

Cedar Grove School District

Cedar Grove, NJ

2017 | Grade 6

Mathematics



Approved by the Cedar Grove Board of Education

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Mathematics Grade 6

Course Description

The Sixth-grade Connected Mathematics curriculum contains a great deal of inquiry-based learning. Students are given an opportunity to show what they know in a variety of ways, including but not limited to: investigation assignments, reflections, summary activities, partner quizzes and unit assessments.

The Connected Mathematics curriculum development has been guided by one primary standard. This standard states that all students should be able to reason and communicate proficiently in mathematics. They should have knowledge of and skill in the use of the vocabulary, forms of representation, materials, tools, techniques, and intellectual methods of the discipline of mathematics, including the ability to define and solve problems with reason, insight, inventiveness, and technical proficiency. CMP is very problem centered. Mathematical tasks for students in class and in homework are the primary source of student engagement with mathematical concepts to be learned. The key mathematical goals are elaborated, exemplified, and connected through the problems in an investigation. CMP identifies big ideas, has coherence, intertwines conceptual and procedural knowledge, promotes effective use of technology and has high expectations for all students. Through the CMP curriculum, all students are asked sophisticated mathematical questions and are expected to persevere in their explorations to these questions, looking for patterns, generalizing, validating, and sharing and critiquing each other's work.

The New Jersey Student Learning Standards for Mathematical Practice are all evident in the CMP classroom as students and teachers interact with a series of tasks to discuss, conjecture, validate, generalize, extend, connect, and communicate. Due to this experience, students develop a deep understanding of concepts and the inclination and ability to reason and make sense of new situations.

All eight mathematical practices come alive in the Connected Mathematics classroom:

- ✓ **Make sense of problems and persevere in solving them**
This mathematical practice is evident in the CMP classroom as students and teachers interact around a series of rich problems to conjecture, validate, generalize, extend, connect and communicate.
- ✓ **Reason abstractly and quantitatively**
As students observe, experiment with, analyze, induce, deduce, extend, generalize, relate and manipulate information from problems, they develop the disposition to inquire, investigate, conjecture and communicate with others around mathematical ideas.
- ✓ **Construct viable arguments and critique the reasoning of others**
Students work in groups daily and are given the opportunity to work through problems together. They focus on explaining, thinking, and understanding the reasoning of others.
- ✓ **Model with mathematics**
The student materials provide opportunities to construct, make inferences from, and interpret concrete and algorithmic models of quantitative, statistical, and algebraic relationships.
- ✓ **Use appropriate tools strategically**
Problem settings encourage the selection and intelligent use of calculators, computers, drawing and measuring tools, and physical models to measure attributes, and represent, simulate and manipulate relationships.

✓ **Attend to precision**

Students are encouraged to decide whether an estimate or an exact answer for a calculation is called for, to compare estimates to compute answers, and to choose an appropriate measure or scale depending on the degree of accuracy needed.

✓ **Look for and make use of structure**

Problems are deliberately designed and sequenced to prompt students to look for interrelated ideas and take advantage of patterns that show how data points, numbers, shapes or algebraic expressions are related to each other.

✓ **Look for and express regularity in repeated reasoning**

Students are encouraged to observe and explain patterns in computations or symbolic reasoning that lead to further insights and fluency with efficient algorithms.

The resources from CMP were used heavily to construct this aligning curriculum. Goals, standards, objectives, and skills are derived from the resources available with this program. Some assessments were altered to meet the needs of students and may be altered in the future to reach every learner.

**This curriculum was written in accordance with the
NEW JERSEY STUDENT LEARNING STANDARDS FOR
MATHEMATICS**

These standards can be viewed at
<http://www.state.nj.us/education/cccs/2016/math/>

Mathematics Grade 6 Course Calendar

Unit:	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
1 Prime Time	1-8									
2 <u>Companing Bits And Pieces</u>		8-15								
3 <u>Let's Be Rational</u>				16-22						
4 <u>Decimal Ops</u>						23-25				
5 <u>Variables and Patterns</u>							27-33			
6 <u>Covering and Surrounding</u>								34-36		
7 <u>Data About Us</u>										37-40
	1-2	3-7	8-15	16-17	18-21	22-25	26-30	31-33	34-36	37-40



Prime Time

Collaboration

Stage 1: Desired Results

NJ Standards

NJ: 2016 SLS: Mathematics

NJ: Grade 6

The Number System

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

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

Expressions & Equations

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

- 6.EE.A.1. Write and evaluate numerical expressions involving whole-number exponents.
- 6.EE.A.2a. Write expressions that record operations with numbers and with letters standing for numbers.
- 6.EE.A.3. Apply the properties of operations to generate equivalent expressions.
- 6.EE.A.4. Identify when two expressions are equivalent (i.e., when the two expressions name the same number regardless of which value is substituted into them).

Mathematical Practice

MP.The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.

- 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.

Enduring Understandings

Students will understand the relationships among factors, multiples, divisors, and products.

- If a number N can be written as a product of two whole numbers, $N = a \times b$, then a and b are factors of N . Multiples of a can be found using the expression ax (some whole number), such as $2a$, $3a$, $4a$, etc. Some numbers can be expressed in exponential notation.
- When all factors of a number are broken down into prime numbers, you have a unique prime factorization. Finding the prime factorization of two numbers can be useful in finding the least common multiple and the greatest common factor of the numbers and in classifying numbers as prime, composite, odd, even, or square.

Equivalent Expressions: Understand why two expressions are equivalent.

Essential Questions

Investigation 1.1-

How can you find all the factors (or divisors) of a number?

Investigation 1.2-

What information about a number can you find by looking at its factors?

Investigation 1.3-

If you know one factor of a number, how can you find another factor of the number?

Investigation 1.4-

How do you know when you have found all of the factors of a number?

Investigation 2.1-

How can you decide when finding common multiples is useful in solving a problem?

Investigation 2.2-

- When calculating the values of an expression, the operations have to be performed in a conventional order, the order of operations.
- Sometimes a numerical expression can be written in different ways but the expressions are equivalent because the value is the same. Properties of operations, including the Distributive Property, are essential tools for writing equivalent expressions.

