South Brunswick School District

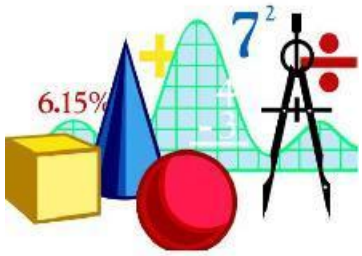
Curriculum Guide for Grades 3-5 Mathematics

Curriculum Aligned to NJ CCSS: August 2012

District Mission

The South Brunswick School District will prepare students to be lifelong learners, critical thinkers, effective communicators and wise decision makers. This will be accomplished through the use of the New Jersey Core Curriculum Content Standards (NJCCCS) and/or the Common Core State Standards (CCSS) at all grade levels. The schools will maintain an environment that promotes intellectual challenge, creativity, social and emotional growth and the healthy physical development of each student.

~Adopted 8.22.11



Annual Board Approval of Mathematics Curriculum
August 2016

This curriculum is approved for all regular education programs as specified and for adoption or adaptation by all programs including those for Special Education, English Language Learners, At-Risk Students and Gifted and Talented Students in accordance with Board of Education Policy.

Mathematics Acknowledgments

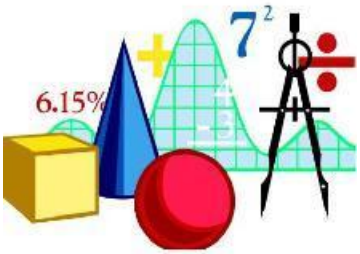
We are appreciative of the leadership provided by our curriculum specialists and the knowledge, skills, work and effort of the teachers who served on our curriculum writing teams. In many cases, our units are "home-grown." While aligning with state and national standards, they are designed with the needs of the South Brunswick student population in mind.

Articulation

The Supervisors, Specialists, Curriculum Chairpersons, Technology Staff Developers, Directors and the Assistant Superintendent for Curriculum and Instruction meet for articulation at roundtables and ongoing administrative and content meetings throughout the year.

Among the topics of discussion are the following: curriculum review cycle, curriculum mapping, resources (ordering, budgeting, inventory), lesson plans, observation look-fors, professional development, NJ Quality Single Accountability Continuum and academic achievement, placement, acceleration, enrichment, basic skills, instructional support, technology proficiencies and content-specific technologies, formative and summative assessments, and various curriculum tasks.

Mathematics Curriculum Development Teams comprised of teachers at every grade level along with representative special education meet together throughout the year as needed. In a time period of major revision, the teams will meet with greater frequency.



Go down deep enough into anything and you will find mathematics.
~Dean Schlicter

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PREAMBLE TO THE MATHEMATICS CURRICULUM

Mission Statement

The South Brunswick Mathematics Program will be based on a well-articulated curriculum that is aligned with standards, has interwoven technology, is connected in meaningful ways to other curriculum and real life, that provides for differentiated needs of students, that is taught by teachers who are well-grounded in and comfortable with both content and methodology, and that leads to equity and excellence in math achievement for all children.

South Brunswick's Beliefs

1. Develop concepts concretely, pictorially, and then abstractly. Students use manipulatives to model abstract ideas, to represent the models as pictures, and finally to translate the model and/or picture into symbolic notation. Sometimes the transition from concrete to abstract takes years, as in the case of multi-digit addition computation; other times the transition may take a few class sessions, as in the case of multiplying fractions.

2. Require students to justify their answers. During class discussions and in written work students should always be asked *why*. Students should be able to verbalize, model, and to write the reason an answer has been given.

3. Provide time for students to write and talk mathematics. Students keep a math journal and discuss mathematical ideas as part of cooperative groups and as part of the whole class. Writing and talking mathematics allows students to clarify and explain thinking, justify answers, explain strategies, ask questions, listen to others, and react to ideas.

4. Develop problem situations from other content areas and from everyday experiences. Science, social studies, and language content are integrated into mathematics lessons. For example, when introducing 2-digit addition, the initial concrete model might be developed out of a social studies unit on Community Helpers. If the class has graphed the number of people going into different municipal buildings, finding the number of people going into 2 or 3 of the buildings together can begin the development of a 2-digit addition algorithm.

5. Give attention to connections among topics in math, between math and other content areas, and between math and daily life. Students should recognize, for example, that the array model of multiplication, the area of a rectangle, and paper folding to multiply fractions are all based on the same idea. Students should use strategies developed in math lessons in their work with other content and in their daily lives

6. Always encourage use of multiple strategies. For example, a large number of objects can be counted in several ways: by ones, by twos, by grouping into tens or by matching with a hundred-number board. Along with traditional algorithms, students should explore alternate methods of computation, including computational strategies developed by the students themselves.

