Algebraic equations and inequalities can be used to model mathematical or real-world situations and to find values of variables.

Knowledge and Skills (SWBAT)
- apply properties of operations to simplify algebraic expression
- evaluate algebraic expressions and formulas using substitution
- utilize the distributive property to create equivalent expressions
- add and subtract linear expressions having rational coefficients, using properties of operations
- factor and expand linear expressions having rational coefficients, using properties of operations
- write expressions in equivalent forms to shed light on the problem and interpret the relationship between the quantities in the context of the problem
- write simple equations
- fluently solve equations using addition or subtraction (Addition Property of Equality and Subtraction Property of Equality)
- fluently solve equations using multiplication or division (Multiplication Property of Equality and Division property of Equality)
- fluently solve two-step equations
- explain how algebra tiles help to model and solve two-step equations

- write an equation of the form px + q = r or p(x + q) = r in order to solve a word problem
- fluently solve equations of the form px + q = r and p(x + q) = r
- find the value of an unknown quantity in a formula
- solve simple fractional equations that can be reduced to linear equations
- construct linear equations from given situations and solve these equations
- write and graph inequalities
- use substitution to check whether an number is a solution of an inequality
- fluently solve inequalities using addition or subtraction (Addition and Subtraction Properties of Inequality)
- fluently solve inequalities using multiplication of division (Multiplication and Division Properties of Inequality)
- fluently solve multi-step inequalities
- write an inequality of the form px + q > r, px + q <r or px + q ≥ r or px + q ≤ r to solve a word problem
- graph the solution set of the inequality
- solve word problems involving inequalities
- interpret the solution to an inequality in the context of the problem
- translate words to symbols involving expressions, equations and inequalities
- translate symbols to words involving expressions, equations and inequalities
- compare an arithmetic solution to a word problem to the algebraic solution of the word problem, identifying the sequence of operations in each solution
- solve real-world problems using expressions, equations and inequalities
- use variables to represent quantities in a real-world or mathematical problem by constructing simple equations and inequalities to represent problems
- justify solutions to word problems and support reasoning with facts and knowledge
- assess the reasonableness of answers by using estimation skills

Stage 2: Evidence of Understanding, Learning Objectives and Expectations
Benchmarks (embedded student proficiencies) administered quarterly
Assessment Methods (formative, summative, other evidence and/or student self-assessment)
Formative
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Summative

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- Short and Extended Constructed Responses
- Technology based Math Assessments
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Other evidence and/or student self-assessment
- Math Journal reflections
- Journal opened-ended, multiple-step responses
- Self-evaluations with individual whiteboards
- Self-assessment checklists
- Group Projects with self-assessment and group rubrics
- Student generated practice activities
- Student Constructed Assessments (peer evaluations)
- Student Reflection and corrections on Assessments

Stage 3: Learning Plan

In this unit the focus will be on writing and solving algebraic expressions, equations and inequalities. Student will evaluate and simplify numerical and algebraic expressions using order of operations for the given variable including exponents. Students will apply Commutative, Associative, Identity and Distributive Properties to solve problems and to show that two expressions are equivalent. Students will then write algebraic expressions to represent real-world situations. Students will apply properties of operations to add and subtract linear expressions; factor linear expressions and solve real-life word problems. In this unit, students will also, explore, investigate and solve one and two-step linear equations. Students will use a variety of methods to solve addition, subtraction, multiplication and division equations. Students will also solve two-step equations by applying the reverse order of operations. Finally, students will utilize their understanding of solving equations and will apply that understanding to writing, solving and graphing one and two-step inequalities. Students will demonstrate an understanding of how the solutions of an equation differ from the solution of an inequality. In this unit the focus will be on using variables to represent quantities in real-world and mathematical problems by constructing simple equations and inequalities to represent problems; justifying solutions to word problems and support reasoning with facts and knowledge and lastly, assessing the reasonableness of answers by using estimation skills.

The activities in this unit will provide students the opportunity to be actively engaged (e.g. manipulatives, Scavenger Hunts, QR code reader activities, Interactive SMARTBoard activities, individual whiteboards, flexible grouping to share ideas and formulate solutions; cross curricular activities and projects; online computer activities as well as supplemental games on the IPads and Chromebooks that can be tracked and monitored). Through the use of multiple learning style activities (visual, auditory,

kinesthetic and tactile), students will explore and develop an understanding of the skills and concepts in this unit. Differentiation will be embedded into the unit in the form of graphic organizers, partner work, cooperative learning groups, tiered instruction and tiered stations (centers), peer reviews, choice options, teacher and peer tutoring, and independent study.

Each of the 8 Standards for Mathematical Practice will be embedded in this unit of instruction.
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MP.3 Construct viable arguments and critique the reasoning of others.
MP.4 Model with mathematics.
MP.5 Use appropriate tools strategically.
MP.6 Attend to precision.
MP.7 Look for and make use of structure.
MP.8 Look for and express regularity in repeated reasoning.