How can you find the least common multiple of two or more numbers?
Investigation 2.3-
How can you decide when finding common factors is useful in solving a problem?
How can you find the greatest common factor of two numbers?
Investigation 3.1 - 3.3-
How can you find the prime factorization of a number? How many unique prime factorizations of a number are there?
How can the prime factorization of a number be used to find the LCM and GCF of two or more numbers?
Investigation 3.4 (later)
What characteristics of numbers, such as factors and multiples, did you use to answer the questions?
What special numbers such as prime numbers, composite numbers, and square numbers did you see?
Investigation 4.1-
How do you decide whether a number is even or odd?
Investigation 4.2-
How is the distribute property used to create equivalent expressions?
How is finding the area of a rectangle related to the distributive property?
Investigation 4.3-
How do you decide the order when you work on number sentences with more than one operation?
Investigation 4.4-
How do you decide what operations are needed in a given situation?

Content

Students are expected to know and understand new and useful strategies for finding factors and multiples of whole numbers. Students should be able to recognize that some numbers have many factors and some numbers do not. In this unit, students will be able to identify common multiples and factors. The distributive property is introduced to illustrate the additive and multiplicative structure of a number.

Skills

Prior Knowledge:

- *learning and applying multiplication and division facts.*
- *applying the division algorithm*
- *counting by 2's, 3's, 10's, etc.*
- *testing numbers for divisibility*
- *comparing positive whole numbers*
- *finding equivalent fractions*

This chapter expects the prior knowledge listed above so students are able to build on factors and multiples to:

- Classify numbers as prime and composite, even, odd, or square
- Recognize that factors of a number occur in pairs
- Recognize situations that call for common factors and situations that call for common multiples.
- Recognize situations that call for the greatest common factor and situations that call for the least common multiple.
- Develop strategies for finding factors and multiples
- Develop strategies for finding the least common multiple and the greatest common factor.
- Recognize and use the fact that every whole number can be written in exactly one way as a product of prime numbers
- Use exponential notation to write repeated factors
- Relate the prime factorization of two numbers to the least common multiple and greatest common factor of two numbers
- Solve problems involving factors and multiples
- Relate the area of a rectangle to the distributive property
- Recognize that the distributive property relates the multiplicative and additive structures of whole numbers
- Use the properties of operations of numbers including the distributive property and order of operations convention to write equivalent numerical expressions
- Solve problems involving the order of operations and distributive property.

Stage 2: Assessment Evidence

Assessments

Investigation Quizzes

Formative: Other written assessments

Investigation quiz prior to continuing the chapter to assess student understanding.

White Board Review

Formative: Other Visual Assessments

Review Skills on White Boards

Unit Test

Summative: Written Test

Unit test at the end of the chapter.

 CMP3 Quiz 1.doc

 CMP3 quiz 2.doc

 CMP3 QUIZ 3.doc

 Prime Time Test.doc

Stage 3: Learning Plan

Learning Activities

Suggested Learning Activities:

- Product Game
- Factor Game
- Around the World

Resources

Suggested Resources:

- Smart Board
- White Boards, Erasers & Markers
- Factor Game Boards
- Product Game Boards
- Tiles
- Pearson DASH
- Brain Pop
- Manipulative Kit
- Flashcards
- Appropriate Labsheets
- Launch Videos



Comparing Bits And Pieces

Collaboration

Stage 1: Desired Results

NJ Standards

NJ: 2016 SLS: Mathematics

NJ: Grade 6

Ratios & Proportional Relationships

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

- 6.RP.A.1. Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities.
- 6.RP.A.2. Understand the concept of a unit rate a/b associated with a ratio $a:b$ with $b \neq 0$, and use rate language in the context of a ratio relationship.
- 6.RP.A.3. Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations.
- 6.RP.A.3a. Make tables of equivalent ratios relating quantities with whole-number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane. Use tables to compare ratios.
- 6.RP.A.3b. Solve unit rate problems including those involving unit pricing and constant speed.

The Number System

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

- 6.NS.C.5. Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation.
- 6.NS.C.6. Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates.
- 6.NS.C.6a. Recognize opposite signs of numbers as indicating locations on opposite sides of 0 on the number line; recognize that the opposite of the opposite of a number is the number itself, e.g., $-(-3) = 3$, and that 0 is its own opposite.
- 6.NS.C.6b. Understand signs of numbers in ordered pairs as indicating locations in quadrants of the coordinate plane; recognize that when two ordered pairs differ only by signs, the locations of the points are related by reflections across one or both axes.
- 6.NS.C.6c. Find and position integers and other rational numbers on a horizontal or vertical number line diagram; find and position pairs of integers and other rational numbers on a coordinate plane.
- 6.NS.C.7. Understand ordering and absolute value of rational numbers.
- 6.NS.C.7a. Interpret statements of inequality as statements about the relative position of two numbers on a number line diagram.
- 6.NS.C.7b. Write, interpret, and explain statements of order for rational numbers in real-world contexts.
- 6.NS.C.7d. Distinguish comparisons of absolute value from statements about order.

Mathematical Practice

MP.The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.

- 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.

Enduring Understandings

Students will understand that rates, unit rates, and ratios are skills that will be frequently seen in the real world (grocery shopping was an example frequently referred to.)

Students will understand fractions and decimals as numbers that can be located on the number line, compared, counted, positioned and decomposed.

- Rational numbers can be written in fraction form or decimal form and can be represented as points or distances on a number line. The absolute value of a number is its distance from zero on the number line. A number line representation is useful for ordering and comparing rational numbers.
- Benchmarks are useful for estimating values of fractions and decimals.

Students will understand ratios as comparisons of two quantities.

- Ratios are comparisons between two numbers. You can scale ratios to make equivalent ratios. Percents are ratios where 100 parts represent the whole.
- A rate is a particular kind of ratio, where the amounts compared are in different units. A unit rate is a ratio in which one of the quantities being compared has a value of one.

Students will understand equivalence of fractions and ratios, and use equivalence to solve problems.

- Fractions and decimals can be renamed or repartitioned to find equivalent fractions or decimals. Equivalence is useful for moving between fraction and decimal representations and for solving problems. Equivalent ratios represent the same relationship between quantities.

Content

Students will know and understand the concept of equivalent fractions to build on their understanding of ratios. They will become skillful at interpreting the different forms of a rational number and become aware of which form is most appropriate for the solution of a given problem. In this unit, students will work on their modeling of fractions using fraction strips, percent bars, and number lines. Modeling will expand the way they reason with numbers.

Essential Questions

Investigation 1.1-

What are two ways to compare a \$500 fundraising goal to a \$200 fundraising goal?

Investigation 1.2-

How does a "for every" statement show a ratio comparison?

