NEW MILFORD PUBLIC SCHOOLS

New Milford, Connecticut

Math 7

December 2021

BOE Approved March 2022

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New Milford's Mission Statement

The mission of the New Milford Public Schools, a collaborative partnership of students, educators, family and community, is to prepare each and every student to compete and excel in an ever-changing world, embrace challenges with vigor, respect and appreciate the worth of every human being, and contribute to society by providing effective instruction and dynamic curriculum, offering a wide range of valuable experiences, and inspiring students to pursue their dreams and aspirations.

Math 7

Grade 7

In grade 7, students will extend their understanding of ratios and rates and apply this to develop an understanding of proportionality. With this, students will graph proportional relationships and understand unit rate as a measure of steepness of the line, solve a wide variety of proportional relationships problems, with a focus on percent problems, and solve problems involving scale drawings. Students will develop a better understanding of numbers, recognizing fractions, decimals (as repeating or terminating), and percents as different representations of rational numbers. They will study performing addition, subtraction, multiplication, and division operations using all rational numbers. This study will include viewing negative numbers in terms of everyday context. Students will continue to study area and build upon their knowledge solving problems involving area and circumference of a circle and surface area of three-dimensional objects. Also, students will solve real-world and mathematical problems involving area, surface area, and volume of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms. They will begin informal work with random sampling to generate data sets and learn about the importance of representative samples for drawing inferences. During all these critical areas, students are encouraged to apply their critical thinking through word problems.

Pacing Guide

Unit Title:	Time:
Unit 1 - Integers and Rational Numbers	6 weeks
Unit 2 - Expressions	3 weeks
Unit 3 - Equations and Inequalities	5 weeks
Unit 4 - Ratios and Proportions	6 weeks
Unit 5 - Percents	4 weeks
Unit 6 - Probability and Statistics	4 weeks
Unit 7 - Geometry	5 weeks

Unit 1: Rational Number Operations

ESTABLISHED GOALS:

CCSS.MATH.CONTENT.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.

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

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

Transfer

Students will be able to independently use their learning to extend their understanding and application of rational numbers.

Meaning

UNDERSTANDINGS

- Objects and sets of objects can be given numerical descriptions.
- When objects/numbers are combined, mathematical rules guarantee the resulting quantity.
- A limited set of symbols can be used to represent numerical descriptions and relationships.
- Mathematical symbols (e.g. period, line) represent quantities and operations in agreed upon ways (e.g. decimal place holders, line to separate numerator from denominator).
- Every problem is a member of a category of problems that has a similar structure and set of characteristics.
- Recognition of patterns and structures fosters efficiency in solving problems.
- Mastery of basic facts and rules maximizes conceptual and procedural fluency.

ESSENTIAL QUESTIONS

- How do I describe this object/number or set of objects/numbers?
- What is the value of this number/ relationship and how can I represent it in different ways?
- How do I use my number sense to perform operations?
- What value(s) can I use/substitute to make this relationship true?
- What characteristics/attributes define this type of problem?
- What does the solution represent?
- How does understanding the pattern/structure help me solve the problem?
- How does being fluent with basic facts and rules help me solve a complex problem?

Acquisition

Students will know…

- Opposites
- Rational Number
- Distributive Property
- Order of Operations
- Terminating Decimal
- Absolute Value
- Additive Inverse

Students will be skilled at…

- Using appropriate notation to indicate positive and negative numbers
- Comparing and order positive and negative numbers rational numbers (fractions, decimals and zero) and locate them on a number line
- Developing algorithms for adding, subtracting, multiplying and dividing positive and negative

	- Commutative Property - Associative Property - Multiplicative Inverse - Repeating Decimal - Integers - Negative Numbers - Positive Numbers - Expressions - Fractions - Mathematical Sentence - Number Line - Number Sentence - Operations	numbers - Writing mathematical sentences to show relationships - Writing/using related fact families for adding and subtracting and multiplying and dividing to solve simple equations - Using parentheses and rules for order of operations in computation - Using positive and negative numbers to model and answer questions about problem situations - Understanding the relationship between a positive and negative number and its opposite (additive inverse) - Understanding absolute value - Understanding the commutative property for addition and multiplication - Understanding the distributive property and its use to simplify expressions and solve problems - Simplifying expressions using combining like terms and distributive property - Simplifying expressions using appropriate order of operations

Code	Evaluative Criteria	Assessment Evidence
T,M,A	Rubric Criteria: **Mathematical Concepts:** 4 - Explanation shows complete understanding of mathematical concepts to solve problems involving operations with rational numbers. 3 - Explanation shows substantial understanding of mathematical concepts to solve problems involving operations with rational numbers. 2 - Explanation shows some understanding of mathematical concepts to solve problems involving operations with rational numbers. 1 - Explanation shows very limited understanding of mathematical concepts to solve problems involving operations with rational numbers OR is not written. **Strategy/Procedures:** 4 - Uses an efficient and effective strategy to solve the operations with rational numbers. 3 - Uses an effective strategy to solve the operations with rational numbers. 2 - Sometimes uses an effective strategy to solve the operations with rational numbers, but does not do it consistently. 1 - Rarely uses an effective strategy to solve the operations with rational numbers. **Mathematical Errors:** 4 - 90-100% of the steps and solutions have no mathematical errors. 3 - Almost all (85-89%) of the steps and solutions have no mathematical errors. 2 - Most (75-84%) of the steps and solutions have no mathematical errors. 1 - More than 75% of the steps and solutions have mathematical errors. **Completion:** 4 - All problems are completed.	PERFORMANCE TASK(S): **Title:** Football Night **Goal:** Students will perform operations with integers to find averages, plot data on number lines, evaluate formulas, determine profit and money spent, and compare data relating to high school football. **Role:** Statistician **Audience:** Athletic Director, Principal, Parents **Situation:** Jenna is the statistician for Midtown High School. She records and compiles the statistics for the football team. So far this season she has recorded the final scores of the games for Midtown and its biggest rival, Bayshore High School. **Product or Performance:** Detailed responses, showing all work. **Standards for Success:** A scoring rubric is shared with students at the onset of the project.

	3 - 75% of all problems are completed. 2 - 50% of all problems are completed. 1 - 25% or less of problems are completed. **Neatness and Organization:** 4 - The work is presented in a neat, clear, organized fashion that is easy to read. 3 - The work is presented in a neat and organized fashion that is usually easy to read. 2 - The work is presented in an organized fashion but may be hard to read at times. 1 - The work appears sloppy and unorganized. It is hard to know what information goes together.	
	T ,M, A T, M, A T,M,A M,A M,A T,M,A	OTHER EVIDENCE: **Embedded Assessment 1:** Adding and Subtracting Integers **Embedded Assessment 2:** Operations with Rational Numbers (Adding, Subtracting, Multiplying, Dividing) **Common Unit Test:** Order Numbers, Operations with Rational Numbers, Order of Operations, Distributive Property, Fact Families, Equivalent Numerical Expressions **Skill Check**: Daily warm-ups **Prompt**: In what kind of situations would it be beneficial and not beneficial to use fractions, integers, and decimals & does it really matter what kind of rational number we use? **Homework:** Almost daily