7. Have students estimate quantities. Students then use that estimate to check reasonableness of answers. Estimate lengths, weights, and so on before measuring. Put out a handful of cubes and estimate the quantity.

8. Make mental math a part of any computation. Encourage students to calculate mentally. Help them to take the risk of giving an answer without using pencil and paper first. Mental math strategies are treated as

just another way, together with pencil and paper, calculators, concrete models, and pictorial models to calculate an answer.

9. Urge students to choose their tools and methods. Students are encouraged to choose among many different methods for problem solving (draw a picture, guess and check, write an equation, and so on), for calculating answers (mental math, paper and pencil, estimation, calculator), and for modeling (base ten blocks, money, geo-boards, counters, and so on).

10. Integrate computers and calculators into mathematics lessons. Students need to begin to choose technology as a tool. Graphing programs are one way to display data; spreadsheet programs are used to solve problems; calculators allow students to deal with more complicated numbers. Students should be offered the opportunity to use online virtual manipulatives, Internet resources and interactive whiteboards when available. Calculators allow students to deal with more complex problem solving.

11. Have students work in a variety of settings. The choice of settings - cooperative groups, pairs of students, individuals, and whole groups - depends on the teacher's objective and the specific content of the lesson. Students should be exposed to each kind of setting throughout the school year.

12. Design, develop, implement and evaluate digital-age learning experiences and assessments. For example, use of classroom technologies such as interactive whiteboards, projection devices, digital hardware and software.

Program Delivery

Our math classrooms are effective standards-based environments that foster understanding of big mathematical ideas, help students make connections between learning experiences, and enable students to see themselves as mathematicians. There are varied "math paths" that students follow during their course of study in South Brunswick.

Elementary School:

- Grade Level Math & Differentiation
- Accelerated Math K-5

Middle School:

- 6th Grade Unit Math
- 6th Grade Transitions (accelerated math)
- Pre-Algebra
- Concepts of Algebra
- Algebra I
- Geometry
- Algebra II (taken on the HS campus)

High School:

- Core Courses (3-Year Sequence): Algebra I[1], Geometry, Algebra II
- Illustrative Math Electives: Pre-Calculus, Calculus, Statistics, Discrete Math, Computer Science[2]
- Note: Many students begin the core sequence during their middle school years, which allows for them to take up to three Advanced Placement level courses. Although only three years of

[1] Algebra I is a graduation requirement.

[2] Computer Science for the 21st Century also meets the mandate for 21st Century.

mathematics is required for graduation, the majority of South Brunswick students take four years of math. Recognizing the differing needs of our students, all of the courses offered have several levels, including Elements, Regular, Advanced, and Honors/AP

Resources

The following are resources used in our mathematics programs.

Elementary School

- Investigations in Data, Number, and Space
- Scott Foresman-Addison Wesley Mathematics
- On Core Mathematics (Houghton Mifflin Harcourt)
- Manipulatives: Hands-on and virtual
- Technologies: Scott Foresman and Calculators (Grades K-1: Calc-U-Vue; Grades 2-5: TI-108)
- SMART Boards (interactive whiteboards)
- Model classroom technologies: projectors, DVD players, speakers
- Study Island (Grades 3-5)
- Accelerated 5th Grade Math- MathScape, Connected Math

Middle School

- 6th Grade Unit Math- Big Ideas
- Accelerated 6th Grade Math- Big Ideas Advanced I
- 7th-8th McDougal Littell Pre-Algebra, Grade 7 Big Ideas Math, Grade 8 Big Ideas Math, Holt McDougal Algebra I, Jurgeuson Geometry
- Manipulatives; Hands-on equations, communicators (mini-whiteboards), integer tiles, and 3-D prisms and cubes
- Technologies: SMARTBoards (interactive whiteboards); document camera; Texts Web sites & Homework Helplines; Calculators (TI 30SX II, TI-84); Study Island

High School

- Anchor Texts: Holt McDougal Texts, Houghton Mifflin Texts
- Technologies: Graphing Calculators (TI 84 and TI 89); Geometer Sketchpad
- SMART Board (interactive whiteboards)

Assessments

There are multiple and varied forms of assessment at each grade level. What follows is a list of the key assessment tools used at each level.