Investigation 1.3-

When you fold fraction strips, what relationship do you see emerge that show how the numerator and denominator change to make equivalent fractions?

Investigation 1.4-

How can fraction strips help you to find part of a number?

Investigation 1.5-

What does it mean for two fractions to be equivalent?

What does it mean for two ratios to be equivalent?

Investigation 2.1-

What does a unit rate comparison statement tell us?

Investigation 2.2-

How are part to part ratio relationships related to part to whole fractions?

Investigation 2.3-

How do rate tables help us find equivalent ratios?

Investigation 3.1-

How can the number line help you think about fractions greater than one and less than zero?

Investigation 3.2-

When comparing two rational numbers, what are some useful strategies for deciding which is greater?

Investigation 3.3-

How does what you know about fractions help you understand decimals?

Investigation 3.4-

How do we use what we know about fractions to estimate and compare decimals?

Investigation 3.5-

Why does it make sense to divide the numerator of a fraction by the denominator to find an equivalent decimal representation?

Investigation 4.1-

How is a percent bar useful in making comparisons with decimals?

Investigation 4.2-

How can partitioning be used to express one number as a percent of another number?

Investigation 4.3-

In what way is a percent like a ratio and like a fraction?

Skills

Prior Knowledge:

- Division of whole numbers
- Comparing whole numbers
- Equivalence of fractions
- Addition and subtraction of simple fractions
- Finding the least common multiple and greatest common multiple
- Exploring multiples of 10
- Division of whole numbers
- Comparing whole numbers and fractions
- Comparing fractions

Factors and Multiples:

- Expand interpretations of a fraction to include expressing a fraction as a part-whole relationship, as a number, and as an indicated

- division
- Reason about the roles of the numerator and denominator in each of the interpretations of a fraction
 - Use multiple interpretations of proper fractions, improper fractions, and mixed numbers
 - Use decimals to represent fractional quantities with attention to place value
 - Recognize that fractions are called rational numbers and that rational numbers are points on the number line
 - Use the number line to reason about rational number relationships
 - Use benchmarks to estimate the values of fractions and decimals and to compare and order fractions and decimals
 - Recognize that fractions can represent both location and distances on a number line
 - Recognize that a number and its opposite are at equal distances from zero on the number line
 - Recognize that the absolute value of a number is its distance from zero on the number line and use that value to describe real world quantities
 - Introduce percent as part-whole relationship in which the whole is not necessarily out of 100, but is partitioned to be "out of 100" or "per 100"
 - Apply a variety of partitioning strategies to solve problems

Ratios as comparisons:

- Use ratios and associated rates to compare quantities
- Distinguish between a difference, which is an additive comparison, and a ratio, which is a multiplicative comparison
- Distinguish between fractions as numbers and ratios as comparisons
- Apply a variety of scaling strategies to solve problems involving ratios and unit rates
- Recognize that a unit rate is a ratio in which one of the quantities being compared has a value of one; use rate language in the context of a ratio relationship
- Scale percents to predict new outcomes

Stage 2: Assessment Evidence

Assessments

Investigation Quiz

Formative: Other written assessments

Investigation quiz after chapter has been complete.

White Board Review

Formative: Other Visual Assessments

Review questions on white boards prior to chapter ending.

Unit Test

Summative: Written Test

Unit test after chapter is complete.

 Investigation 1 partner quiz.doc

 Investigation 2 quiz.doc

 Investigation 3 quiz.doc

Stage 3: Learning Plan

Learning Activities

Suggested Learning Activities:

- Partner Quiz
- White Board Review
- Around the World
- Fraction Strips
- Getting Close Game

Resources

Suggested Resources:

- White Boards, Erasers & Markers
- Smart Board
- Pearson DASH
- Brain Pop
- Manipulative Kit
- Flashcards
- Appropriate Labsheets
- Launch Videos



Let's Be Rational

Collaboration

Stage 1: Desired Results

NJ Standards

NJ: 2016 SLS: Mathematics

NJ: Grade 6

The Number System

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

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

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

- 6.NS.B.3. Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.
- 6.NS.B.4. Find the greatest common factor of two whole numbers less than or equal to 100 and the least common multiple of two whole numbers less than or equal to 12. Use the distributive property to express a sum of two whole numbers 1–100 with a common factor as a multiple of a sum of two whole numbers with no common factor.

Expressions & Equations

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

- 6.EE.A.2. Write, read, and evaluate expressions in which letters stand for numbers.
- 6.EE.A.2a. Write expressions that record operations with numbers and with letters standing for numbers.
- 6.EE.A.2b. Identify parts of an expression using mathematical terms (sum, term, product, factor, quotient, coefficient); view one or more parts of an expression as a single entity.
- 6.EE.A.2c. Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole-number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations).
- 6.EE.A.3. Apply the properties of operations to generate equivalent expressions.

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

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

Mathematical Practice

MP.The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.

- 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.

Enduring Understandings

Numeric Estimation: Understand estimation as a tool for a variety of situations and develop strategies for estimating results of arithmetic

Essential Questions

Investigation 1.1-
What are some strategies for estimating the sum of fractions?

operations.

- Estimation is an important part of reasoning quantitatively. It encourages making sense of a situation, allows you to recognize errors, and complements other problem-solving skills.

Fraction Operations: Revisit and develop meanings for the four arithmetic operations and skill at using algorithms at each.

- To solve real world problems using arithmetic operations on fractions, it is important to first determine which operation (addition, subtraction, multiplication, or division) is appropriate for solving the problem. Modeling the operations provides an understanding of why and when operations work.
- For each operation, there is an efficient general algorithm for computing with fractions that works in all cases.

Variables and Equations: Understand that variables can represent unknown values and that equations can represent relationships.

- Variables are used to represent unknown values in a number sentence.
- Use fact families to solve for unknown values by re-writing and equation in an equivalent form using a different operation.

Investigation 1.2-

How do you know if your estimate is an underestimate or overestimate? What information does an underestimate and an overestimate tell you?

Investigation 1.3-

What are some strategies for adding and subtracting fractions?

Investigation 1.4-

What are some strategies for adding and subtracting mixed numbers?

Investigation 2.1-

How do the area model relate to multiplying fractions?

Investigation 2.2-

What strategies can you use to multiply all combinations of factors including whole numbers, fractions, and mixed numbers?

Investigation 2.3-

How can you use number properties and equivalent fractions to multiply rational numbers?