Code	***Pre-Assessment*** - Rational Number Operations CFA	
T,M,A	Summary of Key Learning Events and Instruction	Progress Monitoring
M	● Opening Activity: Have two students (A and B) stand at the front of the class with a string between them. The teacher holds a piece of paper with the number 0 on it. State that the distance between A and B is 10 units. Pose the following questions while placing the sign with 0 on it in the right spots; if the teacher is at the midpoint, what value is A and B? Who is closer to the teacher (0)? How far away from 0 (teacher) are you? If the teacher moves closer to A so that A is 3, what value is B? Who is closer to the teacher (0)? How far away is each person from the teacher (0)? If the teacher moves closer to B so that B is -2, what value is A? Who is closer to the teacher (0)? How far away is each person from the teacher (0)?What numbers are both 6 units away from 0?	- IXL - Homework - Exit Tickets
T,A	● Teacher will present a lesson on integers and absolute value. Discuss how integers and absolute value are used in real life	
A	● Teacher will present a lesson on adding integers with counter chips and number lines to discover algorithms. At the end of the lesson, perform a lesson check by asking students to discuss with a partner the following questions: If the sum of two integers are negative, are both integers negative? If the sum of two integers are positive, are both integers positive?	
A	● Teacher presents a lesson on subtracting integers with the usage of counter chips. Teacher poses a question: how would you take 4 counter chips away from 2? Students will evaluate how they can perform the subtraction with the usage of zero pairs.	
M	● Teacher will present a lesson on adding and subtracting integers to solve real-world problems. Students will think, pair, share their problem solving for each application and make revisions along the way.	
A	● Assess students by having them take a quiz	
A	● Return and discuss quiz, clarify any misunderstandings	
M	● Guess My Rule: teacher will put three separate number sequences on the board and ask the students to discuss with a partner the	

	possible rule and the next three numbers in each sequence.	
A	● Teacher will present a lesson on multiplying and dividing integers. Students will work in pairs to determine patterns for multiplying with different signs and same sign integers. The teacher will prompt students to rewrite multiplication problems as division problems to determine that the multiplication rules also apply to division rules.	
M	● The teacher will present a lesson on multiplying and dividing integers to solve real-world problems.	
T	● Academic Prompt: In what kind of situations would it be beneficial to use integer rules with rational numbers?	
M	● Have students brainstorm how they might combine integer, fraction, and decimal algorithms to solve applications	
T	● The teacher will present a lesson on adding and subtracting rational numbers using a financial aspect (bank balance, debt, paychecks…). Students will brainstorm how adding and subtracting with integers relates to adding and subtracting with rational numbers.	
A	● The teacher will present a lesson on multiplying and dividing rational numbers	
A	● Students will partake in a classroom maze using their integers rules with integers and rational numbers. Students will move from one question to the next based on the answer they get at each problem. Students will self-evaluate and revise their work as they continue the maze as they may get a wrong answer which will send them back to a problem they have already completed. Students will then need to problem solve to find where they made their mistake.	
A	● Assess students by having them take a quiz	
A	● Return and discuss quiz, clarify any misunderstandings	
M	● Academic Prompt: Does it really matter what order operations are performed?	
A	● The teacher will pre-assess students on order of operations through a series of problems in a warm up. Based on their answers, the teacher will present a lesson on order of operations	
A	● The teacher will present a lesson on distributive property and applications	
M	● The teacher will observe students as they perform and discuss error analysis on order of operations and distributive property	

T	● Academic Prompt: If you are told that a rectangular garden has a perimeter of 36 feet, how many different sized gardens can you create?	
T	● Students will work in pairs to create different dimensions for a garden with a 36 foot perimeter. The teacher will then discuss how they know these all work as possible gardens and explain how these are what equivalent expressions are.	
A	● The teacher will present a lesson on fact families and find the missing value	
T	● Performance task: Students will perform operations with integers to find averages, plot data on number lines, evaluate formulas, determine profit and money spent, and compare data relating to high school football.	
A	● Review with students concepts for upcoming test	
A	● Students take test on ordering rational numbers, all four operations with rational numbers, order of operations, distributive property applications, equivalent numerical expressions, fact families/finding the missing value	
A	● Conclude the unit with the return and discussion of the test, clarify any misunderstandings	

Unit 2: Numerical and Algebraic Expressions

ESTABLISHED GOALS:

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

CCSS.MATH.CONTENT.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."*

CCSS.MATH.CONTENT.7.EE.A.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*

Transfer

Students will be able to independently use their learning to understand the importance of the language of algebra and algebraic thinking in everyday real world mathematical experiences.

Meaning

UNDERSTANDINGS

- Expressions are foundational for Algebra; they serve as building blocks for work with equations and functions.
- Two or more expressions may be equivalent, even when their symbolic forms differ.
- A relatively small number of symbolic transformations can be applied to expressions to yield equivalent expressions.
- Variables are tools for expressing mathematical ideas clearly and concisely. They have many different meanings, depending on the context and purpose.
- Using variables permits writing expressions whose values are not known or vary under different circumstances.

ESSENTIAL QUESTIONS

- Of the many possible equivalent expressions, how does each represent the meaning of a given situation?
- Of the many possible equivalent expressions, which of them best represents the meaning of the situation?
- How does changing one term of an expression change the meaning of the context?
- How can you rewrite expressions to help you solve problems?
- How can you solve problems by using expressions, equations, and inequalities?

Acquisition

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. **CCSS.MATH.CONTENT.7.NS.A.3** Solve real-world and mathematical problems involving the four operations with rational numbers. *Computations with rational numbers extend the rules for manipulating fractions to complex fractions.*	*Students will know…* - Order of operations - Combine like terms - Distributive property - Greatest common factor - Expand an expression - Coefficient - Numerical Expression - Constant term - Variable - Factor of an expression - Commutative property - Algebraic expression - Simplest form - Linear expression - Substitution - Evaluation	*Students will be skilled at…* - Evaluating numerical expressions with rational numbers using the order of operations. - Writing and evaluating expressions for mathematical and contextual situations. - Expanding and factoring expressions using the distributive property and the greatest common factor. - Expanding and factoring expressions with negative rational numbers. - Adding and simplifying expressions by combining like terms. - Subtracting and simplifying expressions. - Simplifying expressions by combining like terms and using the distributive property and properties of operations - Writing and interpreting expressions in different ways to shed new meaning on a context. - Substituting a correct value(s) for an unknown makes the mathematical statement/relationship true

Code	Evaluative Criteria	Assessment Evidence
T,M,A	Rubric Criteria: **Mathematical Concepts:** 4 - Explanation shows complete understanding of mathematical concepts to solve problems involving operations with rational numbers. 3 - Explanation shows substantial understanding of mathematical concepts to solve problems involving operations with rational numbers. 2 - Explanation shows some understanding of mathematical concepts to solve problems involving operations with rational numbers. 1 - Explanation shows very limited understanding of mathematical concepts to solve problems involving operations with rational numbers OR is not written. **Strategy/Procedures:** 4 - Uses an efficient and effective strategy to solve the operations with rational numbers. 3 - Uses an effective strategy to solve the operations with rational numbers. 2 - Sometimes uses an effective strategy to solve the operations with rational numbers, but does not do it consistently. 1 - Rarely uses an effective strategy to solve the operations with rational numbers. **Mathematical Errors:** 4 - 90-100% of the steps and solutions have no mathematical errors. 3 - Almost all (85-89%) of the steps and solutions have no mathematical errors. 2 - Most (75-84%) of the steps and solutions have no mathematical errors. 1 - More than 75% of the steps and solutions have mathematical errors. **Completion:** 4 - All problems are completed. 3 - 75% of all problems are completed. 2 - 50% of all problems are completed.	PERFORMANCE TASK(S): **Title:** Translating and Evaluating Cell Phone Plans **Goal:** This task requires students to translate verbal expressions describing cell phone plans into algebraic expressions and evaluate these expressions to determine the most cost-effective plan. **Role:** Picking the better plan **Audience:** Teacher **Situation:** You want to get a cell phone plan including unlimited data, texting, and calls for your first phone you are going to purchase this summer from Best Buy. You need to compare all possible plans offered. **Product or Performance:** Detailed responses, showing all work. **Standards for Success:** A scoring rubric is shared with students at the onset of the project.