Assessments at the Elementary Level

- District-made Beginning of Year Math Assessment for Kindergarten
- Mid-Year Check In for Kindergarten
- District-made End of Year Competency Tests K-5
- District-made End of Year Math Acceleration Tests K-5
- District-made Pre and Posttests for grades 1-5
- State Assessments (PARCC 3-5)
- Mad Minute Drills/Otter Creek Drills
- Teacher-Made Tests, Projects

Assessments at the Middle Level:

- Teacher-made Tests, Quizzes & Projects
- District-made Pre and Post Assessments

- Mid Terms and Final exams for Algebra and Geometry (advanced math)
- Crossroads (District Placement) Test
- Algebra Predictive Test for placement
- State Assessments (PARCC 6-8)

Assessments at the High School Level

- Teacher-made tests, quizzes and projects
- District-made Pre and Post Assessments
- Midterms and final exams (upper level courses)
- Final exams (core courses)
- State Assessments (PARCC 9-11)
- SAT, PSAT, ACT, Accuplacer, ASVAB
- AP exams

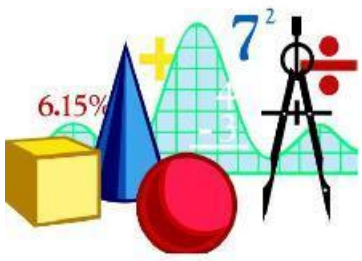
Curriculum Content Standards for Mathematics

The South Brunswick mathematics curriculum was developed to meet the objectives as stated in the NJ State Department of Education Core Curriculum Content Standards 2009 and/or the Common Core State Standards 2010. Technology Education, 21st Century Life and Career Education, and Character Education lessons are embedded where meaningful. Cross-curricular connections are purposely and explicitly noted.

The curriculum is written in the Understanding by Design format and is based on enduring understandings (broad concepts) with essential questions and both formative and summative assessments.

Complete copies of the standards for mathematics may be found at:
Common Core State Standards Initiative (CCSSI)http://www.corestandards.org/
http://www.state.nj.us/education/cccs/http://www.state.nj.us/education/cccs/

ELEMENTARY MATH



Elementary Math Curriculum Overview Statement

The South Brunswick elementary mathematics program is based on a rigorous curriculum that provides our students with the mathematical skills and flexible thinking that will enable them to be strong mathematical thinkers. Our program promotes deep conceptual understanding that goes beyond calculations - challenging students to be flexible with numbers, to adapt their skills to multiple mathematical situations, and to communicate their strategies and justify their solutions.

In line with the Common Core State Standards, our K-5 students will be provided with a solid foundation in number sense and encouraged to develop meaningful strategies which will be retained, developed, and refined as they develop more complex skills. Students are encouraged to develop their own problem-solving strategies, engage in mental math, and solve problems and perform calculations in more than one way.

The District has adopted three standards-based math programs, *Investigations in Number, Data, and Space, On Core Mathematics,* and *Scott Foresman Mathematics*. These resources are used in combination to deliver a balanced math program. These, along with other resources, including manipulatives, games, computer software, and calculators, help the teachers deliver a program with high levels of rigorous mathematical thinking skills.

CURRICULUM MAP: K-2

Based on Common Core State Standards (CCSS)- Mathematics

Kindergarten	Essential Questions	Enduring Understandings
Number Sense	● How do numbers represent and define value? ● How do we use numbers in everyday life?	● Numbers have relative value. ● There are many ways to represent a number.
Numerical Operations	● Numbers have relative value. ● There are many ways to represent a number.	● Relationships between numbers can be expressed with words or symbols. ● There are a variety of ways to represent quantities.
Measurement & Data	● What important information does a chart or table provide? ● How do charts, tables, and graphs help you interpret data? ● How do you use measurement in your life?	● Everyday objects have variety of attributes that can be measured in many ways. ● Data can be organized in meaningful ways so it can be interpreted and analyzed.
Geometry	● Where in the real world would I find patterns? ● Where in the real world would I find shapes? ● In what ways can I match geometric figures to real-world objects? ● How can I put shapes together and take them apart to form other shapes?	● Objects can be described, compared, and classified by geometric attributes. ● Patterns are a way to recognize order and to organize the world.
1st Grade	**Essential Questions**	**Enduring Understandings**
Number Sense & Base 10	● How do numbers represent and define value? ● What are the relationships between numbers?	● Numbers have relative value. ● There are many ways to represent a number. ● Quantities can be counted and compared.
1st Grade Operations & Algebraic Thinking	● How do addition and subtraction relate to each other? ● How do I know which operation to use to solve a problem? ● How do I determine which computational strategy to use?	● Mathematical expressions represent relationships. ● In everyday life, we combine and separate quantities to solve problems. ● `More efficient computation occurs when using combinations of 10.
Measurement & Data	● Why do we use measurement? ● Why is telling time essential for our daily lives? ● How & why do we organize information?	● Everyday objects have a variety of attributes that can be measured in many ways. ● Measurement can be used to compare lengths. ● Time is measured in hours and minutes. ● Data can be organized in meaningful ways so that it can be interpreted and