The 21st Century Skills and Technology used in this unit are:
Creativity and Innovation
- Compare different ways of approaching traditional mathematical problems
- Find innovative solutions, using practical examples where appropriate
- Listen to and evaluate others' reasoning and offer improvements and corrections with supporting arguments
- Listen to others' feedback and modify solutions as needed.
- Learn from mistakes and make repeated attempts at solving problems
- Look for patterns and make generalizations from patterns observed

Critical Thinking and Problem Solving
- Identify and ask significant questions about mathematics and engage in analyzing each other's answers
- Analyze how parts of a whole interact with each other in mathematics
- Make judgements and solve problems in both conventional and innovative ways

Communication and Collaboration
- Articulate mathematical thoughts and ideas using oral and written communication skills
- Analyze others' reasoning and construct viable arguments using reasoning with attention to mathematical fact
- Listen respectfully to the reasoning of others'
- Communicate respectfully in diverse teams articulating mathematical thoughts and ideas effectively

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- Explore and share with others new areas of mathematics and its applications
- Learn about mathematics from reliable websites and share knowledge with

others
- Evaluate information critically and competently
- Use technology as a tool to research, organize, evaluate and communicate information

Life and Career Skills
- Demonstrate the ability to work in pairs and small groups to solve mathematical problems with flexibility, adaptability and respect for others ideas and cultural differences
- Set goals, establish priorities and timelines to complete short-term and long-term project

Integration of Digital Tools
- Google Classroom, Big Ideas Math (online site), various websites and online resources will be used with the Chromebooks, IPads, Interactive SMARTBoard

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Suggested resources will include but are not limited to the following:
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- Videos
- Informational Websites
- STEM/STEAM activities
- Teacher collected Resources

Unit 3: Rates, Ratios, Proportional Relationships and Percents

Topics: Ratios, Rates, Proportions, Slope, Direct Variation, Percents, Decimals, The Percent proportion, The Percent Equation, Percents of Increase and Decrease, Discounts, Markups and Simple Interest

Stage 1: Desired Results

Content Standards

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.
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.
   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.

7.EE.A.2. Understand that rewriting an expression in different forms in a problem context can she light on the problem and how the quantities are related.

7.EE.B.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.

Essential Questions

- When is it appropriate to use proportional reasoning to solve real-world problems?
- What are different ways percent problems are represented in our world?

Enduring Understandings

- Ratios make comparisons between two quantities by division. Rates, unit rates and percents (indicating the quantity per one hundred) are all types of ratios.
- A rate is a ratio that compares two quantities of different rates and a unit rate has a denominator of 1.
- If the ratios are not equal, then the two quantities are non-proportional. Two quantities are proportional if they have a constant ratio.
- The constant of proportionality is also the slope of the line.
- When two variable quantities have a constant ratio, their relationship is called direct variation.
-

Knowledge and Skills (SWBAT embedded course proficiencies)
- find ratios, rates and unit rates
- compute and interpret unit rates with ratios of fractions representing measurement quantities in both like and different units of measure
- use tables and graphs to determine if two quantities are in a proportional relationship
- use equivalent ratios and the Cross Products Property to determine whether two ratios form a proportion

- decide whether two quantities are proportional using ratio tables and graphs
- interpret graphs of proportional relationships in context
- write proportions
- solve proportions using mental math
- solve proportions using multiplication or the Cross Products Property
- apply and extend previous understanding of graphing ordered pairs in all four quadrants of the coordinate plane
- use a point on a graph to write and solve a proportion and interpret a point on the graph of a proportional relationship in context
- find the slopes of lines
- find the slope of a straight line on a graph as the ratio of vertical change to horizontal change and interpret the slopes of lines as rates
- explain what a point (x,y) means on a proportional graph in context, particularly (0,0) and (1,r) where r is the unit rate
- identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams and verbal descriptions of proportional relationships
- understand that the constant of proportionality is the slope of the line
- write equations representing proportional relationships in real-world problems
- identify direct variation from graphs or equations
- use direct variation models to solve real-world problems
- convert decimals to percents and percents to decimals
- compare and order fractions, decimals and percents and then apply that knowledge to solving real-world problems
- use the percent proportion and equation to find parts, wholes and percents
- understand how to use the percent proportion or equation to solve real-world problems
- find percents of increase or decrease
- use percent of discounts to find prices of items
- use percent of markups to find selling prices of items
- calculate the interest earned or paid, annual interest rates and amounts paid on loans using the simple interest formula
- use proportions and equations to solve multi-step real-world percent problems including simple interest, tax, markups, discounts, gratuities, commissions, fees, percent increase, percent decrease, and percent error
- interpret solutions by describing real-world contexts
- justify solutions to word problems and support reasoning with facts and knowledge
- assess the reasonableness of answers by using estimation skills