	1 - 25% or less of problems are completed. **Neatness and Organization:** 4 - The work is presented in a neat, clear, organized fashion that is easy to read. 3 - The work is presented in a neat and organized fashion that is usually easy to read. 2 - The work is presented in an organized fashion but may be hard to read at times. 1 - The work appears sloppy and unorganized. It is hard to know what information goes together	
	T,M,A T,M,A T,M,A M,A M,A T,M,A	OTHER EVIDENCE: **Embedded Assessment 1:** Writing and reading algebraic expressions, combining like terms, distributive property, adding and subtracting linear expressions **Embedded Assessment 2:** Evaluating expressions **Common Unit Test:** Writing expressions, distributive property, combining like terms, equivalent expressions, constant, coefficient, variable, like terms, evaluating expressions **Skill Check**: Daily warm-ups **Prompt**: How can I justify that multiple representations in the context of a problem are equivalent expressions? **Homework:** Almost daily

Code	***Pre-Assessment***	
	- Equations CFA - Rational Number Operations Unit Test - Rational Number Operations CFA - Expressions Pre-Assessment	
T,M,A	Summary of Key Learning Events and Instruction	Progress Monitoring
M	● Opening Activity: As students enter the classroom, the teacher will provide each one with an envelope containing two quadrilaterals and four triangles; students will be instructed not to open their envelopes. The students will be divided into teams of two to complete parts (a) and (b). Each envelope contains a number of triangles and a number of quadrilaterals. For this exercise, let t represent the number of triangles, and let q represent the number of quadrilaterals. Each group will work through the following problems: ○ (a) Write an expression using t and q that represents the total number of sides in your envelope. Explain what the terms in your expression represent. ○ (b) You and your partner have the same number of triangles and quadrilaterals in your envelopes. Write an expression that represents the total number of sides that you and your partner have. If possible, write more than one expression to represent this total. As students work to discuss the problems, the teacher can scaffold those that are struggling by discussing a numerical expression, such as $2 \times 3 + 6 \times 4$, as an example where there are two triangles and six quadrilaterals. The class will then discuss the variations of the expressions in part (b) and whether those variations are equivalent and how this relates to their unit.	- IXL - Homework - Exit Tickets
A	● Introduce the essential questions and key terms	
A	● The teacher will present a lesson on parts of expression, reading, and writing expressions. Students will review their learning through practice of their skills with a partner to allow for discussion and reflection.	
M	● Academic Prompt: How can I use properties to justify that expressions are equivalent?	
A	● The teacher will present a lesson on equivalent expressions using	

	the associative and commutative properties.	
M	● The teacher will present a lesson on combining like terms. Students will complete an error analysis on simplified expressions where combining like terms was performed.	
M	● Academic Prompt: How do you use integer rules and combine like terms to simplify the addition and subtraction of multiple algebraic expressions?	
A	● The teacher will present a lesson on adding and subtracting linear expressions. Students will complete a self-assessment of real world applications involving adding and subtracting linear expressions.	
T	● The teacher will present a lesson on distributive property with variables. The teacher will display three rectangles with side lengths that are either numbers or expressions. Students will be asked to write the area of each rectangle. Students will use their knowledge from distributing with numerical expressions to solve algebraic expressions with distributive property. The teacher will ask for all students to share their answers and as a class will discuss if all work and if so, are they equivalent to each other.	
A	● Assess students by having them take a quiz	
A	● Return and discuss quiz, clarify any misunderstandings	
T	● The teacher will present a lesson on factoring expressions. The teacher will display three rectangle area models on the board with the area expression written in each rectangle and an expression will be written with missing parts to display the area. Students will be instructed to determine what the possible values can be used to make the expressions true. The class will discuss possible values for each model. The teacher will pose the following questions: are the expressions written for each area model equivalent to the original expression given? How can we use the distributive property to find factors of an expression? Students will take a self-assessment exit ticket on factoring the greatest common factor, factoring a rational number, factoring a negative number, and describing the relationship between using the distributive property to simplify an expression and factor an expression.	
M	● The teacher will present a lesson on evaluating expressions. The students will use their prior knowledge of order of operations to evaluate expressions for given values. The students will review and assess their learning through a station activity where they will	

T A A A	use this skill in real world problems (example for a station - finding the area of a given shape from an expression (the area formula) and measurements they are given). ● Performance Task: This task requires students to translate verbal expressions describing cell phone plans into algebraic expressions and evaluate these expressions to determine the most cost-effective plan. ● Review with students concepts for upcoming test ● Students take a test on parts of an expression, reading and writing expressions, combining like terms, adding and subtracting linear expressions, distributive property, factoring an expression, and evaluating expressions. ● Conclude the unit with the return and discussion of the test, clarify any misunderstandings	

Unit 3: Equations and Inequalities

ESTABLISHED GOALS:

CCSS.MATH.CONTENT.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.*

CCSS.MATH.CONTENT.7.EE.B.4

Use variables to represent quantities in a real-world or mathematical problem, and

Transfer

Students will be able to independently use their learning to extend their understanding and application of equations and inequalities.

Meaning

UNDERSTANDINGS

- Equations and inequalities are powerful tools that can be used to model and solve real-world situations with unknown quantities.
- Equations can be solved by reasoning about the arithmetic needed to uncover the value of the unknown. Equations can also be solved algebraically by using properties of operations and equality.
- Inequalities have infinite solutions, which can be represented graphically on a number line. In context, these solutions are sometimes constrained by what makes sense for the situation; for example, if solving for the maximum number of people who can fit onto a boat, the solution set would be limited to positive integers.

ESSENTIAL QUESTIONS

- What are some arithmetic tools you can use to solve real-life problems?
- When is it appropriate to use arithmetic tools and when is it appropriate to solve equations algebraically?
- What is the purpose of using inverse operations? When solving equations and inequalities, using inverse operations, how do you know whether to create a zero or a one?
- For equations such as 5(x+10)=25 and $\frac{2}{3}$(9x+6)=10 , what are different methods for solving algebraically?
- What does your solution mean in the context of the problem?
- When solving a problem using both methods (arithmetic tools and algebraically), where do you see relationships in your work?
- Why and when would you reverse an inequality symbol?
- How do you interpret the graph of an inequality in terms of the context of the problem?

Acquisition

Students will know…

- Equation
- Equivalent Equation
- Addition Property of Equality

Students will be skilled at…

- Solving one-step equations with rational numbers.
- Solving equations in the forms $px + q = r$and

construct simple equations and inequalities to solve problems by reasoning about the quantities. **CCSS.MATH.CONTENT.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?* **CCSS.MATH.CONTENT.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.*	- Subtraction Property of Equality - Multiplication Property of Equality - Division Property of Equality - Solution - Substitution - Inequality - Solution Set	$p(x + q) = r$algebraically - Solving word problems leading to equations in the forms $px + q = r$and $p(x + q) = r$ - Modeling with equations in the form $px + q = r$ and $p(x + q) = r$ - Solving and graphing one-step inequalities. - Writing and solving inequalities in the forms $px + q > r$or $px + q < r$and $p(x + q) > r$or $p(x + q) < r$ - Solving inequalities with negative coefficients. - Solving word problems leading to inequalities in the forms $px + q > r$or $px + q < r$and $p(x + q) > r$or $p(x + q) < r$ - Modeling with inequalities.

Code	Evaluative Criteria	Assessment Evidence
T,M,A	Rubric Criteria: **Mathematical Concepts:** 4 - Explanation shows complete understanding of mathematical concepts to solve problems involving operations with rational numbers. 3 - Explanation shows substantial understanding of mathematical concepts to solve problems involving operations with rational numbers. 2 - Explanation shows some understanding of mathematical concepts to solve problems involving operations with rational numbers. 1 - Explanation shows very limited understanding of mathematical concepts to solve problems involving operations with rational numbers OR is not written. **Strategy/Procedures:** 4 - Uses an efficient and effective strategy to solve the operations with rational numbers. 3 - Uses an effective strategy to solve the operations with rational numbers. 2 - Sometimes uses an effective strategy to solve the operations with rational numbers, but does not do it consistently. 1 - Rarely uses an effective strategy to solve the operations with rational numbers. **Mathematical Errors:** 4 - 90-100% of the steps and solutions have no mathematical errors. 3 - Almost all (85-89%) of the steps and solutions have	PERFORMANCE TASK(S): **Title:** Pen Pal **Goal:** This task requires students to convert cake baking temperatures between Celsius and Fahrenheit by solving equations. **Role:** Baker **Audience:** Family **Situation:** Darla's european pen pal sent her a recipe for baking a cake but the recipe calls for the oven to be set to 170 degrees celsius. Darla's oven is only in fahrenheit so she found a formula she could use to determine the degrees in fahrenheit. **Product or Performance:** Detailed responses, showing all work. **Standards for Success:** A scoring rubric is shared with students at the onset of the project.