		analyzed.
Geometry	● How are geometric properties used to solve problems in everyday life?	● Objects can be described, compared, and classified by geometric attributes. ● Many geometric shapes can be divided into equal parts.
2nd Grade	**Essential Questions**	**Enduring Understandings**
Place Value	● How does a number's position affect its value? ● How are place value patterns repeated in numbers?	● Our Base 10 number system determines a digit's value.
Addition & Subtraction/Numbers and Operations in Base 10	● What strategies can be used to find sums and differences? ● How do mathematical operations relate to each other? ● What are strategies for making a reasonable estimation?	● Flexible methods of computation involve grouping numbers in strategic ways. ● Estimation is a way to get an approximate answer. ● Proficiency with basic facts aids estimation and computation of larger and smaller numbers.
Foundations for Multiplication	● How are patterns used to communicate mathematical concepts? ● What is the relationship between products and sums?	● There is a relationship between multiplication and addition. ● Multiplication can be a more efficient strategy for solving problems. ● There is a connection between the numerical concept of multiplication and the geometric concept of area (arrays).
Measurement & Time	● Why is it important to use standard units of measure? ● How and why do we organize information? ● How is telling time used in our daily lives?	● Standard units provide a common language for communicating measurement accurately. ● Data can be organized in meaningful ways so that it can be interpreted and analyzed. ● Time is measured in hours and minutes.
Geometry	● How are geometric properties used to solve problems in everyday life?	● Objects can be described, compared, and classified by geometric attributes. ● Many geometric shapes can be divided into equal parts.

Note: K-2 Curriculum located in the K-2 Math Curriculum Guide.

CURRICULUM MAP: 3-5

Based on Common Core State Standards (CCSS)- Mathematics

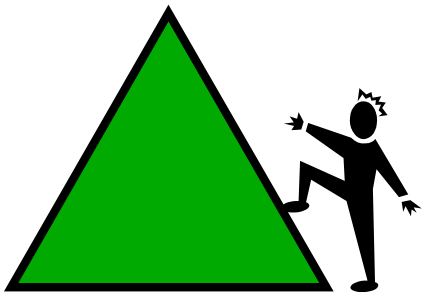
3rd Grade	Essential Questions	Enduring Understandings
Number and Operations in Base 10	● How does a number's position affect its worth? ● What strategies can be used to find sums and differences? ● How can the properties of operations be used to find reasonable estimations and to explain/justify answers? ● How do we represent currency and add/subtract money amounts?	● The value of a digit in our number system is determined by its place value position. ● Numbers can be decomposed and recomposed into component parts to add and subtract multi-digit numbers efficiently. ● Our society uses a base 10 number system ● Using place value builds understanding when regrouping is necessary.
Multiplication & Division	● What is the relationship between products & sums, quotients and differences? ● What strategies can be used to solve multiplication/division problems? ● How can the properties of operations be used to explain/justify answers?	● Multiplication and division situations involve equal-size groups, arrays, and/or area models. ● Multiplication and division are inverse operations. ● The commutative, associative, and distributive properties can be used to develop efficient strategies to multiply and divide.
Measurement & Data – Area & Perimeter	● How are area and perimeter different? ● How can you apply rules of the distributive property by finding the area of two smaller figures to find the total area of a figure? ● How can you classify objects according to their attributes?	● Area and perimeter are attributes used to describe and measure 2D figures. ● Understand that rectangular arrays can be decomposed into identical rows or columns.
Number & Operations - Fractions & Geometry	● How can we represent fractions & equivalent fractions using visual models, including number lines? ● Why do we need to consider the size of a whole before comparing the same size fractions? (Think: Comparing ½ of a large pizza to ½ of a small pizza) ● How do you express a whole number as a fraction? (Ex: 3 in the form of 3/1 or locating 4/4 as "1" on a number line) ● How can you classify objects according to their attributes?	● Fractions are a special type of number. o Fractions refer to parts of wholes. o Fractions fall between whole numbers on a number line. ● Unit fractions are the building blocks of all other fractions. o Understand that a fraction is made up (composed) of many pieces - "unit fractions -" which have a numerator of 1. ● We need to consider the size of the "whole" when comparing fractions of the same size. (Ex: ½ of a large pizza is a different size than ½ of a small pizza) ● Shapes in different categories may share