Stage 2: Evidence of Understanding, Learning Objectives and Expectations

Benchmarks (embedded student proficiencies) administered quarterly

Assessment Methods (formative, summative, other evidence and/or student self-assessment)

Formative

- Teacher Observation/Anecdotal notes
- Graphic organizers
- Do Now
- Journal writing
- Exit Tickets
- Daily homework
- Group work
- Discussion (large group, small group and partner share)
- Problem of the Week Solutions
- Quizzes

Summative
- Chapter Tests
- Unit Tests
- Short and Extended Constructed Responses
- Technology based Math Assessments
- Individual Student Unit Projects with Rubric
- Benchmark Assessments

Other evidence and/or student self-assessment
- Math Journal reflections
- Journal opened-ended, multiple-step responses
- Self-evaluations with individual whiteboards
- Self-assessment checklists
- Group Projects with self-assessment and group rubrics
- Student generated practice activities
- Student Constructed Assessments (peer evaluations)
- Student Reflection and corrections on Assessments

Stage 3: Learning Plan

Students will explore proportional reasoning and its application in similarity. Students understand that two quantities are proportional when a change in one quantity corresponds to a predictable change in the other. The topics of ratio, rate and proportion give students the opportunity to solve proportional relationships and to determine whether a relationship is non-proportional. Students graph proportional relationships and understand unit rate as a measure of the steepness of the related line, called slope. The emphasis is on developing an understanding of proportionality and its use in real-world applications so that students become competent and confident in their ability to determine if values are either directly or inversely related. Proportional reasoning is applied throughout the unit to solve real-world measurement problems.

The second part of the unit focuses on problem solving with percents. Students learn to apply percent proportions, percent equations and percent estimation skills to real-world problems. Using decimal and fraction equivalents for percents, students solve real-world multi-step problems involving percent of change, sales tax, tip, discount, markups,

simple interest, commissions and percent error. Students will use reasoning skills they learn to make decisions in the real-world about products and services they intend to purchase.

The activities in this unit will provide students the opportunity to be actively engaged (e.g. manipulatives, Scavenger Hunts, QR code reader activities, Interactive SMARTBoard activities, individual whiteboards, flexible grouping to share ideas and formulate solutions; cross curricular activities and projects; online computer activities as well as supplemental games on the IPads and Chromebooks that can be tracked and monitored). Through the use of multiple learning style activities (visual, auditory, kinesthetic and tactile), students will explore and develop an understanding of the skills and concepts in this unit. Differentiation will be embedded into the unit in the form of graphic organizers, partner work, cooperative learning groups, tiered instruction and tiered stations (centers), peer reviews, choice options, teacher and peer tutoring, and independent study.

Each of the 8 Standards for Mathematical Practice will be embedded in this unit of instruction.
Standards for Mathematical Practice:
MP.1 Make sense of problems and persevere in solving them.
MP.2 Reason abstractly and quantitatively.
MP.3 Construct viable arguments and critique the reasoning of others.
MP.4 Model with mathematics.
MP.5 Use appropriate tools strategically.
MP.6 Attend to precision.
MP.7 Look for and make use of structure.
MP.8 Look for and express regularity in repeated reasoning.

In this unit, students will engage in 21st Century Skills as listed below.
Creativity and Innovation
- Compare different ways of approaching traditional mathematical problems
- Find innovative solutions, using practical examples where appropriate
- Listen to and evaluate others' reasoning and offer improvements and corrections with supporting arguments
- Listen to others' feedback and modify solutions as needed.
- Learn from mistakes and make repeated attempts at solving problems
- Look for patterns and make generalizations from patterns observed

Critical Thinking and Problem Solving
- Identify and ask significant questions about mathematics and engage in analyzing each other's answers
- Analyze how parts of a whole interact with each other in mathematics
- Make judgments and solve problems in both conventional and innovative ways

Communication and Collaboration
- Articulate mathematical thoughts and ideas using oral and written communication

skills
- Analyze others' reasoning and construct viable arguments using reasoning with attention to mathematical fact
- Listen respectfully to the reasoning of others'
- Communicate respectfully in diverse teams articulating mathematical thoughts and ideas effectively

Information, Media and Technology Literacy
- Explore and share with others new areas of mathematics and its applications
- Learn about mathematics from reliable websites and share knowledge with others
- Evaluate information critically and competently
- Use technology as a tool to research, organize, evaluate and communicate information

Life and Career Skills
- Demonstrate the ability to work in pairs and small groups to solve mathematical problems with flexibility, adaptability and respect for others ideas and cultural differences
- Set goals, establish priorities and timelines to complete short-term and long-term project

Integration of Digital Tools
- Google Classroom, Big Ideas Math (online site), various websites and online resources will be used with the Chromebooks, IPads, Interactive SMARTBoard

Time Allotment
35 days

Resources
Suggested resources will include but are not limited to the following:
- District approved Math textbook and materials series (Big Ideas Math)
- Assessments
- Interactive Websites
- Videos
- Informational Websites
- STEM/STEAM activities
- Teacher collected Resources

Unit 4: Geometry (Two-Dimensional)

Topics: Adjacent, Vertical, Complementary and Supplementary Angles, Triangles, Quadrilaterals, Scale Drawings, Circles and Circumference, Perimeters of Composite

Figures, Areas of Circles and Areas of Composite Figures

Stage 1: Desired Results

Content Standards

7.G.A. Draw, construct and describe geometrical figures and describe the relationship 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.