	no mathematical errors. 2 - Most (75-84%) of the steps and solutions have no mathematical errors. 1 - More than 75% of the steps and solutions have mathematical errors. **Completion:** 4 - All problems are completed. 3 - 75% of all problems are completed. 2 - 50% of all problems are completed. 1 - 25% or less of problems are completed. **Neatness and Organization:** 4 - The work is presented in a neat, clear, organized fashion that is easy to read. 3 - The work is presented in a neat and organized fashion that is usually easy to read. 2 - The work is presented in an organized fashion but may be hard to read at times. 1 - The work appears sloppy and unorganized. It is hard to know what information goes together	
	T,M,A T,M,A T,M,A M,A M,A M,A T,M,A	OTHER EVIDENCE: **Embedded Assessment 1:** Solving two step equations **Common Unit Test:** Two step equations and applications **Common Unit Test:** Two step inequalities and applications **Skill Check**: Daily warm-ups **Prompt**: How can equations be used to solve everyday problems? **Prompt:** How are the solutions to inequalities different from the solutions to equations? **Homework:** Almost daily

Code	***Pre-Assessment***	
	- Equations CFA - Rational Number Operations CFA - Equations and Inequalities Pre-Assessment	
T,M,A	Summary of Key Learning Events and Instruction	Progress Monitoring
A	● The teacher will present a review lesson on one step equations based on how students performed on the pre-assessment	- IXL - Homework
T	● Opening Activity: The teacher writes the number 4 on an index card and places it in an envelope. On the outside of the envelope, the teacher writes 15. Placing the envelope to their head, the teacher states, "I'm thinking of a number. When I double the number and add 7, I get the answer 15." Show the number 15 on the envelope. Ask the students what number you started with. Ask the students to explain how they arrived at their answers. Open the envelope and show the students the 4 on your index card. Ask the students why they didn't divide by 2 first and then subtract 7. Explain that this puzzle is what we will be doing in the unit.	- Exit Tickets
M	● The teacher will present a lesson on solving two step equations using algebra tiles. With the tiles, students will discover rules that can be used to solve. As a class the rules made will be examined and applied to examples. The teacher will make sure to address the idea of doing multiplication and/or division first instead of adding and/or subtracting. The teacher will show the difference to show that both ways do in fact give the same answer however one will either involve fractions or distributive property. The teacher will then pose the question about which way students prefer to solve (most students want to avoid fractions).	
A	● Assess students with a quiz.	
A	● The teacher will present a lesson on real life applications of two step equations. Students will work in pairs to use their prior knowledge of expressions to form. Students will self-assess their knowledge through an error analysis exit ticket.	
A	● The teacher will present a lesson on two step equations that involve clearing out fractions, decimals, and distributive property. Students will assess their learning through a "go fish" activity where the students have a deck of cards. Some cards will have	

	answers on it and others will have the equation. Students will have to solve the equation and then ask their peers if they have the solution (A suggestion is to tell students that they are only able to ask if their partner has solutions since the other option would be too time consuming).	
A	● Review with students concepts for upcoming test	
A	● Students take a test on two step equations and applications.	
A	● Discussion of the test, clarify any misunderstandings	
T	● The teacher will open the lesson by posing the question: Does anyone know the guidelines for suitcases at an airport? If the maximum weight is 50lbs, what inequality does this suggest?	
A	● The teacher will present a review lesson on one step inequalities based on the students pre-assessment needs.	
A	● The teacher will present a lesson on writing and graphing solutions to two step inequalities. Students will display their knowledge in a “beat the time” game against a partner. Students will be given 5 minutes for each round to either write the inequalities, check the solution, or graph the solution. After each round, students are to discuss their answers with their peers to determine if they are in need of revision.	
A	● The teacher will present a lesson on solving two step inequalities. The teacher will prompt the students to remember that the rules for solving one step inequalities were similar to those of equations, so one would conclude that two steps will work in the same manner. Remind students that multiplication and division of negatives will flip the sign.	
T	● Performance Task: This task requires students to convert cake baking temperatures between Celsius and Fahrenheit by solving equations.	
A	● Review with students concepts for upcoming test	
A	● Students take a test on two step inequalities and applications.	
A	● Conclude the unit with the return and discussion of the test, clarify any misunderstandings	

Unit 4: Ratios and Proportions

ESTABLISHED GOALS:

CCSS.MATH.CONTENT.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.*

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

CCSS.MATH.CONTENT.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.

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

CCSS.MATH.CONTENT.7.RP.A.2.C

Transfer

Students will be able to independently use their learning to extend their understanding and application of ratios and proportions.

Meaning

UNDERSTANDINGS

- A proportional relationship between two quantities is a collection of equivalent ratios, related to each other by a constant of proportionality.
- Proportional relationships can be represented in different, related ways, including a table, equation, graph, and written description. Knowing one representation provides the information needed to represent the relationship in a different way.
- A unit rate, associated with a ratio a: $b$is a/b or b/a units of one quantity per 1 unit of another quantity. Unit rates are represented in equations of the form $y = kx$
- and in graphs of proportional relationships as the ordered pair $(1, r)$.
- There are many applications that can be solved using proportional reasoning, including problems with price increases and decreases, commissions, fees, unit prices, and constant speed.

ESSENTIAL QUESTIONS

- How do you find and compare unit rates?
- How can you use tables and equations to identify and describe proportional relationships?
- How can you use graphs to represent and analyze proportional relationships?

Acquisition

Students will know…

- constant of proportionality
- equivalent ratio
- ratio

Students will be skilled at…

- Solving ratio and rate problems using double number lines, tables, and unit rate.
- Representing proportional relationships in tables,

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.* **CCSS.MATH.CONTENT.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. **CCSS.MATH.CONTENT.7.G.A.1** Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.	- unit rate - part to part ratio - part to whole ratio - commission - rate - dependent variable - proportion - independent variable - proportional relationship - direct variation - scale image/drawing - scale factor - scale - corresponding	and define the constant of proportionality. - Determining the constant of proportionality in tables, and using it to find missing values. - Writing equations for proportional relationships presented in tables and graphs. - Writing equations for proportional relationships from word problems. - Representing proportional relationships in graphs. - Interpreting proportional relationships represented in graphs. - Comparing proportional and non-proportional relationships. - Determining if relationships are proportional or non-proportional. - Making connections between the four representations of proportional relationships - Using different strategies to represent and recognize proportional relationships. - Finding the unit rate of ratios involving fractions. - Finding the unit rate and using it to solve problems. - Solving ratio and rate problems by setting up a proportion, including part-part-whole problems. - Defining and identifying scale images**.** - Defining and determining scale factor between two scale images. Use scale factor to draw scale images. - Using a scale to determine actual measurements. - Using scales in maps to find actual distances between locations. - Using scales in floor plans to find actual measurements and dimensions. - Computing actual areas from scale drawings. - Drawing scale drawings at different scales.

Code	Evaluative Criteria	Assessment Evidence
T,M,A	Rubric Criteria: **Mathematical Concepts:** 4 - Explanation shows complete understanding of mathematical concepts to solve problems involving operations with rational numbers. 3 - Explanation shows substantial understanding of mathematical concepts to solve problems involving operations with rational numbers. 2 - Explanation shows some understanding of mathematical concepts to solve problems involving operations with rational numbers. 1 - Explanation shows very limited understanding of mathematical concepts to solve problems involving operations with rational numbers OR is not written. **Strategy/Procedures:** 4 - Uses an efficient and effective strategy to solve the operations with rational numbers. 3 - Uses an effective strategy to solve the operations with rational numbers. 2 - Sometimes uses an effective strategy to solve the operations with rational numbers, but does not do it consistently. 1 - Rarely uses an effective strategy to solve the operations with rational numbers. **Mathematical Errors:** 4 - 90-100% of the steps and solutions have no mathematical errors. 3 - Almost all (85-89%) of the steps and solutions have no mathematical errors. 2 - Most (75-84%) of the steps and solutions have no mathematical errors. 1 - More than 75% of the steps and solutions have mathematical errors. **Completion:** 4 - All problems are completed.	PERFORMANCE TASK(S): **Title:** Cereal **Goal:** This task challenges a student to use knowledge of proportional reasoning and to use equivalent ratios. A student must be able to convert between representations of rational numbers to compare and order ratios. A student must be able to interpret quantities and the associated units to interpret values in the context of a real-world problem. **Role:** Nutritionist **Audience:** Teacher, Family **Situation:** You are a nutritionist and are trying to determine which cereal has the higher ratio of protein and determine how many grams of each cereal you would need to consume a certain amount of protein. **Product or Performance:** Detailed responses, showing all work. **Standards for Success:** A scoring rubric is shared with students at the onset of the project.