Investigation 3.1-

What does it mean to divide a fraction by a fraction?

What strategies help you divide a fraction by a fraction?

Investigation 3.2-

What does it mean to divide a whole number by a fraction?

What strategies help you divide a whole number or a mixed number by a fraction?

Investigation 3.3-

What does it mean to divide a fraction by a whole number?

What strategies help you divide a fraction by a whole number?

Investigation 3.4-

What is an efficient algorithm for division problems involving fractions and mixed numbers?

Investigation 4.1-

How do fact families help you solve equations such as $\frac{4}{5} - N = \frac{3}{8}$?

Investigation 4.2-

How do fact families help you solve equations such as $\frac{2}{9} + N = \frac{2}{3}$?

Investigation 4.3-

How do you know when a particular operation is called for to solve a problem?

How do you represent the problem with a number sentence?

Content

Students are expected to develop meaning for and skill with computations involving fractions. Students are expected to develop a deep understanding of rational numbers that comes from experiencing operations when solving a variety of problems including those that require more than one operation.

When students finish this unit they should know, understand and fluently use algorithms for computing fractions with all four operations. As they work individually, in groups, and as a whole class on the problem students practice the algorithms to develop skill and fluency in carrying them out. This development process allows students to recognize special cases that can be easily handled and also provides students with an efficient, general algorithm that works for all cases within an operation.

Skills

Prior Knowledge:

- Estimating answers to whole number operations
- Estimating the size of a fraction
- Whole number operations
- Interpreting fractions as part-whole relationships
- Combining and comparing fractions
- Partitioning and repartitioning fractions
- Finding equivalent fractions
- Comparing ratios
- Finding equivalent ratios
- Recognizing which operation to use with whole numbers
- Recognizing situations in which fractions represent numbers or ratios
- Inverse operations in whole number settings (ex.: fact families)

Numeric Estimation:

- Use benchmarks and other strategies to estimate results of operations with fractions.
- Use estimates to check the reasonableness of exact computations
- Give various reasons to estimate and identify when a situation calls for an overestimate and underestimate
- Use estimates and exact solutions to make decisions

Fraction Operations:

- Determine when addition, subtraction, multiplication, and division is the appropriate operation to solve a problem
- Develop ways to model sums, differences, products, and quotients with areas, fraction strips, and number lines
- Use knowledge of fractions and equivalence of fractions to develop algorithms for adding, subtracting, multiplying and dividing fractions
- Write fact families with fractions to show the inverse relationship between addition and subtraction and between multiplication and division
- Compare and contrast dividing a whole number by a fraction to dividing a fraction by a whole number
- Recognize that when you multiply or divide a fraction your answer might be less than or more than the numbers you started with
- Solve real-world problems using arithmetic operations on fractions

Variables and Equations:

- Represent unknown real world and abstract values with variables
- Write equations (or number sentences) to represent relationships among real world and abstract values.
- Use fact families to solve for unknown values

Stage 2: Assessment Evidence

Assessments

Investigation Quiz

Formative: Other written assessments

Quiz after one investigation prior to moving on in the chapter.

Unit Test

Summative: Written Test

 Investigation 1 quiz.doc

 Investigation 3 quiz.doc

 Unit Test.doc

Stage 3: Learning Plan

Learning Activities

Suggested Learning Activities:

- Around the World
- Brownie Pan Shading
- Fraction/Decimal/ Percent Grid Picture Activity

Resources

Suggested Resources:

- Smart Board
- Pearson DASH
- Brain Pop
- Manipulative Kit
- Flashcards
- Appropriate Labsheets
- Launch Videos



Decimal Ops

Collaboration

Stage 1: Desired Results

NJ Standards

NJ: 2016 SLS: Mathematics

NJ: Grade 6

Ratios & Proportional Relationships

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

- 6.RP.A.2. Understand the concept of a unit rate a/b associated with a ratio $a:b$ with $b \neq 0$, and use rate language in the context of a ratio relationship.
- 6.RP.A.3. Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations.
- 6.RP.A.3a. Make tables of equivalent ratios relating quantities with whole-number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane. Use tables to compare ratios.
- 6.RP.A.3b. Solve unit rate problems including those involving unit pricing and constant speed.
- 6.RP.A.3c. Find a percent of a quantity as a rate per 100 (e.g., 30% of a quantity means $30/100$ times the quantity); solve problems involving finding the whole, given a part and the percent.
- 6.RP.A.3d. Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.

The Number System

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

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

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

- 6.NS.B.2. Fluently divide multi-digit numbers using the standard algorithm.
- 6.NS.B.3. Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.

Expressions & Equations

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

- 6.EE.A.2. Write, read, and evaluate expressions in which letters stand for numbers.
- 6.EE.A.2a. Write expressions that record operations with numbers and with letters standing for numbers.
- 6.EE.A.3. Apply the properties of operations to generate equivalent expressions.

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

- 6.EE.B.5. Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true.
- 6.EE.B.6. Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set.
- 6.EE.B.7. Solve real-world and mathematical problems by writing and solving equations of the form $x + p = q$ and $px = q$ for cases in which p , q and x are all nonnegative rational numbers.

Mathematical Practice

MP.The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.

- 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.

Enduring Understandings

The students will understand that estimation can be used as a tool in a variety of situations to solve problems.

- Estimation is an important part of reasoning quantitatively. It helps you make sense of a situation, allows you to recognize errors, and complements other problem-solving skills.

The students will understand that they are able to use variables to represent unknown values and number sentences to represent relationships between values.

- Writing number sentences to represent relationships between both real world and abstract values contributes to an initial understanding of algebra.
- Fact families can be used to write and solve equivalent number sentences.

Essential Questions

Investigation 1.1-

How do you decide which operation to use to solve a real world problem?

Investigation 1.2-

When you work with decimal computations, what strategies can you use to estimate the results?

Investigation 1.3-

How can you express a unit rate as a decimal then use it to solve problems?

Investigation 2.1-

How do you use place value to add two given decimal numbers?

Investigation 2.2-

How do you subtract one decimal number from another?

Investigation 2.3-

How can you determine whether fact-family relationships are true for decimal addition and subtraction?

Investigation 3.1-

How do you find the product of any two decimal numbers?

Investigation 3.2-

What algorithm can be used to find any decimal product?

Investigation 3.3-

How can a decimal division problem be written in equivalent fraction and whole number form?

Investigation 3.4-

How can you carry out a decimal division using a method similar to long division of whole numbers?