7.G.B. Solve real-life and mathematical problems involving angle measure, area, surface area and volume.
3. 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.
4. 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.
5. 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.

7.EE.A.2 Understand that rewriting an expression in different forms in a problem context can she light on the problem and how the quantities are related.

7.EE.B.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 rare 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.

7.RP.A.3. Use proportional relationships to solve multistep ratio and percent problems.

Essential Questions

- How do changes in dimensions of similar geometric figures affect the perimeters and areas of the figures?
- How can scale drawings be used in our lives?

Enduring Understandings

- Angles can be classified by their size, their location in relation to each other in a figure or design and their combined angle measure. Angle classification by location or combined angle measure can help you write equations to find unknown angle measures.
- The shape of a polygon is determined by its sides and angles. Polygons can be sorted into families according to the number and lengths of their sides and the measures of their angles. Patterns exist among interior and exterior angles in polygons.
- A circle is a geometric figure that has many useful applications in the real world.

Knowledge and Skills (SWBAT embedded course proficiencies)
- identify adjacent and vertical angles
- find angle measures of adjacent and vertical angles by using facts to write and solve simple equations
- classify pairs of angles as complementary, supplementary or neither
- find angle measures of complementary and supplementary angles by using facts to write and solve simple equations
- draw, construct and measure vertical, adjacent, complementary and supplementary angles (with technology, with ruler and protractor, as well as freehand) geometric shapes with given conditions
- solve mathematical multi-step problems by writing and solving simple algebraic equations based on the relationships between and the properties of angles (supplementary, complementary, vertical and adjacent)
- apply and extend their understanding of how to classify triangles
- construct triangles (with technology, with ruler and protractor, as well as freehand) with given angle measures and given side lengths
- understand that the sum of the angle measures of any triangle is 180°
- find the missing angle measure in a triangle by constructing and solving an equation for the unknown value
- recognize conditions determining a unique triangle, more than one triangle, or no triangle
- understand that the sum of the angle measures of any quadrilateral is 360°
- apply and extending their understanding of how to classify quadrilaterals by the attributes they possess
- construct quadrilaterals (with technology, with ruler and protractor, as well as freehand) with given angle measures and given side lengths
- find the missing angle measures in quadrilaterals by constructing and solving an equation for the unknown value
- use scale drawings to find actual distances
- use ratios and proportions to create scale drawings
- recreate a scale drawing at a different scale
- compute actual lengths and area from a scale drawing
- solve problems involving scale drawings using proportions

- describe a circle in terms of radius and diameter
- understand the concept of Pi
- calculate the circumference of circles, semicircles and quarter circles
- understand how to find the perimeter of semicircles and quarter circles
- subdivide composite figures into basic geometric shapes in order to find the total area
- calculate the area of circles, semicircles and quarter circles
- find areas of composite figures by separating them in familiar figures
- apply the properties of circles and composite figures to solve real-world problems
- justify solutions to word problems and support reasoning with facts and knowledge
- assess the reasonableness of answers by using estimation skills

Stage 2: Evidence of Understanding, Learning Objectives and Expectations

Benchmarks (embedded student proficiencies) administered quarterly
Assessment Methods (formative, summative, other evidence and/or student self-assessment)

Formative
- Teacher Observation/Anecdotal notes
- Graphic organizers
- Do Now
- Journal writing
- Exit Tickets
- Daily homework
- Group work
- Discussion (large group, small group and partner share)
- Problem of the Week Solutions
- Quizzes

Summative
- Chapter Tests
- Unit Tests
- Short and Extended Constructed Responses
- Technology based Math Assessments
- Individual Student Unit Projects with Rubric
- Benchmark Assessments

Other evidence and/or student self-assessment
- Math Journal reflections
- Journal opened-ended, multiple-step responses
- Self-evaluations with individual whiteboards
- Self-assessment checklists
- Group Projects with self-assessment and group rubrics
- Student generated practice activities
- Student Constructed Assessments (peer evaluations)
- Student Reflection and corrections on Assessments

Stage 3: Learning Plan

In this unit of study, students will use information about supplementary, complementary, vertical and adjacent angles to solve for an unknown angle in a multi-step problem. They will draw and construct (using various tools and techniques such as freehand, use of a ruler and protractor and use of technology) geometric shapes. Students will explore the ways that polygons are sorted into families according to the number and length of their sides and the size of their angles and use that knowledge to explore the patterns among interior and exterior angles of a polygons. Using their prior knowledge of ratios and proportions, students solve problems involving scale factor and reproduce a scale drawing at a different scale. This unit will also focus on calculating the missing angle measure in angles and polygons by constructing and solving algebraic equations for the unknown value. An understanding of basic geometric shapes and their properties will be used to find the perimeters and areas of polygons and composite figures in real-world situations. Finally, students will develop an understanding of pi and use values of it to estimate and calculate circumference and areas of circles in real-world problems.