	3 - 75% of all problems are completed. 2 - 50% of all problems are completed. 1 - 25% or less of problems are completed. **Neatness and Organization:** 4 - The work is presented in a neat, clear, organized fashion that is easy to read. 3 - The work is presented in a neat and organized fashion that is usually easy to read. 2 - The work is presented in an organized fashion but may be hard to read at times. 1 - The work appears sloppy and unorganized. It is hard to know what information goes together	
	T,M,A T,M,A T,M,A T,M,A T,M,A M,A M,A T,M,A	OTHER EVIDENCE: **Embedded Assessment 1:** Unit Rates **Embedded Assessment 2:** Proportions **Embedded Assessment 3:** Constant of Proportionality **Common Unit Test:** Ratios, Proportions, Constant of Proportionality, Determine proportional relationships from graphs, Construct direct variation equation **Common Unit Test:** find unit rate, determine proportional from ratios and tables, solve a proportion, identify the constant of proportionality, write diverse variation equation, scale drawings **Skill Check**: Daily warm-ups **Prompt**: When do you use ratios to describe something using parts of a whole or parts of a part? **Homework:** Almost daily

Code	***Pre-Assessment***	
	- Equations CFA - Rational Number Operations CFA - Proportions Pre-assessment	
T,M,A	Summary of Key Learning Events and Instruction	Progress Monitoring
M	● Opening Activity: The teacher will break the students up into 4 equal groups. Each group will have a poster labeled "Graffiti Wall." Students will be asked to brainstorm and record their ideas (e.g., terms, examples, pictures) onto the Graffiti Wall and share ideas with their team. The following questions will be asked to prompt student discussion: ○ What do you know about ratios and proportions? ○ Are there any situations you can think of related to these words? ○ Is there anything you know of that is proportional? ○ What additional words do you associate with these words? The teacher will display the posters at the front of the room and the teams will share their Graffiti Wall with the whole class, making connections and exploring different perspectives. The teacher will explain that this unit will build on their prior knowledge of ratios and proportions in the form of proportional relationships.	- IXL - Homework - Exit Tickets
A/M	● The teacher will present a lesson on ratios and ratio tables. Students will use tables to discover patterns that they will learn will form equivalent ratios.	
T	● The teacher will present a lesson on rates and unit rates. Students will practice calculating unit price using their method of choice. Students will use unit rate in context to determine better deals, and analyze when a smaller or larger unit rate is most desirable.	
A	● Assess students on a quiz.	
A	● The teacher will present a lesson on identifying proportional relationships. Students participate in a series of activities where one task is proportional and one is not. For each activity, they will record the data in a t-chart and graph it. By comparing and contrasting the two activities, students will see that Task 1 has a ratio and forms a straight line through (0,0). Then given two new	

	scenarios, the students will have to determine if the data is proportional. Students will compare and contrast data that are proportional and data that are not proportional to come up with four big ideas about what it means to be proportional. Then given scenarios, tables, or fractions, the student will determine if the information is proportional or not.	
A	● The teacher will present a lesson on writing and solving proportions. Students will work out three problems in groups of 4. They are each responsible for one of four methods— double-sided number line, using unit rate, graphing, or writing an equation. Then they will share how they solved it in their groups and then compare and contrast the methods. They will brainstorm the benefits to using each method.	
A	● The teacher will present a lesson on graphs of proportional relationships. Students will find unit rates and compare them to rate of change to discover that proportional relationships have a constant rate of change which is equal to the unit rate (constant of proportionality). Students should practice analyzing graphs that correspond to real world scenarios. Students should identify the constant of proportionality as well as the contextual meaning of a given point (emphasizing connection to unit rate).	
A	● Assess students on a quiz.	
A	● The teacher will present a lesson on direct variation. Students should write equations to model proportional relationships. Optionally, they can use the equations they write to solve proportional questions.	
M	● The teacher will present a lesson on scale drawings. The students will use their knowledge of proportions to complete conversions between measurements. The students will work in groups to create a scale model of a certain part of the classroom (examples: a desk, a textbook, a computer, a notebook). Each group will place their scale model (with scale factor) at a station table. The groups will then rotate to each station table and use the scale model and scale factor to determine the actual measurements of the object. There should be no more than six groups.	
T	● Performance task: This task challenges a student to use knowledge of proportional reasoning and to use equivalent ratios. A student must be able to convert between representations of rational numbers to compare and order ratios. A student must be	

	able to interpret quantities and the associated units to interpret values in the context of a real-world problem	
A	● Review with students concepts for upcoming test	
A	● Students take a test on finding unit rate, determining proportionality from ratios and tables, solving a proportion, identifying the constant of proportionality, writing diverse variation equations, and scale drawings.	
A	● Conclude the unit with the return and discussion of the test, clarify any misunderstandings	

Unit 5: Percents

ESTABLISHED GOALS:

CCSS.MATH.CONTENT.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."*

CCSS.MATH.CONTENT.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*

Transfer

Students will be able to independently use their learning to extend their understanding and application of percents.

Meaning

UNDERSTANDINGS

- Percentages can be used to understand the relationship between parts of quantities and the whole quantity.
- Percentages can also be used to understand how quantities change in relation to their starting values.
- Percentages can be used to model many real-world applications such as price changes and simple interest.

ESSENTIAL QUESTIONS

- How are percentages used to help solve real world application problems?
- What are the different ways percent problems are represented?

Acquisition

Students will know…

- corresponding
- commission
- percent increase/percent decrease
- markup/markdown
- discount
- tax
- tip
- simple interest
- measurement error
- percent error

Students will be skilled at…

- Defining percent and converting between fractions, decimals, and percentages. Solve percent problems mentally with benchmark percentages.
- Finding percent of a number when given percent and the whole.
- Finding the whole given a part and percent.
- Finding the percent given a part and the whole.
- Finding a new amount given the original and a percent increase or decrease.
- Finding the original amount given a new amount after a given percent increase or decrease.
- Finding the percent of increase or decrease given

inches from each edge; this estimate can be used as a check on the exact computation. **CCSS.MATH.CONTENT.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.* **CCSS.MATH.CONTENT.7.NS.A.3** Solve real-world and mathematical problems involving the four operations with rational numbers. *Computations with rational numbers extend the rules for manipulating fractions to complex fractions.*		the original and new amounts. - Solving percent problems fluently, including percent increase and decrease. - Solving percent applications involving discount, tax, and tip. - Solving percent applications involving simple interest, commissions, and other fees. - Solving percent applications involving measurement and percent error.

Code	Evaluative Criteria	Assessment Evidence
T,M,A	Rubric Criteria: **Mathematical Concepts:** 4 - Explanation shows complete understanding of mathematical concepts to solve problems involving operations with rational numbers. 3 - Explanation shows substantial understanding of mathematical concepts to solve problems involving operations with rational numbers. 2 - Explanation shows some understanding of mathematical concepts to solve problems involving operations with rational numbers. 1 - Explanation shows very limited understanding of mathematical concepts to solve problems involving operations with rational numbers OR is not written. **Strategy/Procedures:** 4 - Uses an efficient and effective strategy to solve the operations with rational numbers. 3 - Uses an effective strategy to solve the operations with rational numbers. 2 - Sometimes uses an effective strategy to solve the operations with rational numbers, but does not do it consistently. 1 - Rarely uses an effective strategy to solve the operations with rational numbers. **Mathematical Errors:** 4 - 90-100% of the steps and solutions have no mathematical errors. 3 - Almost all (85-89%) of the steps and solutions have no mathematical errors. 2 - Most (75-84%) of the steps and solutions have no mathematical errors. 1 - More than 75% of the steps and solutions have mathematical errors. **Completion:** 4 - All problems are completed.	PERFORMANCE TASK(S): **Title:** Buying a Car **Goal:** This task challenges a student to use knowledge of simple interest and percentages to compare different car buying scenarios. **Role:** Car financer **Audience:** Teacher **Situation:** The students are buying a new car. The students are to determine the better value for each car based on interest and total balance. They are then deciding which bank would have the best interest rate (mark up) for your purchase. **Product or Performance:** Detailed responses, showing all work. **Standards for Success:** A scoring rubric is shared with students at the onset of the project.