		attributes and the shared attributes can define a larger category.
Measurement & Data	● How and why do we organize information? ● How can we estimate the weight of an object? (Think: How do we choose the appropriate unit of measure?) ● How do we measure the volume of objects/liquids?	● Standard units enable people to measure data in the same way. ● Data can be organized, represented, and interpreted in multiple ways for a variety of purposes. ● Larger units can be subdivided into equivalent units.
4st Grade	**Essential Questions**	**Enduring Understandings**
Place Value and Addition & Subtraction	● What is the relationship among the values of each digit in a multi-digit number? ● How can numbers be compared? ● How and why do we use both rounding and estimation?	● The value of numbers is determined by our base-ten number system. ● Symbols can be used to record number comparisons. ● Estimation skills are essential in daily life.
Multiplication & Division- Operations and Algebraic Thinking	● What are factors and multiples? ● What are the different strategies that can be used to solve multiplication or division problems? ● What is the relationship between multiplication and division?	● Factors and multiples can be used to determine part-whole relationships. ● By utilizing varied and efficient methods of multiplication and division, more complex problem solving is possible. ● You can use multiplication to solve division problems.
Geometry and Geometric Measurement	● How can geometric attributes be drawn, recognized, and classified? ● How can we measure angles? ● How can we find area and perimeter using formulas?	● Objects can be described, compared, and classified by geometric attributes. ● Angles within geometric shapes can be measured with a protractor. ● Area and perimeter can be found through using formulas.
Fractions and Decimals	● What are fractions composed of? How can they be decomposed? ● What strategies can be used to add, subtract, and multiply fractions? ● How are fractions and decimals related? ● What strategies can be used to compare fractions and decimals?	● Fractions are built from unit fractions (fractions with a numerator of 1) through the process of addition and multiplication. ● You can use visual fraction models and equations for adding and subtracting fractions, and for multiplying a fraction by a whole number. ● Fractions and decimals can represent the same quantities. ● You can use visual models and place value to compare fractions and decimals.
Data Analysis and Measurement	● What strategies can be used to solve measurement problems? ● How can units be converted within a system of measurement? ● How can you represent data?	● By utilizing varied and efficient methods, we can solve measurement problems. ● Within a system of measurement, the larger units are made from smaller units. ● Smaller units are divisions of a larger unit.

		● Line plots can be used to represent data.
5th Grade	**Essential Questions**	**Enduring Understandings**
Multiplication and Division (Whole Numbers & Decimals)	● How do mathematical operations relate to one another? ● What strategies can be used to find products and quotients?	● There is a functional relationship between multiplication and division. ● Flexible methods of computation involve grouping numbers in strategic ways.
Numbers in Base 10	● How does a number's position affect its value? ● How are place value patterns repeated in numbers?	● Numbers have relative value, determined by a Base 10 number system.
Number & Operations-Fractions	● How are numbers between 0 and 1 represented? ● What methods, other than standard algorithms, can be used to add, subtract, multiply, and divide fractions?	● A quantity can be represented numerically and visually. ● How can we represent real-world problems mathematically?
Geometry, Measurement, & Data	● How are geometric properties used in everyday life? ● Where are patterns found in the world? ● Why do we use measurement? ● How and why do we organize information?	● Objects can be described, compared, and classified by geometric properties. ● Standard units provide a common language for communicating measurement. ● Data can be organized in meaningful ways so it can be interpreted and analyzed.

THIRD GRADE

Units of Study



Number & Operations in Base 10
Multiplication & Division (Operations & Algebraic Thinking)
Measurement and Data – Area & Perimeter
Number & Operations – Fractions & Geometry
Measurement and Data

CURRICULUM OVERVIEW: THIRD GRADE MATH

Content: Third Grade Math

Content Overview:

In third grade, students will use place value understanding and properties of operations to perform multi-digit arithmetic. A strong understanding of place value builds understanding when regrouping is necessary, and helps students to recognize when an answer isn't reasonable. Students are encouraged to use multiple strategies to solve addition and subtraction problems. By being fluent in multiple strategies, students can choose the method that is most efficient in a given mathematical situation. In addition, rounding numbers is an essential skill in building mental math abilities and checking the reasonableness of answers. Students will extend their understanding that number operations (addition & subtraction) are connected and will use this understanding to solve problems. Additionally, they will recognize that there is a relationship between place value and money. Counting money builds necessary consumer skills for their future.

Third graders will develop an understanding of the meanings of multiplication and division of whole numbers through activities and problems involving equal-sized groups, arrays, and area models. They will understand that multiplication is finding an unknown product, and division is finding an unknown factor in these situations. For equal-sized group situations, division can require finding the unknown number of groups or the unknown group size. Students use properties of operations to calculate products of whole numbers, using increasingly sophisticated strategies based on these properties to solve multiplication and division problems involving single-digit factors. By comparing a variety of solution strategies, students learn the relationship between multiplication and division. Students will apply these strategies to solve two-step problems involving the four operations.