The activities in this unit will provide students the opportunity to be actively engaged (e.g. manipulatives, Scavenger Hunts, QR code reader activities, Interactive SMARTBoard activities, individual whiteboards, flexible grouping to share ideas and formulate solutions; cross curricular activities and projects; online computer activities as well as supplemental games on the IPads and Chromebooks that can be tracked and monitored). Through the use of multiple learning style activities (visual, auditory, kinesthetic and tactile), students will explore and develop an understanding of the skills and concepts in this unit. Differentiation will be embedded into the unit in the form of graphic organizers, partner work, cooperative learning groups, tiered instruction and tiered stations (centers), peer reviews, choice options, teacher and peer tutoring, and independent study.

Each of the 8 Standards for Mathematical Practice will be embedded in this unit of instruction.
Standards for Mathematical Practice:
MP.1 Make sense of problems and persevere in solving them.
MP.2 Reason abstractly and quantitatively.
MP.3 Construct viable arguments and critique the reasoning of others.
MP.4 Model with mathematics.
MP.5 Use appropriate tools strategically.
MP.6 Attend to precision.
MP.7 Look for and make use of structure.
MP.8 Look for and express regularity in repeated reasoning.

In this unit, students will engage in 21st Century Skills of…

Creativity and Innovation
- Compare different ways of approaching traditional mathematical problems
- Find innovative solutions, using practical examples where appropriate
- Listen to and evaluate others' reasoning and offer improvements and corrections with supporting arguments
- Listen to others' feedback and modify solutions as needed.
- Learn from mistakes and make repeated attempts at solving problems
- Look for patterns and make generalizations from patterns observed

Critical Thinking and Problem Solving
- Identify and ask significant questions about mathematics and engage in analyzing each other's answers
- Analyze how parts of a whole interact with each other in mathematics
- Make judgments and solve problems in both conventional and innovative ways

Communication and Collaboration
- Articulate mathematical thoughts and ideas using oral and written communication skills
- Analyze others' reasoning and construct viable arguments using reasoning with attention to mathematical fact
- Listen respectfully to the reasoning of others'
- Communicate respectfully in diverse teams articulating mathematical thoughts and ideas effectively

Information, Media and Technology Literacy
- Explore and share with others new areas of mathematics and its applications
- Learn about mathematics from reliable websites and share knowledge with others
- Evaluate information critically and competently
- Use technology as a tool to research, organize, evaluate and communicate information

Life and Career Skills
- Demonstrate the ability to work in pairs and small groups to solve mathematical problems with flexibility, adaptability and respect for others ideas and cultural differences
- Set goals, establish priorities and timelines to complete short-term and long-term project

Integration of Digital Tools
- Google Classroom, Big Ideas Math (online site), various websites and online resources will be used with the Chromebooks, IPads, Interactive SMARTBoard

<ins>Time Allotment</ins>
   29 days

Resources
Suggested resources will include but are not limited to the following:
- District approved Math textbook and materials series (Big Ideas Math)
- Assessments
- Interactive Websites
- Videos
- Informational Websites
- STEM/STEAM activities
- Teacher collected Resources

Unit 5: Geometry (Three-Dimensional)

Topics: Surface Area and Volume

Stage 1: Desired Results

Content Standards

7.G.A.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.

7.G.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.
   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.

7.NS.A.3. Solve real-world and mathematical problems involving the four operations with rational numbers.

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

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.

Essential Questions

- How is surface area similar or different to area?
- How is finding the volume of a composite figure different that finding the surface area of a composite figure? How is it similar?

- How is volume and surface area used in the real world?

Enduring Understandings

- Volume is the measure of space occupied by a three-dimensional region. It is measured in cubic units.
- Surface area is the sum of the area of all the surfaces, or faces of a three-dimensional figure. It is measured in square units.
- Slicing three-dimensional figures vertically, horizontally or on a slant can expose different shapes of cross-sections, depending on which of the original edges are intersected.
- Proportional changes to dimensions of the sides of a prism lead to predictable changes in the surface area and the volume.