Investigation 3.5-

How can you complete a long division problem that doesn't give a whole number quotient?

That is, how do you express remainders in decimal form?

Investigation 4.1-

How do you find the tax and total cost of an item from a given selling price and tax rate?

How do you find the base price from a given tax rate and amount?

Investigation 4.2-

How do you find the tip and total cost of a restaurant meal from a given meal price and tip rate?

How do you find the meal price from a given tip percent and amount?

Investigation 4.3-

How do you find the discount and total cost of an item from a given selling price and discount rate?

How do you find the base price from a given discount rate and a dollar amount?

How can you express a change in a given amount as a percent change?

Investigation 4.4-

How do you decide which operations to perform when a problem involves decimals and percents?

Content

Problems in this unit are focused on the development of three essential understandings and skills:

1. Recognizing which operations will be helpful to solve problems.
2. Making approximate computations that provide ballpark estimates of exact computations.

Skills

Prior Knowledge:

- Connecting fractions, decimals and percents to check the reasonableness of answers, estimating to check the reasonableness of answers
- Developing algorithms for finding the area and perimeter of two-dimensional shapes

3. Performing exact calculations using reasonably efficient methods including use of a scientific calculator and common algorithms

- Interpreting decimals as fractions; understanding place value of decimals; combining and comparing decimals
- Performing mathematical operations with fractions
- Inverse operations in whole number settings
- Finding an unknown dimension when given the area
- Developing and applying algorithms for performing fraction calculations
- Defining, comparing and applying percents

Numeric Estimation.

- Use estimates to solve problems and check answers

Decimal Operations

- Recognize when addition, subtraction, multiplication or division is the appropriate operation to solve a problem
- Use place value to develop an understanding of algorithms and to relate operations with decimals to the same operations with fractions
- Extend understanding of multiplication and division of multi-digit whole numbers
- Develop standard algorithms for multiplying and dividing decimals with paper and pencil
- Find a repeating or terminating decimal equivalent to a given fraction
- Solve problems using arithmetic operations on decimals, including finding unit rates

Variables and Number Sentences

- Write number sentences to represent relationships between both real-world and abstract values
- Use fact families to write and solve equivalent number sentences
- Use multiplication sentences to check division sentences

Percents

- Develop models for percent problems
- Write and solve number sentences using percents

Stage 2: Assessment Evidence

Assessments

Unit Test

Summative: Written Test

Unit Test after chapter has been completed.

Investigation Quizzes

Formative: Other written assessments

Quizzes distributed at the end of each investigation.

Partner Quiz

Formative: Other written assessments

Quiz taken with an assigned partner.

 Decimal OPs 1 quiz.doc.docx

 Decimal OPs inv 1 quiz.doc

 Decimal Ops Check In-Inv 1.doc

 Decimal Ops Check In-Inv 2.doc

Stage 3: Learning Plan

Learning Activities

Suggested Learning Activities:

- Around the World
- Product Game
- Factor Game

Resources

Suggested Resources:

- Calculators
- Smart Board
- Pearson DASH
- Brain Pop
- Manipulative Kit
- Flashcards
- Appropriate Labsheets
- Launch Videos



Variables and Patterns

Collaboration

Stage 1: Desired Results

NJ Standards

NJ: 2016 SLS: Mathematics

NJ: Grade 6

Ratios & Proportional Relationships

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

- 6.RP.A.3. Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations.
- 6.RP.A.3a. Make tables of equivalent ratios relating quantities with whole-number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane. Use tables to compare ratios.
- 6.RP.A.3b. Solve unit rate problems including those involving unit pricing and constant speed.
- 6.RP.A.3c. Find a percent of a quantity as a rate per 100 (e.g., 30% of a quantity means 30/100 times the quantity); solve problems involving finding the whole, given a part and the percent.

The Number System

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

- 6.NS.C.6. Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates.
- 6.NS.C.6b. Understand signs of numbers in ordered pairs as indicating locations in quadrants of the coordinate plane; recognize that when two ordered pairs differ only by signs, the locations of the points are related by reflections across one or both axes.
- 6.NS.C.6c. Find and position integers and other rational numbers on a horizontal or vertical number line diagram; find and position pairs of integers and other rational numbers on a coordinate plane.
- 6.NS.C.8. Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane. Include use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate.

Expressions & Equations

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

- 6.EE.A.1. Write and evaluate numerical expressions involving whole-number exponents.
- 6.EE.A.2. Write, read, and evaluate expressions in which letters stand for numbers.
- 6.EE.A.2a. Write expressions that record operations with numbers and with letters standing for numbers.
- 6.EE.A.2b. Identify parts of an expression using mathematical terms (sum, term, product, factor, quotient, coefficient); view one or more parts of an expression as a single entity.
- 6.EE.A.2c. Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole-number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations).
- 6.EE.A.3. Apply the properties of operations to generate equivalent expressions.

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

- 6.EE.B.5. Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true.
- 6.EE.B.6. Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set.
- 6.EE.B.7. Solve real-world and mathematical problems by writing and solving equations of the form $x + p = q$ and $px = q$ for cases in which p , q , and x are all nonnegative rational numbers.
- 6.EE.B.8. Write an inequality of the form $x > c$ or $x < c$ to represent a constraint or condition in a real-world or mathematical problem. Recognize that inequalities of the form $x > c$ or $x < c$ have infinitely many solutions; represent solutions of such inequalities on number line diagrams.

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

- 6.EE.C.9. Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express

one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. For example, in a problem involving motion at constant speed, list and graph ordered pairs of distances and times, and write the equation $d = 65t$ to represent the relationship between distance and time.

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Enduring Understandings

Variables and Patterns (Relationships): Develop an understanding of variables and how they are related.

- In many real world situations, one variable quantity depends on another. Tables, graphs, and equations are various representations that can be used to better understand the pattern of change between variable and quantities.
- Not all relationships are linear. Linear relationships have a constant rate of change between variables and are written in the form $y=mx$, $y=x+b$, $y=b+mx$.

Expressions and Equations: Develop understanding of expressions and equations

- There is more than one way to write an expression to model a real world situation. Properties of operations allow you to generate equivalent expressions and check equivalence.
- Solutions for equations and inequalities can be found by examining the table or graph of the equation or by re-writing it as a related equation.

Essential Questions

Investigation 1.1-

How can you construct a graph from a table of data that depicts change over time?