In geometry, students will recognize area as an attribute of two-dimensional regions, with a focus on area and perimeter. They will measure the area of a shape by finding the total number of same-size units of area required to cover the shape without gaps or overlaps. Students will understand that rectangular arrays can be decomposed into identical rows or into identical columns. By decomposing rectangles into rectangular arrays of squares, students connect area to multiplication, and justify using multiplication to determine the area of a rectangle. Students will also recognize that perimeter is an attribute of plane figures and will distinguish between linear and area measures. Students will also describe, analyze, and compare properties of two-dimensional shapes. They will compare and classify shapes by their sides and angles, and connect these with definitions of those shapes. Students will also relate their fraction work this year to geometry by expressing the area of part of a shape as a unit fraction of the whole. The focus of geometry in 3rd grade is on 2-dimensional figures.

Students will develop an understanding of fractions, beginning with unit fractions (fractions with a 1 as the numerator). Students will view fractions in general as being built out of unit fractions, and they will use written fractions, along with visual fraction models, to represent parts of a whole. Students will understand that the size of a fractional part is relative to the size of the whole. For example, 1/2 of the paint in a small bucket could be less paint than 1/3 of the paint in a larger bucket, but 1/3 of a ribbon is longer than 1/5 of the same ribbon because when the ribbon is divided into 3 equal parts, the parts are longer than when the ribbon is divided into 5 equal parts. Students will use fractions to represent numbers equal to, less than, and greater than one. They solve problems that involve comparing fractions by using visual fraction models and

strategies based on noticing equal numerators or denominators. The grade 3 expectations limit fractions to those with denominators of 2, 3, 4, 6, & 8. Also, fraction models in third grade include area (parts of a whole) models and number lines.

In measurement and data, students will tell and write time to the minute, and solve elapsed time problems to the nearest minute. They will solve problems involving measurement and estimation of liquid volumes and masses of objects. Linear measurement will be reviewed, and students will use linear measurements to record data on a line plot. Students will pose a question and collect and represent data in tally charts, picture graphs, bar graphs, and line plots. Students will use these graphs to interpret data sets.

Common Core State Standards (CCSS):

- Number & Operations in Base 10 - 3.NBT.1, 3.NBT.2
- Multiplication & Division (Operations & Algebraic Thinking) - 3.OA.1, 3.OA.2, 3.OA.3, 3.OA.4, 3.OA.5, 3.OA.6, 3.OA.7, 3.OA.8, 3.OA.9, 3.NBT.3
- Measurement and Data – Area & Perimeter - 3.MD.5, 3.MD.6, 3.MD.7, 3.MD.8
- Number & Operations – Fractions & Geometry - 3. NF.1, 3.NF.2, 3.NF.3, 3.G.1, 3.G.2
- Measurement and Data – 3.MD.1, 3.MD.2, 3.MD.3

Enduring Understandings:

Number & Operations in Base 10:

- The value of a digit in our number system is determined by its place value position.
- Numbers can be decomposed and recomposed into component parts to add and subtract multi-digit numbers efficiently.
- Our society uses a base 10 number system
- Using place value builds understanding when regrouping is necessary.

Multiplication & Division (Operations & Algebraic Thinking):

- Multiplication and division situations involve equal-size groups, arrays, and/or area models.
- Multiplication and division are inverse operations.
- The commutative, associative, and distributive properties can be used to develop efficient strategies to multiply and divide.

Measurement and Data – Area & Perimeter

- Area and perimeter are attributes used to describe and measure 2D figures.
- Understand that rectangular arrays can be decomposed into identical rows or columns.

Number & Operations – Fractions & Geometry

- Fractions are a special type of number.
    - Fractions refer to parts of wholes.
    - Fractions fall between whole numbers on a number line.
- Unit fractions are the building blocks of all other fractions.
    - Understand that a fraction is made up (composed) of many pieces - “unit fractions -” which have a numerator of 1.
- We need to consider the size of the “whole” when comparing fractions of the same size.
- Shapes in different categories may share attributes and the shared attributes can define a larger category.

Measurement and Data

- Standard units enable people to measure data in the same way.
- Data can be organized, represented, and interpreted in multiple ways for a variety of purposes.
- Larger units can be subdivided into equivalent units.

Essential Questions:

Number & Operations in Base 10:

- How does a number's position affect its worth?
- What strategies can be used to find sums and differences?
- How can the properties of operations be used to find reasonable estimations and to explain/justify answers?
- How do we represent currency and add/subtract money amounts?

Multiplication & Division (Operations & Algebraic Thinking):

- What is the relationship between products & sums, quotients and differences?
- What strategies can be used to solve multiplication/division problems?
- How can the properties of operations be used to explain/justify answers?

Measurement and Data – Area & Perimeter

- How are area and perimeter different?
- How can you apply rules of the distributive property by finding the area of two smaller figures to find the total area of a figure?
- How can you classify objects according to their attributes?

Number & Operations – Fractions & Geometry

- How can we represent fractions & equivalent fractions using visual models, including number lines?
- Why do we need to consider the size of a whole before comparing the same size fractions? (Think: Comparing ½ of a large pizza to ½ of a small pizza)
- How do you express a whole number as a fraction? (Ex: 3 in the form of 3/1 or locating 4/4 as "1" on a number line)
- How can you classify objects according to their attributes?