Knowledge and Skills (SWBAT embedded course proficiencies)
- use two-dimensional nets to represent three-dimensional solids
- find the surface areas of rectangular and triangular prisms using models, nets and formulas
- find the surface areas of regular pyramids using models, nets and formulas
- find the surface areas of cylinders using models, nets and formulas
- justify the formula for the surface area of a cone by using a net
- solve real-world problems involving surface area of three dimensional shapes composed of pyramids, prisms, cylinders and cones
- find the volume of prisms and solve real-world problems involving them
- find the volume of pyramids and solve real-world problems involving them
- justify formulas for the volume and surface areas of those three dimensional shapes studied
- compare the surface area and volume of rectangular prisms and cylinders
- explore and find the volume and surface area of composite figures
- describe the cross sections that result from slicing three-dimensional figures at various angles
- solve problems by solving a simpler problem
- justify solutions to word problems and support reasoning with facts and knowledge
- assess the reasonableness of answers by using estimation skills

Stage 2: Evidence of Understanding, Learning Objectives and Expectations
Benchmarks (embedded student proficiencies) administered quarterly
Assessment Methods (formative, summative, other evidence and/or student self-assessment)
Formative
- Teacher Observation/Anecdotal notes
- Graphic organizers
- Do Now
- Journal writing

- Exit Tickets
- Daily homework
- Group work
- Discussion (large group, small group and partner share)
- Problem of the Week Solutions
- Quizzes

Summative
- Chapter Tests
- Unit Tests
- Short and Extended Constructed Responses
- Technology based Math Assessments
- Individual Student Unit Projects with Rubric
- Benchmark Assessments

Other evidence and/or student self-assessment
- Math Journal reflections
- Journal opened-ended, multiple-step responses
- Self-evaluations with individual whiteboards
- Self-assessment checklists
- Group Projects with self-assessment and group rubrics
- Student generated practice activities
- Student Constructed Assessments (peer evaluations)
- Student Reflection and corrections on Assessments

Stage 3: Learning Plan

In this unit, students will use hands on exploration activities to investigate the concepts of surface area and volume of three-dimensional shapes including prisms, cylinders, pyramids and cones. They will discover relationships between the volumes of prisms and pyramids; and cylinders and cones to justify and apply surface area and volume formulas. Students will also use the formulas to find volume and surface areas of three-dimensional composite shapes. Students will build on these concepts as they work with similar solids and investigate how changes in dimensions affect the surface area and volume of similar solids. By understanding surface area and volume, students can begin to apply those concepts to solve real-word problems. Finally, students will describe the cross sections that result from slicing three-dimensional figures.

The activities in this unit will provide students the opportunity to be actively engaged (e.g. manipulatives, Scavenger Hunts, QR code reader activities, Interactive SMARTBoard activities, individual whiteboards, flexible grouping to share ideas and formulate solutions; cross curricular activities and projects; online computer activities as well as supplemental games on the IPads and Chromebooks that can be tracked and monitored). Through the use of multiple learning style activities (visual, auditory, kinesthetic and tactile), students will explore and develop an understanding of the skills and concepts in this unit. Differentiation will be embedded into the unit in the form of

graphic organizers, partner work, cooperative learning groups, tiered instruction and tiered stations (centers), peer reviews, choice options, teacher and peer tutoring, and independent study.

Each of the 8 Standards for Mathematical Practice will be embedded in this unit of instruction.
Standards for Mathematical Practice:
MP.1 Make sense of problems and persevere in solving them.
MP.2 Reason abstractly and quantitatively.
MP.3 Construct viable arguments and critique the reasoning of others.
MP.4 Model with mathematics.
MP.5 Use appropriate tools strategically.
MP.6 Attend to precision.
MP.7 Look for and make use of structure.
MP.8 Look for and express regularity in repeated reasoning.

21st century skills and technology used in this unit are:
Creativity and Innovation
- Compare different ways of approaching traditional mathematical problems
- Find innovative solutions, using practical examples where appropriate
- Listen to and evaluate others' reasoning and offer improvements and corrections with supporting arguments
- Listen to others' feedback and modify solutions as needed.
- Learn from mistakes and make repeated attempts at solving problems
- Look for patterns and make generalizations from patterns observed

Critical Thinking and Problem Solving
- Identify and ask significant questions about mathematics and engage in analyzing each other's answers
- Analyze how parts of a whole interact with each other in mathematics
- Make judgments and solve problems in both conventional and innovative ways

Communication and Collaboration
- Articulate mathematical thoughts and ideas using oral and written communication skills
- Analyze others' reasoning and construct viable arguments using reasoning with attention to mathematical fact
- Listen respectfully to the reasoning of others'
- Communicate respectfully in diverse teams articulating mathematical thoughts and ideas effectively

Information, Media and Technology Literacy
- Explore and share with others new areas of mathematics and its applications
- Learn about mathematics from reliable websites and share knowledge with others
- Evaluate information critically and competently

- Use technology as a tool to research, organize, evaluate and communicate information

Life and Career Skills
- Demonstrate the ability to work in pairs and small groups to solve mathematical problems with flexibility, adaptability and respect for others ideas and cultural differences
- Set goals, establish priorities and timelines to complete short-term and long-term project

Integration of Digital Tools
- Google Classroom, Big Ideas Math (online site), various websites and online resources will be used with the Chromebooks, IPads, Interactive SMARTBoard

Time Allotment
20 days

Resources
Suggested resources will include but are not limited to the following:
- District approved Math textbook and materials series (Big Ideas Math)
- Assessments
- Interactive Websites
- Videos
- Informational Websites
- STEM/STEAM activities
- Teacher collected Resources

Unit 6: Statistics and Probability

Topics: Outcomes and Events, Probability, Samples and Populations

Stage 1: Desired Results

Content Standards

7.SP.A. Use random sampling to draw inferences about 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.