	3 - 75% of all problems are completed. 2 - 50% of all problems are completed. 1 - 25% or less of problems are completed. **Neatness and Organization:** 4 - The work is presented in a neat, clear, organized fashion that is easy to read. 3 - The work is presented in a neat and organized fashion that is usually easy to read. 2 - The work is presented in an organized fashion but may be hard to read at times. 1 - The work appears sloppy and unorganized. It is hard to know what information goes together	
	T,M,A M,A M,A T,M,A	OTHER EVIDENCE: **Embedded Assessment 1:** Percent, decimal, and fractions **Skill Check**: Daily warm-ups **Prompt**: What role do percentage increases and decreases play in our everyday lives? **Homework:** Almost daily

Code	***Pre-Assessment***	
	- Equations CFA - Rational Number Operations - Ratios and Proportions Assessment	
T,M,A	Summary of Key Learning Events and Instruction	Progress Monitoring
T	● Opening Activity: The teacher will break students into groups of four. The teacher will project the following statement at the front of the room: “Kyle is at the mall with some of his friends shopping for a new shirt to wear to the Mississippi State Fair tomorrow. While in Abercrombie and Fitch he notices a $50 shirt on the 35% off rack. The problem is, the calculator on Kyle’s phone does not have a percent key. How can Kyle use his cell phone calculator to determine the discounted sale price ?” In each group, one student will be designated as the reader and another student as the recorder. The “reader” from each group will re-read the problem given to the class. Students will take turns commenting aloud on the problem. The “recorder” will write the common reactions or ideas that they agree upon as a group in the center of the Wheel. One member from each group will come to the front of the room and write their group's perspectives on a poster for the class to review. After the class discussion, the teacher will explain to the students that in this unit they will discover exactly how percentages play a role in our everyday lives.	- IXL - Homework - Exit Tickets
T/M	● The teacher will present a lesson on converting between fractions, decimals, and percents. Students will participate in a “crack the code” activity where students are placed in groups and practice with models, real-world situations all while trying to uncover the meaning of a ransom note left to find their teacher. Students will work through ten activities to where each reveals another clue. Students will work collaboratively with assigned roles in order to effectively and accurately solve the clues in a timed manner.	
A	● Assess students with a quiz.	
A	● The teacher will present a lesson on the percent proportions. Students will discover the rule for solving percent proportions through the prompt: If percent means “out of 100”, what percent of students like math best if one in every 5 students say they prefer math class? Students will work through this example and	

A A T M	other similar ones in groups of 4. The teacher will facilitate the learning by reminding them to think back to proportions and the different methods used to find the missing portions. ● The teacher will present a lesson on the percent equation. The teacher will display the problem $\frac{part}{whole} = percent$on the board. The teacher will ask the whole class how we could rewrite this equation so that there is no longer a fraction in it. The teacher will remind students of when they cleared fractions in their equation unit and what that entailed. Students will discover the percent equation format from the classroom discussion and will work together to use the equation with percent problems. The students will then work in pairs on independent practice where they do the problem alone and then discuss their answers with their partner. ● The teacher will present a lesson on percent increases and decreases. The students must make sense of the quantities in each problem, how they are related, what they mean in context, etc., and then determine what strategy or approach they will use to solve. The students will complete two rounds of a "Sprint" exercise included at the end of this lesson (Percent More or Less) that focuses on finding the part, the whole, and the percent more or percent less. Sprints are designed to develop fluency where the students are competing against time and themselves. One Sprint has two parts with closely-related problems on each. Students complete the two parts of the Sprint in quick succession with the goal of improving on the second part, even if only by one more. Between each part, students are given a question session to ask for clarification on any concepts they did not fully understand. ● The teacher will present a lesson on discounts and markups. Students will build on their prior knowledge of percent proportions and percent equations to discover how to find totals given a discount or a markup. Students will work in pairs playing the role of a store manager for a local department store and correct errors of two staff members. Students also apply the concept of calculating discount percentages using four advertisements found in the newspaper and neatly displaying their calculations on construction paper. ● The teacher will present a lesson on simple interest. After learning the formula, the students will partake in station activities (5 stations) where they must work collaboratively to figure out the	

T	simple interest for multiple real world scenarios. Students will need to use their prior knowledge of solving proportion equations as well. Students will assess and then review their work with their groups. ● Performance task: This task challenges a student to use knowledge of simple interest and percentages to compare different car buying scenarios.	

Unit 6: Probability and Statistics

<table>
<tr><td rowspan="3">ESTABLISHED GOALS:
CCSS.MATH.CONTENT.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.
CCSS.MATH.CONTENT.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.
CCSS.MATH.CONTENT.7.SP.C.5
● Understand that the probability of a chance event is a number</td><td colspan="2">Transfer</td></tr>
<tr><td colspan="2">Students will be able to independently use their learning to extend their understanding and application of statistics and probability.</td></tr>
<tr><td colspan="2">Meaning</td></tr>
<tr><td>UNDERSTANDINGS
- The probability of an event or combination of events occurring is determined by the number of desired or favorable outcomes divided by the total number of outcomes possible. This value ranges from 0, where the event is impossible, to 1, where the event is certain to occur, with various levels of likelihood in between.
- Experimental or theoretical probabilities can be used to estimate or predict long-run frequencies.
- Real-world situations can be simulated using various probability models in order to test hypotheses or make predictions based on data.
- Studying sample statistics is a way to reasonably understand and make predictions about larger population characteristics.
- Random samples tend to produce the most representative samples of populations. The larger the sample size, the more accurate and less variable the data tends to be.
- Sample data can be used to compare characteristics of interest between two or more populations. The mean and mean absolute deviation can shed light on differences between populations and how meaningful these differences are compared to</td><td>ESSENTIAL QUESTIONS
- How can you investigate chance processes, and develop, use, and evaluate probability models?
- How are tables, lists, tree diagrams, or simulations used to find the probability of an event?
- How is probability used to find the frequency of an event?
- How can sampling be used to draw inferences about one or more populations?
- What are the different types of sampling and how and/or what would they represent?</td></tr>
</table>

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. **CCSS.MATH.CONTENT.7.SP.C.6** ● Approximate the probability of a chance event by collecting data on the chance process that produces it and observing its long-run relative frequency, and predict the approximate relative frequency given the probability. *For example, when rolling a number cube 600 times, predict that a 3 or 6 would be rolled roughly 200 times, but probably not exactly 200 times.* **CCSS.MATH.CONTENT.7.SP.C.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. **CCSS.MATH.CONTENT.7.SP.C.8** ● Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation.	sampling variability.	
	Acquisition	
	Students will know… - distribution - population characteristic - statistical question - population - sample population - sample statistic - sample proportion - representative sample - random sample - measure of center - mean absolute deviation (MAD) - population proportion - mean (average) - range - interquartile range - tree diagram - experimental probability - likelihood - probability - sample space - outcome - theoretical probability - simulation - simple event - compound event	*Students will be skilled at…* - Understanding the probability of an event happening is a number between 0 and 1, ranging from impossible to certain. - Defining probability and sample space. Estimate probabilities from experimental data. - Determining the probability of events. - Using probability to predict long-run frequencies. - Designing and conducting simulations to model real-world situations. - Conducting simulations with multiple events to determine probabilities. - Listing the sample space for compound events using organized lists, tables, or tree diagrams. - Determining the probability of compound events. - Designing and conducting simulations to model real-world situations for compound events. - Understanding and identifying populations and sample populations for statistical questions. - Describing sampling methods that result in representative samples. - Generating a random sample for a statistical question. - Analyzing data sets using measures of center and interquartile range. - Understanding and determining mean absolute deviation (MAD) as a measure of variability of a data set. - Determining the impact of sample size on variability and prediction accuracy. - Estimating population proportions using sample data. - Comparing different populations using sample data. - Identifying meaningful differences between populations using the mean and mean absolute

		deviation (MAD) of samples.