Measurement and Data

- How and why do we organize information?
- How can we estimate the weight of an object? (Think: How do we choose the appropriate unit of measure?)
- How do we measure the volume of objects/liquids?

Knowledge and Skills:

Students will know and be able to:

<u>Number & Operations in Base 10</u>:

- Model (concretely or pictorially) whole numbers through 1,000. (**Example:** Extend place value understanding beyond standard algorithm or procedure. Students should be able to explain and reason about the answers they get when they round as a result of a deep understanding of place value. **(***Students can use a number line, hundreds charts, Base-10 blocks, etc to explain)

- Read numbers through 10,000 from a place value model.
- Write numbers through 10,000 in standard, expanded, and written form.
- Identify place value through 100,000 and identify the number of hundred thousands, thousands, hundreds, tens, and ones in a given number.
- Identify the place value position or the value of the digit in a number.
- Compare, order, and sequence whole numbers through 10,000.
- Use symbols < , =, and > correctly.
- Create, describe, and extend number patterns.

● Round numbers to the nearest ten and hundreds. (**Example:** Extend place value understanding beyond standard algorithm or procedure. Students should be able to explain and reason about the answers they get when they round, as a result of a deep understanding of place value. (*Students can use number lines, hundreds charts, etc to explain.)

- Use visual representations such as a number line or hundreds chart to model rounding of numbers.
- Identify the actual/possible numbers when given the rounded number.
- Use compatible numbers and rounding to estimate sums.
- Use estimation as a strategy for determining the reasonableness of an answer in computation.
- Create and describe strategies for reaching solutions.

● Correctly and efficiently (within 3-4 seconds) add and subtract within 1,000 using strategies and algorithms based on place value, properties of operations, the relationship between addition & subtraction, number lines, etc. (**Example:** There are 178 4^{th} graders and 225 5^{th} graders on the playground. How many total students are on the playground? **Student Strategy/Answer:** First add 100+200=300, Then add 70+20 = 90, last add 8+5= 13. Add 300+90+13= 403)

- Demonstrate the properties of addition and subtraction (commutative, associative, identity) to solve computation problems.
- Use multiple strategies for addition and subtraction (Count by 10's and 1's, use a number line, break-apart strategy, make compatible numbers, use friendly numbers, etc.).
- Use knowledge of properties to justify solutions/answers.
- Use mental math to add and subtract multiples of 10.
- Use addition/subtraction strategies to find sums and differences mentally.
- Write addition and subtraction problems based on everyday life situations.
- Model (concretely, pictorially, and symbolically) to solve and explain **computation & word problems** using **addition** of 3 digit whole numbers using multiple strategies.
- Model (concretely, pictorially, and symbolically) to solve and explain **computation & word problems** using **subtraction** of 3 digit whole numbers using multiple strategies.

● Work with money to:

- Use correct money notation. (Ex: $0.23)
- Add/subtract money.
- Compare amounts of money. (up to $5.00)
- Make equivalent sets of money. (up to $5.00)
- Model (concretely, pictorially, symbolically) to solve problems that demonstrate knowledge of making change. (up to $100.00)
- Solve multi-step, real-life problems with adding of money and making change (**Example:** Sally bought a folder for $2.00 and a pencil for $1.55. She paid with a 5.00 bill, how much change did she get back?)

- Technology- Solve problems individually or collaboratively using computer applications.
- Technology- Use calculators, computers, software, online manipulatives, Internet resources, (including graphing resources) and digital tools.

Multiplication & Division (Operations & Algebraic Thinking):