7.SP.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.
4. Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations.

7.SP.C. Investigate chance processes and develop and 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 1/2 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.
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.
   b. Develop a probability model (which may not be uniform) by observing frequencies in data generated from a chance process.
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 the 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.

Essential Questions

● What are some real-world situations in which you can use probability to make predictions?
● How are statistical displays helpful to us in our everyday life?

Enduring Understandings

● 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. Random sampling tends to produce representative samples. Inferences can be drawn from random sampling.

● Inferences and conclusions can be made about situations by comparing two sets data distributions from random samples using measures of center and variability.

● Probabilities are ratios. Probability can be used to predict outcomes in real-world events, to analyze games for fairness and to determine the long-term average of a game of chance.

● Probability of a chance event is a number between 0 and 1. Probability expresses the likelihood of the event occurring. Larger probability indicates greater likelihood.

● Experimental probability is based on actual experiments and is used to make predictions. Theoretical probability is based on mathematical reasoning.

● A simulation is an experiment that is designed to reproduce conditions of a situation or process. Simulations allow you to study situations that are impractical to create in real life.

Knowledge and Skills (SWBAT embedded course proficiencies)
● understand statistical terms such as population, sample, sample size, random sampling, generalizations, valid, biased and unbiased
● analyze and distinguish between representative and non-representative samples of a population
● understand that generalizations about a population from a sample are valid only if the sample is representative of that population
● identify an appropriate sample size
● analyze and interpret data from a sample to draw inferences and make predictions about the population
● generate multiple random samples of the same size to make predictions about populations
● analyze the variation in multiple random samples of the same size
● identify and calculate the measures of mean, median and mode of a distribution
● identify and find given a distribution, the measures of variation including upper quartile, lower quartile, upper extreme-maximum, lower extreme-minimum, range, interquartile range and mean absolute deviation in box and whisker plots, dot plots and stem and leaf plots
● visually compare two numerical data distributions and describe the degree of overlap
● use measures of center (mean, median and mode) to draw informal inferences about two populations and compare the inferences
● use measures of variability (range, quartile, mean absolute deviation) to draw informal inferences about two populations and compare the inferences
● identify and count the outcomes of experiments
● understand the concept of probability
● understand that probability is the likelihood of an event occurring, expressed as a number from 0 to find probabilities of events

- find and develop an understanding of relative frequencies
- use experimental probabilities to make predictions
- use theoretical probabilities to find quantities
- compare experimental and theoretical probabilities
- understand the difference between experimental and theoretical probabilities
- draw conclusions about the likelihood of events given their probability
- predict the relative frequency (experimental probability) of an event based on the theoretical probability
- use tree diagrams, tables or a formula to find the number of possible outcomes to an event
- find the probability of single and compound events
- define and describe a compound event
- identify independent and dependent events and describe their difference
- use formulas to find probabilities of independent and dependent events
- choose the appropriate method such as organized lists, tables and tree diagrams to represent sample spaces for compound events and find the probability of the event
- identify the outcomes in the sample space for an everyday event
- define simulation
- design and use a simulation to generate frequencies for a compound event
- justify solutions to word problems and support reasoning with facts and knowledge and assess the reasonableness of their answers

Stage 2: Evidence of Understanding, Learning Objectives and Expectations
Benchmarks (embedded student proficiencies) administered quarterly
Assessment Methods (formative, summative, other evidence and/or student self-assessment)
Formative
- Teacher Observation/Anecdotal notes
- Graphic organizers
- Do Now
- Journal writing
- Exit Tickets
- Daily homework
- Group work
- Discussion (large group, small group and partner share)
- Problem of the Week Solutions
- Quizzes

Summative
- Chapter Tests
- Unit Tests
- Short and Extended Constructed Responses
- Technology based Math Assessments
- Individual Student Unit Projects with Rubric
- Benchmark Assessments

Other evidence and/or student self-assessment
- Math Journal reflections
- Journal opened-ended, multiple-step responses
- Self-evaluations with individual whiteboards
- Self- assessment checklists
- Group Projects with self-assessment and group rubrics
- Student generated practice activities
- Student Constructed Assessments (peer evaluations)
- Student Reflection and corrections on Assessments

Stage 3: Learning Plan

Students will build on their previous knowledge of single data distributions to compare two data distributions and answer questions about differences between populations. Students will use real-life data to explore measures of central tendency and understand that way information is presented influences our interpretation of it. Students will collect and analyze data, choosing the best way to communicate their findings. They will work with random sampling to generate data sets and learn about the importance of representative samples for drawing inferences. Students will explore theoretical and experimental probabilities and determine whether particular events are likely or unlikely. Students will understand the distinction between independent and dependent events. Finally, students will have the opportunity to apply their knowledge of theoretical probability to make predictions and will test those predictions using experimental probability. Students will use statistics and probability concepts to make decisions about real-world situations.