How is this pattern of change represented in the graph?

Investigation 1.2-

What are the advantages and disadvantages of tables and graphs in representing and describing the pattern of change in a variable over time?

Investigation 1.3-

Which representation of data—table, graph, or written notes— seems to better show patterns of change in distance over time? Why?

Investigation 1.4-

How do you calculate average speed for a trip?

How do a table and graph of (time, distance) data show speed?

Investigation 2.1-

How do you analyze and compare the relationship between variables given in different representations?

Investigation 2.2-

How are the relationships between independent and dependent variables in this problem different from those in problem 2.1?

How are the differences shown in tables and graphs of data?

Investigation 2.3-

How are the variables tour income and tour profit related to each other?

How do you plot data points with one or both coordinates negative?

Investigation 2.4-

When the relationship between dependent and independent variables is displayed in a graph what can you learn about the relationship from a rising graph, a level graph, and a falling graph?

Investigation 3.1-

In what kinds of situations will the equation for the relationship between dependent and independent variables be in the form $y=x+k$? $y=x-k$? $y=kx$? $y=x/k$?

Investigation 3.2-

What can you tell about the relationship between dependent and independent variables in an equation of the form $y=mx$?

How is that relationship shown in a table and a graph of sample (x, y) values?

Why is the point $(1, m)$ on every graph?

Investigation 3.3-

How do you calculate values of y from an equation like $y=3x+5$ when values of x are given? How about $y=5+3x$?

When do you need such equations that involve two operations?

Investigation 3.4-

When an equation relating two variables involve two or more operations how do you use the equation to find values of the dependent variable from given values of the independent variable?

Investigation 4.1-

Is it possible to have two different but equivalent expressions for a given situation? Explain.

Investigation 4.2-

What does it mean to say that two algebraic expressions are equivalent?

Investigation 4.3-

How can expressions such as $3x+7x$ or $3(x+2)$ be written in equivalent form?

Investigation 4.4-

What strategies can you use to solve equations in the forms $x+a=b$, $x-a=b$, $ax=b$ and $x/a=b$ (a cannot equal zero)?

Investigation 4.5-

How can you represent and find solutions for inequalities?

Content

The objective is to develop student ability to recognize, describe, and analyze two kinds of relationships between variables

1. Change in the value of a single variable over time
2. Change in the value of a dependent variable as it responds to the change in value of a related independent variable

Students should learn how to reason about those relationships using numeric, graphic, symbolic, and verbal representations.

Skills

Prior Knowledge:

- Analyzing patterns to develop concepts of area and volume.
- Developing algorithms for operations of fractions and decimals.
- Identifying patterns in number and geometry
- Analyzing maximum and minimum values in measurement
- Organizing, displaying, and interpreting data in one-and two-dimensional graphs and tables
- Constructing graphs of the relationship between the dimensions and area of a rectangle when the perimeter is held constant
- Developing operation algorithms for fractions, decimals, and percents
- Developing rules for perimeter
- Using four function calculators for computation

Variables and Patterns

- Explore problem situations that involve variables and relationships
- Identify the dependent and independent variable and describe how they are related in a situation
- Interpret the "stories" told by patterns in tables and coordinate graphs of numeric (x,y) data
- Represent the pattern of change that related two variables in words, data tables, graphs, and equations.
- Investigate situations that change over time
- Examine increasing and decreasing patterns of change
- Compare linear and nonlinear patterns of change by using tables or graphs
- Use tables, graphs, and equations to find the value of a variable given the value of the associated variable
- Explore relationships that require graphing in all four quadrants
- Describe advantages and disadvantages of using words, tables, graphs, and equations to represent patterns of change relating two variables and make connections across those representations
- Write an equation to express the relationship between two variables in one and two operations: $y=mx$, $y=b+x$, $y=b+mx$
- Calculate average speed and show how it is reflected in a table or graph and vice versa
- Recognize and express direct proportionality relationships with a unit rate ($y=mx$) and represent these relationships in rate tables and graphs
- Solve problems that involve variables

Expressions and Equations

- Use properties of operations including the distributive property and order of operations to write equivalent expressions for the dependent variable in terms of the independent variable

- Use tables, graphs, or properties of numbers such as the distributive property to show that two expressions are equivalent
- Identify parts of an expression using mathematical terms (sum, term, product, factor, quotient, coefficient); view one or more parts of an expression as a single entity
- Interpret and evaluate expressions in which letters stand for numbers and apply the order of operations as needed
- Recognize that equations are statements of equivalence between two expressions
- Solve linear equations of the forms $y=ax$, $y=b+x$, and $y=b+ax$ using numeric guess and check, tables of coordinates (x,y) values and graphs or fact families
- Write an inequality and associate it with an equation to find solutions and graph the solutions on a number line

Stage 2: Assessment Evidence

Assessments

Investigation Quizzes

Formative: Other written assessments

Quizzes at the end of each investigation to assess students' understanding before moving on.

White Board Review

Formative: Other Visual Assessments

White board review of concepts before summative assessment to see how well students grasp material.

Unit Test

Summative: Written Test

Unit test after chapter.

 Investigation 1 quiz.doc

 Investigation 3 quiz.doc

 VARIABLES PATTERNS TEST.doc

Stage 3: Learning Plan

Learning Activities

Suggested Learning Activities:

- Around the World
- Jumping Jack Activity
- 4-quadrant Graphing Pictures

Resources

Suggested Resources

- Smart Board
- Timers
- Pearson DASH
- Brain Pop
- Manipulative Kit
- Flashcards
- Appropriate Labsheets
- Launch Videos



Covering and Surrounding

Collaboration

Stage 1: Desired Results

NJ Standards

NJ: 2016 SLS: Mathematics

NJ: Grade 6

The Number System

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

- 6.NS.C.7c. Understand the absolute value of a rational number as its distance from 0 on the number line; interpret absolute value as magnitude for a positive or negative quantity in a real-world situation.
- 6.NS.C.8. Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane. Include use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate.

Expressions & Equations

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

- 6.EE.A.2. Write, read, and evaluate expressions in which letters stand for numbers.
- 6.EE.A.2a. Write expressions that record operations with numbers and with letters standing for numbers.
- 6.EE.A.2c. Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole-number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations).
- 6.EE.A.3. Apply the properties of operations to generate equivalent expressions.
- 6.EE.A.4. Identify when two expressions are equivalent (i.e., when the two expressions name the same number regardless of which value is substituted into them).