Code	Evaluative Criteria	Assessment Evidence
T, M, A	Rubric Criteria: **Mathematical Concepts:** 4 - Explanation shows complete understanding of mathematical concepts to solve problems involving operations with rational numbers. 3 - Explanation shows substantial understanding of mathematical concepts to solve problems involving operations with rational numbers. 2 - Explanation shows some understanding of mathematical concepts to solve problems involving operations with rational numbers. 1 - Explanation shows very limited understanding of mathematical concepts to solve problems involving operations with rational numbers OR is not written. **Strategy/Procedures:** 4 - Uses an efficient and effective strategy to solve the operations with rational numbers. 3 - Uses an effective strategy to solve the operations with rational numbers. 2 - Sometimes uses an effective strategy to solve the operations with rational numbers, but does not do it consistently. 1 - Rarely uses an effective strategy to solve the operations with rational numbers. **Mathematical Errors:** 4 - 90-100% of the steps and solutions have no mathematical errors. 3 - Almost all (85-89%) of the steps and solutions have no mathematical errors. 2 - Most (75-84%) of the steps and solutions have no mathematical errors. 1 - More than 75% of the steps and solutions have mathematical errors. **Completion:**	PERFORMANCE TASK(S): **Title:** Design You Own Amusement Park **Goal:** This task challenges a student to use knowledge on probability of simple events, theoretical vs. experimental probability, probability of compound events, and tree diagrams in order to complete tasks required for creating a real life amusement park. **Role:** Designer **Audience:** Teacher, classmates **Situation:** The students want to design their own amusement park. The design must include the essentials; name, top attractions, operation times, policies, roller coaster design, games, food, and the gift shop. **Product or Performance:** Detailed responses, showing all work. **Standards for Success:** A scoring rubric is shared with students at the onset of the project.

	4 - All problems are completed. 3 - 75% of all problems are completed. 2 - 50% of all problems are completed. 1 - 25% or less of problems are completed. **Neatness and Organization:** 4 - The work is presented in a neat, clear, organized fashion that is easy to read. 3 - The work is presented in a neat and organized fashion that is usually easy to read. 2 - The work is presented in an organized fashion but may be hard to read at times. 1 - The work appears sloppy and unorganized. It is hard to know what information goes together	
T,M,A T,M,A M,A M,A T,M,A		OTHER EVIDENCE: **Embedded Assessment 1:** Identifying outcomes, Determining likelihood, Using relative frequencies, and Theoretical and Experimental Probability **Common Unit Test:** Samples, Population, Random samples to describe populations, and Comparing populations including random samples. **Skill Check**: Daily warm-ups **Prompt**: What are the chances that someone has your birthday in the entire 7th grade? **Prompt:** How are statistics used to mislead? **Homework:** Almost daily

Code	***Pre-Assessment***	
	- Equations CFA - Rational Number Operations CFA - Probability and Statistics Pre-assessment	
T, M, A	Summary of Key Learning Events and Instruction	Progress Monitoring
M	● Opening Activity: The teacher will have four students stand at the front of the classroom. The teacher will pose the question to all students, “How many different ways can these students stand in a line?” The teacher will record all the possible line ups on the board. The teacher will then pose the question, “How many chances are there that student #1 is at the front of the line?” The teacher will then explain how these chances tie into the unit on probability and statistics.	- IXL - Homework - Exit Tickets
A/M	● The teacher will present a lesson on identifying outcomes, determining likelihood, and using relative frequencies. Students will play a game to collect data about what is inside bags and then make a decision based on the information they have collected. The process of using previous results from repeated trials to inform the likelihood of future events is one way to estimate probabilities that will be revisited later.	
A/M	● The teacher will present a lesson on experimental and theoretical probability. Students will explore the meaning of theoretical and experimental probability by viewing interactive websites. A lab activity will be performed using cooperative learning groups to allow the students to determine experimental and theoretical probability. The activity is done using 3 pennies where students perform coin tosses to find the experimental probability and determine the theoretical probability given the potential tosses that could happen.	
A	● Assess students with a quiz.	
A	● The teacher will present a lesson on sample space and the probability of compound events. The students will practice their learning through a 1 on 1 game. Each pair gets a game board (start space plus ten forward spaces) and game piece. Students will roll one die. Based on the first roll students will guess “low” or “high” low is a total of both dice (high is total greater than	

	seven, low is total less than seven). If they guess correctly, they move forward one space. If not, they do not move. A total of seven is "wild" and if it is rolled the student moves forward one space regardless of guess. First to the finish wins. Play twice, rotate opponents. Students will calculate the probability of each compound event.	
A/T	● The teacher will present a lesson on simulations. This lesson should ease students into simulation by defining the real outcomes of an experiment and specifying a device to simulate the outcome. Then, students are carefully led to define how an outcome of the device represents the real outcome, define a trial for the simulation, and identify what is meant by a trial resulting in a success or failure. Students should see how a device that may have many outcomes can be used to simulate a situation that has only two outcomes, for example, how a number cube can be used to represent a boy's birth (e.g., even outcome, prime number outcome, or any three of its digits). Students will model this by creating their own simulation for real world events. Students will use various tools (spinners, coins, blocks, dice) to help them design experiments and draw conclusions.	
T	● Performance task: This task challenges a student to use knowledge on probability of simple events, theoretical vs. experimental probability, probability of compound events, and tree diagrams in order to complete tasks required for creating a real life amusement park.	
A	● The teacher will present a lesson on samples and population. In this lesson students work through class discussions and activities to identify populations and samples, as well as gain an understanding of the importance of selecting reliable random samples to gain information about a population. Students work in pairs to gather information using a biased sample and random sample to compare data and reflect on possible misconceptions that a biased sample could produce.	
A	● The teacher will present a lesson on using random sampling to describe the population. The lesson engages students in two activities that investigate random samples and how random samples vary. The first investigation (Sampling Pennies) looks at the ages of pennies based on the dates in which they were made or minted. Students select random samples of pennies and	

	examine the age distributions of several samples. Based on the data distributions, students think about what the age distribution of all of the pennies in the population might look like. In the second investigation, students examine the statistical question, "Do store owners price the groceries with cents that are closer to a higher value or to a lower value?" Students select random samples of the prices from a population of grocery items and indicate how the samples might represent the population of all grocery items. In this lesson, students begin to see sampling variability and how it must be considered when using sample data to learn about a population.	
A	● The teacher will present a lesson on comparing populations including random sampling. The students will look at different samples from the same population to see that their means are relatively close based on the MADs of the samples. This concept can be reversed to say that if two samples have means that are *not* very close, then the samples likely came from populations that are quite different. A general rule is given to determine whether two populations are meaningfully different based on the mean and MAD from a sample of each.	
A	● Review with students concepts for upcoming test	
A	● Students take a test on samples, population, random samples to describe populations, and comparing populations including random samples.	
A	● Conclude the unit with the return and discussion of the test, clarify any misunderstandings	

Unit 7: Geometry

ESTABLISHED GOALS:

CCSS.MATH.CONTENT.7.G.A.2
Draw (freehand, with ruler and protractor, and with technology) 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.

CCSS.MATH.CONTENT.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.

CCSS.MATH.CONTENT.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.

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

CCSS.MATH.CONTENT.7.G.B.6
Solve real-world and

Transfer

Students will be able to independently use their learning to extend their understanding and application of two and three dimensional figures.

Meaning

UNDERSTANDINGS

- When two lines intersect, a pair of congruent vertical angles are created. This angle relationship, along with complementary and supplementary angle relationships, can be used to determine missing angle measures in diagrams.
- A circle is a closed shape that is defined by the set of points that are the same distance from the center of the circle. The distance from the center to any point on the circle is called the radius, and the distance across the circle through the center is called the diameter. The measurement around a circle is called the circumference and is proportional to the diameter of the circle with a constant of proportionality equivalent to π. The area of a circle can be found using the formula $A = \pi r^2$.
- In any triangle, the sum of any two side lengths must be longer than the measure of the third side. Given different conditions about the side and angle measures of a triangle, one unique triangle may be formed, more than one triangle may be formed, or no triangle may be formed.