The activities in this unit will provide students the opportunity to be actively engaged (e.g. manipulatives, Scavenger Hunts, QR code reader activities, Interactive SMARTBoard activities, individual whiteboards, flexible grouping to share ideas and formulate solutions; cross curricular activities and projects; online computer activities as well as supplemental games on the IPads and Chromebooks that can be tracked and monitored). Through the use of multiple learning style activities (visual, auditory, kinesthetic and tactile), students will explore and develop an understanding of the skills and concepts in this unit. Differentiation will be embedded into the unit in the form of graphic organizers, partner work, cooperative learning groups, tiered instruction and tiered stations (centers), peer reviews, choice options, teacher and peer tutoring, and independent study.

Each of the 8 Standards for Mathematical Practice will be embedded in this unit of instruction.
Standards for Mathematical Practice:
MP.1 Make sense of problems and persevere in solving them.
MP.2 Reason abstractly and quantitatively.

MP.3 Construct viable arguments and critique the reasoning of others.
MP.4 Model with mathematics.
MP.5 Use appropriate tools strategically.
MP.6 Attend to precision.
MP.7 Look for and make use of structure.
MP.8 Look for and express regularity in repeated reasoning.

21st century skills and technology used in this unit are:
Creativity and Innovation
- Compare different ways of approaching traditional mathematical problems
- Find innovative solutions, using practical examples where appropriate
- Listen to and evaluate others' reasoning and offer improvements and corrections with supporting arguments
- Listen to others' feedback and modify solutions as needed.
- Learn from mistakes and make repeated attempts at solving problems
- Look for patterns and make generalizations from patterns observed

Critical Thinking and Problem Solving
- Identify and ask significant questions about mathematics and engage in analyzing each other's answers
- Analyze how parts of a whole interact with each other in mathematics
- Make judgements and solve problems in both conventional and innovative ways

Communication and Collaboration
- Articulate mathematical thoughts and ideas using oral and written communication skills
- Analyze others' reasoning and construct viable arguments using reasoning with attention to mathematical fact
- Listen respectfully to the reasoning of others'
- Communicate respectfully in diverse teams articulating mathematical thoughts and ideas effectively

Information, Media and Technology Literacy
- Explore and share with others new areas of mathematics and its applications
- Learn about mathematics from reliable websites and share knowledge with others
- Evaluate information critically and competently
- Use technology as a tool to research, organize, evaluate and communicate information

Life and Career Skills
- Demonstrate the ability to work in pairs and small groups to solve mathematical problems with flexibility, adaptability and respect for others ideas and cultural differences
- Set goals, establish priorities and timelines to complete short-term and long-term project

Integration of Digital Tools
- Google Classroom, Big Ideas Math (online site), various websites and online resources will be used with the Chromebooks, IPads, Interactive SMARTBoard

Time Allotment

20 days

Resources

Suggested resources will include but are not limited to the following:
- District approved Math textbook and materials series (Big Ideas Math)
- Assessments
- Interactive Websites
- Videos
- Informational Websites
- STEM/STEAM activities
- Teacher collected Resources

New Jersey Student Learning Standards

http://www.state.nj.us/education/cccs/

Integration of 21st Century Theme(s)

The following websites are sources for the following 21st Century Themes and Skills: http://www.nj.gov/education/code/current/title6a/chap8.pdf
http://www.p21.org/about-us/p21-framework .
http://www.state.nj.us/education/cccs/standards/9/index.html

21st Century Interdisciplinary Themes (into core subjects)
• **Global Awareness**
• **Financial, Economic, Business and Entrepreneurial Literacy**
• **Civic Literacy**
• **Health Literacy**

• **Environmental Literacy**

Learning and Innovation Skills
• **Creativity and Innovation**
• **Critical Thinking and Problem Solving**
• **Communication and Collaboration**

Information, Media and Technology Skills
• **Information Literacy**
• **Media Literacy**
• **ICT (Information, Communications and Technology) Literacy**

Life and Career Skills
• **Flexibility and Adaptability**
• **Initiative and Self-Direction**
• **Social and Cross-Cultural Skills**
• **Productivity and Accountability**
• **Leadership and Responsibility**

Integration of Digital Tools
● **Classroom computers/laptops**
● **Technology Lab**
● **FM system**
● **Other software programs**