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

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

Geometry

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

- 6.G.A.1. Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems.
- 6.G.A.2. Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths, and show that the volume is the same as would be found by multiplying the edge lengths of the prism. Apply the formulas $V = lwh$ and $V = Bh$ to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems.
- 6.G.A.3. Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate. Apply these techniques in the context of solving real-world and mathematical problems.
- 6.G.A.4. Represent three-dimensional figures using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures. Apply these techniques in the context of solving real-world and mathematical problems.

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Enduring Understandings

Area and Perimeter- Understand area and perimeter as a measure.

- Perimeter is a measure of linear units needed to surround a two-dimensional shape and that area is a measure of square units needed to cover a two-dimensional shape.
- A fixed number of area units can be enclosed by many different perimeters, and a fixed number of perimeter units can enclose many different areas.
- Formulas for the area and perimeter of a rectangle can help you solve problems by reasoning about the relationship between values.

Area and Perimeter of Parallelograms and Triangles- Understand the area of parallelograms and triangles.

- Linear measurements of the base, height, and slanted height of parallelograms and triangles are essential to finding the area and perimeter of these shapes.
- There are many triangles (and parallelograms) that can be drawn with the same base and height.
- The area of a triangle and the area of a parallelogram are related to each other and to the area of a rectangle.
- Polygons and irregular figures can be decomposed into triangles and rectangles to find the area of the figures.

Surface area of prisms and pyramids and volume of rectangular prisms- Understand the surface area and volume of a three-dimensional shape.

- The volume of a prism is a measure in cubic units of the capacity of the prism and can be thought of as multiplying a base layer of unit cubes by the number of layers needed to fill the prism.
- Surface areas of three-dimensional solids can be found by adding the areas of the faces

Essential Questions

Investigation 1.1-

What are the formulas for finding the area and perimeter of a rectangle? Explain why they work.

Investigation 1.2-

For a fixed area, what are the shape and perimeter of the rectangles with the greatest and least perimeters?

Investigation 1.3-

For a fixed perimeter, what are the shape and area of the rectangles with the greatest and least area?

Investigation 2.1-

What is a formula for finding the area of a triangle?

Investigation 2.2-

Does it make any difference which side is used as the base when finding the area of a triangle?

Investigation 2.3-

What can you say is true and what can you say is not true about triangles that have the same base and height?

Investigation 2.4-

What conditions for a triangle produce triangles that have the same area? Do they have the same shape? Explain.

Investigation 3.1-

What is a strategy for finding the area of a parallelogram? Explain why the strategy works.

Investigation 3.2-

What can you say about two parallelograms that have the same base and height?

Investigation 3.3-

Under what conditions will two or more parallelograms have the same area? Do these parallelograms have the same shape? Explain.

Investigation 3.4-

How can you find the area of a polygon drawn on a coordinate graph? On grid paper?

Investigation 4.1-

What is a strategy for finding the surface area of a rectangular prism? Explain why this strategy works.

Investigation 4.2-

What is a strategy for finding the volume of a rectangular prism? Explain why the strategy works.

Investigation 4.3-

What is a strategy for finding the surface area of a three-dimensional object? Explain why the strategy works.

Content

This unit was developed to help students understand measurement of polygonal surfaces and three-dimensional objects. Students study four kinds of measurements appropriate for grade 6:

- perimeter
- area
- surface area
- volume

The problems in this unit are structured so that students can build a strong understanding of what it means to measure area, perimeter, surface area, and volume. They will develop strategies for measuring perimeter and area of both rectangular and non-rectangular shapes. Students use their

Skills

Prior Knowledge:

- Side lengths of polygons
- Finding area of rectangles by covering and counting
- Finding area of nonrectangular shapes by composing and decomposing into rectangles
- Exploring the relationship between area and perimeter
- Using rectangular models to perform operations with rational numbers and understand the distributive property and find factor pairs of whole numbers
- Collecting data and looking for and generalizing patterns
- Performing operations with rational numbers
- Estimating sums of rational numbers

understanding of rectangles to develop strategies for finding the area of triangles, parallelograms, and other polygons. They will then extend their knowledge to find the surface area and volume of three-dimensional figures.

For the area of polygons, students determine the number of square units needed to cover the surface of the shape. For the perimeter of polygons, students find the number of linear units needed to surround the shape. They look for patterns or regularities that lead to more efficient strategies and formulas.

Area and Perimeter

- Deepen the understanding of area and perimeter of rectangular and non-rectangular shapes
- Relate area to covering a figure
- Relate perimeter to surrounding a figure
- Analyze what it means to measure area and perimeter
- Develop and use formulas for calculating area and perimeter
- Develop techniques for estimating the area and perimeter of an irregular figure
- Explore relationships between perimeter and area including that one can vary considerably while others stay fixed
- Visually represent relationships between perimeter and area on a graph
- Solve problems involving area and perimeter of rectangles

Area and Perimeter of Parallelograms and Triangles

- Analyze how the area of a triangle and the area of a parallelogram are related to each other and to the area of a rectangle
- Recognize that a triangle can be thought of as half of a rectangle whose sides are equal to the base and height of a triangle
- Recognize that a parallelogram can be decomposed into two triangles. Thus, the area of a parallelogram is twice the area of a triangle with the same base and height as the parallelogram
- Know that the choice of base of a triangle (or parallelogram) is arbitrary but that the choice of the base determines the height
- Recognize that there are many triangles (or parallelograms) that can be drawn with the same base and height
- Develop formulas and strategies stated in words or symbols for finding the area and perimeter of triangles and parallelograms
- Find the side lengths and area of polygons on a coordinate grid
- Solve problems involving area and perimeter of parallelograms and triangles
- Solve problems involving area and perimeter of polygons by composing into rectangles or decomposing into triangles

Surface Area of Prisms and Pyramids and Volume of Rectangular Prisms

- Extend the understanding of the volume of rectangular prisms
- Relate volume to filling a three-dimensional figure
- Extend understanding of the strategies for finding the volume of rectangular prisms to accommodate fractional side lengths
- Relate finding area of two-dimensional shapes to finding the surface area of three-dimensional objects
- Develop strategies for finding the surface area of three-dimensional objects made from rectangles and triangles
- Solve problems involving surface area of prisms and pyramids and volume of rectangular prisms

Stage 2: Assessment Evidence

Assessments

Partner Quiz

Formative: Other written assessments

Quiz with a partner to check for understanding of material.