ESSENTIAL QUESTIONS

- How can you draw shapes that satisfy given conditions?
- How can you identify cross sections of three-dimensional figures?
- How can you use angle pairs to solve problems?
- How can you find the circumference of a circle?
- How do you find the area of a circle?
- How do you find the area of composite figures?
- How do you find the surface area of a figure made of prisms?
- How do you find the volume of a figure made up of cubes and prisms?

Acquisition

Students will know…

Students will be skilled at…

mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.	- supplementary angles - surface area - adjacent angles - vertical angles - radius - diameter - circumference - complementary angles - triangle inequality theorem - cross-section - volume	- Identifying and determining values of angles in complementary and supplementary relationships. - Using vertical, complementary, and supplementary angle relationships to find missing angles. - Using equations to solve for unknown angles**.** - Defining a circle and identifying the measurements radius, diameter, and circumference. - Determining the relationship between the circumference and diameter of a circle and using it to solve problems. - Solving real-world and mathematical problems using the relationship between the circumference of a circle and its diameter. - Determining the relationship between the area and radius of a circle and using it to solve problems. - Solving real-world and mathematical problems using the relationship between the area of a circle and its radius. - Solving problems involving area and circumference of two-dimensional figures**.** - Drawing two-dimensional geometric shapes using rulers, protractors, and compasses. - Determining if three side lengths will create a unique triangle or no triangle. - Identify unique and identical triangles. - Determining if conditions describe a unique triangle, no triangle, or more than one triangle. - Identifying and describing two-dimensional figures that result from slicing three-dimensional figures. - Finding the surface area of right prisms. - Finding the surface area of right pyramids. - Finding the volume of right prisms and pyramids. - Solving real-world and mathematical problems involving volume. - Distinguishing between and solving real-world

		problems involving volume and surface area.

Code	Evaluative Criteria	Assessment Evidence
T, M, A	Rubric Criteria: **Mathematical Concepts:** 4 - Explanation shows complete understanding of mathematical concepts to solve problems involving operations with rational numbers. 3 - Explanation shows substantial understanding of mathematical concepts to solve problems involving operations with rational numbers. 2 - Explanation shows some understanding of mathematical concepts to solve problems involving operations with rational numbers. 1 - Explanation shows very limited understanding of mathematical concepts to solve problems involving operations with rational numbers OR is not written. **Strategy/Procedures:** 4 - Uses an efficient and effective strategy to solve the operations with rational numbers. 3 - Uses an effective strategy to solve the operations with rational numbers. 2 - Sometimes uses an effective strategy to solve the operations with rational numbers, but does not do it consistently. 1 - Rarely uses an effective strategy to solve the operations with rational numbers. **Mathematical Errors:** 4 - 90-100% of the steps and solutions have no mathematical errors. 3 - Almost all (85-89%) of the steps and solutions have no mathematical errors. 2 - Most (75-84%) of the steps and solutions have no mathematical errors. 1 - More than 75% of the steps and solutions have mathematical errors. **Completion:**	PERFORMANCE TASK(S): **Title:** Yum Yum Cereal **Goal:** This task challenges students to solve some constructed response questions involving areas of 2-dimensional figures. Additionally, students will solve for surface area and volume of 3-dimensional figures. **Role:** Designer **Audience:** Teacher, classmates **Situation:** The performance task requires students to design a cereal box that is cost efficient and space saving. **Product or Performance:** Detailed responses, showing all work. **Standards for Success:** A scoring rubric is shared with students at the onset of the project.

	4 - All problems are completed. 3 - 75% of all problems are completed. 2 - 50% of all problems are completed. 1 - 25% or less of problems are completed. **Neatness and Organization:** 4 - The work is presented in a neat, clear, organized fashion that is easy to read. 3 - The work is presented in a neat and organized fashion that is usually easy to read. 2 - The work is presented in an organized fashion but may be hard to read at times. 1 - The work appears sloppy and unorganized. It is hard to know what information goes together	
		OTHER EVIDENCE: **Embedded Assessment 1:** Area and circumference of circles, perimeter and area of composite figures. **Embedded Assessment 2:** Surface area **Common Unit Test:** area, circumference, perimeter, surface area, and volume. **Skill Check**: Daily warm-ups **Prompt**: How are volume and surface area used in the real world? **Homework:** Almost daily

Code	*Pre-Assessment*	
	- Equations CFA - Rational Number Operations CFA - Pre-assessment	
T, M, A M	Summary of Key Learning Events and Instruction ● Opening Activity: Students will work with a partner on a "Geometric Shapes and Angles" introduction activity. The students will be given a sheet with three polygon shapes on it (one 6 sided, one 8 sided, and one 10 sided) and will be asked to measure the following for each shape: ○ The perimeter of the larger polygon to the nearest millimeter. ○ The diameter of the circle to the nearest millimeter. ○ The perimeter of the smaller polygon to the nearest millimeter. ○ Calculate the value of ratio of the two perimeters to the diameter. ○ Take the average of the ratios. This average is the approximation of π. The teacher will ask each group what their ratio averages conclude about π. The teacher will explain how this activity will incorporate into the next topics in the geometric shapes and angles category.	Progress Monitoring - IXL - Homework - Exit Tickets
M A	● The teacher will present a lesson on the area and circumference of circles. The students will take part in a discovery lab activity that will show what area and circumference are in a concrete manner. The students will approximate the area through a coloring activity that involves counting squares/partial squares. They will also approximate circumference through wrapping a string around a contained and measuring. They will make connections to the opening activity and discover the formula used for area and circumference. ● The teacher will present a lesson on finding the perimeter and area of composite figures. Students will discover how to approximate perimeter and area given color tiles and grid paper. The students will then take their approximations and the provided	

	formulas to determine accuracy.	
A	• Assess students with a quiz.	
A	• The teacher will present a lesson on constructing polygons. The students will use tools (protractor and compass) to model their learning through constructing polygons given angles and/or side lengths.	
A	• The teacher will present a lesson on finding unknown angle measures. The students will use their knowledge about supplementary, complementary, vertical and adjacent angles to find the missing measurements. Students will work with partners to review their calculations and discuss plans on how to solve real world applications.	
A	• The teacher will present a lesson on finding the surface area of right prisms. In sixth grade, students found the surface area by finding the area of individual shapes in the net. In this activity students explore more efficient ways to determine surface area. The students make the connection between the length of the long rectangle that wraps around the base and the perimeter of the trapezoid base. This enables students to find the surface area of the prism by finding the area of three shapes (rectangle and two bases) rather than each individual shape.	
A	• The teacher will present a lesson on finding the surface area of right pyramids. The students will use nets to determine the surface area of their given pyramids.	
A	• Assess students with a quiz.	
A	• The teacher will present a lesson on finding the volume of right prisms and pyramids. The students will work in pairs through stations where they use their equation skills to manipulate the volume formula to find missing measurements.	
M	• The teacher will present a lesson on describing cross sections of three-dimensional figures. The students will practice visualizing cross sections in a more abstract way by looking at images of a solid object that has been cut by a plane and matching those images to the shapes created by the cuts (card sorting game). The cuts made in this activity vary from the previous activity in that the cuts are not all parallel to the base of the three-dimensional object. The card sorting game will be done in groups of three. Once each group is done, the groups will do a gallery walk around the room and discuss what they agree/disagree with. The cards	

	have different things in common so different groups of students might have different reasons for grouping certain images together.	
M	● Performance task: This task challenges students to solve some constructed response questions involving areas of 2-dimensional figures. Additionally, students will solve for surface area and volume of 3-dimensional figures.	
A	● Review with students concepts for upcoming test	
A	● Students take a test on area, circumference, perimeter, surface area, and volume.	
A	● Conclude the unit with the return and discussion of the test, clarify any misunderstandings	