Unit Test

Summative: Written Test

Unit test after chapter.

 Covering Surrounding Test.doc

 Investigaion 2 Quiz.doc

 Investigation 3 quiz.doc

Stage 3: Learning Plan

Learning Activities

Suggested Learning Activities:

- Around the World

Resources

Suggested Resources:

- Smart Board
- Pearson DASH
- Brain Pop
- Manipulative Kit
- Flashcards
- Appropriate Labsheets
- Launch Videos
- PARCC Reference Sheet



Data About Us

Collaboration

Stage 1: Desired Results

NJ Standards

NJ: 2016 SLS: Mathematics

NJ: Grade 6

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

The Number System

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

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

Statistics & Probability

6.SP.A. Develop understanding of statistical variability.

- 6.SP.A.1. Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers.
- 6.SP.A.2. Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape.
- 6.SP.A.3. Recognize that a measure of center for a numerical data set summarizes all of its values with a single number, while a measure of variation describes how its values vary with a single number.

6.SP.B. Summarize and describe distributions.

- 6.SP.B.4. Display numerical data in plots on a number line, including dot plots, histograms, and box plots.
- 6.SP.B.5. Summarize numerical data sets in relation to their context, such as by:
 - 6.SP.B.5a. Reporting the number of observations.
 - 6.SP.B.5b. Describing the nature of the attribute under investigation, including how it was measured and its units of measurement.
 - 6.SP.B.5c. Giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered.
 - 6.SP.B.5d. Relating the choice of measures of center and variability to the shape of the data distribution and the context in which the data were gathered.

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Enduring Understandings

Statistical Process: Understand and use the process of statistical investigation.

- The process of statistical investigation involves posing questions, collecting and analyzing data, and interpreting answers

Data Displays: Understand the role of multiple representations of data distributions.

- Finding measures of center or variability and graphing data are used for summarizing the information in a variable data set.
- Visual representations of a data set can help you interpret the measures of center and spread and relate this to the overall shape of the representation

Attributes of data: Distinguish data and data types.

- The answers to a statistical question are called data. Data can be either numerical or categorical.

Measures of Central Tendency and Variability: Understand that a single number may be used to characterize the center of a distribution of data and the degree of variability.

- There are several ways to try to say what is typical of a data set. In each case, a single number called a measure of center summarizes the data because various measures of center are calculated differently, they respond differently to changes in the data or to unusual data values.
- The variability of a set of data can be measured, interpreted, and compared with the variability of other data sets. Measures of variability tell you how spread out the data are in relation to each other or to the center.

Content

Students will learn about the process of statistical investigations. They will also construct and analyze distributions of data. They will compare data distributions by using what they know about measures of center and spread. Statistical investigations involve a set of four interrelated components:

1. Posing a question
2. Collecting the data
3. Analyzing the Data
4. Interpreting the results

Students are able to use the data presented in the investigations, or they are able to collect their own set of data.

Essential Questions

Investigation 1.1-

What are "data"?

How do you represent data using a frequency table or a line plot?

How can you compare two distributions of data?

Investigation 1.2-

What are measures of central tendency and variability (or spread)?

How do you compute and use mode and range?

Investigation 1.3-

How do you identify and use the median?

How can you compare two distributions of data using the medians?

Investigation 2.1-

How do you go about finding the number that is a good estimate of typical household size based on the given data?

Investigation 2.2-

How do you interpret, compute and use the mean?

Investigation 2.3-

How do the median and the mean respond to the data in a distribution?

How do you choose which measure of center to use when describing what is typical?

Investigation 2.4-

How do you distinguish different types of data?

What statistics are used with different types of data?

Investigation 3.1-

What information does the interquartile range (IQR) provide about how data vary in a distribution?

Investigation 3.2-

How is the IQR used to make comparisons among distributions?

Investigation 3.3-

What information does the Mean Absolute Deviation (MAD) provide about how data vary in a distribution?

Investigation 4.1-

How can you use a histogram to help you interpret data?

Investigation 4.2-

How can you interpret data using a box-and-whisker plot?

Investigation 4.3-

How can you compare and contrast data represented by dot plots, histograms, and box plots?

Skills

Prior Knowledge:

- Analyzing and classifying counting and rational numbers
- Representing the number of factors of a counting number
- Graphing rectangular lengths and widths with constant perimeter or constant area
- Ordering numbers from least to greatest
- Comparing, counting and ordering numbers
- Using arithmetic operations

Statistical Process:

- Ask questions, collect and analyze data, and interpret data to answer questions
- Describe data with respect to its shape, center, and variability or spread
- Construct and use simple surveys as a method of collecting data

Attributes of Data:

- Recognize that data consists of counts or measurements of a variable or an attribute. These observations comprise a distribution of data values

- Distinguish between categorical data and numerical data and identify which graphs and statistics can be used to represent each kind of data

Multiple Representations for Data Displays:

- Organize and represent data using tables, dot plots, line plots, ordered value bar graphs, frequency bar graphs, histograms, and box and whisker plots
- Make informed decisions about which graphs or tables can be used to display a particular set of data
- Recognize that a graph shows the overall shape of a distribution whether the data values are symmetrical around a central value and whether the graph contains any unusual characteristics, such as gaps, clusters or outliers.

Measures of Central Tendency and Variability:

- Distinguish between and compute measures of central tendency (mean, median, and mode) and measures of spread (range, interquartile range (IQR), and mean absolute deviation (MAD))
- Identify how the median and mean respond to changes in the data values of a distribution
- Relate the choice of measures of central tendency and variability to the shape of the distribution and the context
- Describe the amount of variability in a distribution by noting whether the data values cluster in one or more areas or are fairly spread out
- Use measures of center and spread to compare data distributions

Stage 2: Assessment Evidence

Assessments

Investigation Quiz

Formative: Other written assessments

Quiz at the end of an investigation before moving on to a new skill.

Unit Test

Summative: Written Test

Unit test for entire chapter

 Investigation 3 quiz.doc

 Unit Test.doc

Stage 3: Learning Plan

Learning Activities

Suggested Learning Activities:

- Around the World
- Surveying the class to collect Data

Resources

Suggested Resources:

- Smart Board
- Highlighters
- Centimeter Grid Paper
- Pearson DASH
- Brain Pop
- Manipulative Kit
- Flashcards
- Appropriate Labsheets
- Launch Videos

- Calculators
- BIG Ideas Math Resources book