- Interpret products of whole numbers. (Example: Jim purchased 5 packages of muffins. Each package contained 3 muffins. How many muffins did Jim purchase? 5 groups of 3, 5 x 3 = 15. Describe another situation where there would be 5 groups of 3 or 5 x 3.)
- Model and skip count objects in equal groups to find how many there are.
- Write an addition sentence and a multiplication sentence for a model.
- Describe and model two distinct models of division: partition models and measurement (repeated subtraction) models. Example: Partition models focus on the question, "How many in each group?" A context for partition models would be: There are 12 cookies on the counter. If you are sharing the cookies equally among three bags, how many cookies will go in each bag? Measurement (repeated subtraction) models focus on the question, " How many groups can you make?" A context for measurement models would be: There are 12 cookies on the counter. If you put 3 cookies in each bag, how many bags will you fill?
- Apply multiplication and division skills to solve word problems within 100. This could include one or two-step word problems, such as: If you divide 4 dozen brownies among 8 people, how many cookies does each person receive? (4 x 12 = 48, 48 ÷ 8 = 6).
- Represent multiplication/division problems using arrays, number lines, skip counting, repeated addition/subtraction, picture models, and story problems.
- Use a variety of pictures, such as stars, boxes, flowers, etc. to represent unknown numbers (variables) in all the positions of the equation. Letters are introduced to represent unknowns. Example: There are some students at recess. The teacher divides the class into 4 lines with 6 students in each line. Write a division equation for this story and determine how many students are in class.
- Use repeated subtraction and number lines to relate subtraction to division.
- Determine the unknown whole number in a multiplication or division equation. *** Focus goes beyond the traditional notion of fact families, by having students explore the inverse relationship of multiplication and division. Example: (3 x ? = 18 or 18 ÷ 3 = 6) (? X 6 = 18 or 18 ÷ 6 = 3)
    - Types of problems should include "unknown product", but also "group size unknown" or "number of groups unknown."
    - Play "Find the Rule" using multiplication/division (number patterns & function machines).
- Apply the properties (rules about how numbers work) in order to multiply and divide. **Students do not need to know the formal vocabulary for the properties, but they do need to understand how they work and how to apply them.
    - The commutative property (order property) states the order does not matter. Example: 4 x 5 = 5 x 4.
    - The distributive property determines products by breaking numbers apart. Example: 7 x 6 can be broken apart into 7 x 5 = 35 and 7 x 1 = 7. 35 + 7 = 42.
    - The associative property states that the sum or product stays the same when the grouping of addends or factors is changed. Example: 7 x 5 x 2 can be rearranged to first multiply 5 x 2 = 10, and then multiply 10 x 7 = 70.
- Solve and explain solutions to multiplication and division problems using the inverse operation.

*Calculate answers to multiplication/division problems in different ways.

- Accurately and efficiently develop proficiency with basic multiplication facts using a variety of strategies such as skip counting, repeated addition, working with manipulatives, pictures, arrays, etc. (***By the end of 3rd grade, know from memory all products of times tables up through 9.)**
- Multiply and divide single-digit factors and products less than 100.
- Solve two-step word problems using the four operations.
- Perform operations in order when there are no parentheses.
- Represent problems using equations with a letter as the unknown quantity. Example: Mike runs 2 miles a day. His goal is to run 25 miles. After 5 days, how many miles does Mike have left to run in order to meet his goal? Write an equation and find the solution (2 x 5 + m = 25).
- Use estimation as a strategy for determining the reasonableness of an answer in computation. Estimation strategies include using compatible numbers and rounding.
- Examine arithmetic patterns involving both addition and multiplication. Example: Skip counting. * Create and extend number patterns. *Finding patterns on the hundreds chart, addition chart, and multiplication chart
    - Even numbers are always divisible by 2. Even numbers can always be decomposed into 2 equal addends
    - Multiples of even numbers are always even numbers.
    - Identify multiples and recognize them as number patterns.
- Explain and reason (using understanding of place value) about products in multiplication. (**Example:** Students should think about 50 x 4 as 4 groups of 5 tens which = 20 tens = 200.) *This is instead of saying "just multiply 5x4 = 20 and add another zero"
    - Mentally multiply multiples of 10 x 1 digit numbers (Example 60 x 7 or 40 x 5)
    - Explain strategies using place value patterns
- Solve problems individually or collaboratively using computer applications.
- Use calculators, computers, software, online manipulatives, Internet resources, (including graphing resources) and digital tools.

Measurement and Data – Area & Perimeter

- Determine the area of a rectangular shape by exploring the concept of covering a region with "unit squares," which could include square tiles or shading on grid or graph paper.
- Count the square units to find the area in metric, customary, or non-standard square units.
- Tile a rectangle, then multiply the side lengths to show it is the same. For example, to find the area one could count the squares or multiply 3 x 4 = 12.
- Multiply side lengths to find areas of rectangles with whole number side lengths.
- Solve real world and mathematical problems. (For example, Drew wants to tile the bathroom floor, which is 6 square feet by 8 square feet. How many square tiles will he need?)
- Apply knowledge of the distributive property. For example, finding the area of two smaller parts of a figure can be used to find the total area of a figure. (Finding the area of a 7 x 8 figure can be found by finding 2 x 8 and 5 x 8 and adding the two areas together)
- Use the term *rectilinear figure* to describe a polygon that has all right angles.
- Decompose (break apart) a rectilinear figure into non-overlapping rectangles to find its total area by adding the area of each non-overlapping section together.
- Solve problems about perimeter, or the distance around a shape. (Students should have ample opportunities to measure and determine the perimeters of polygons. For example, what rectangles can be made with a perimeter of 12 units? Which rectangle gives you the greatest area? How do you know?)

- Find the perimeter of polygons by counting units on grid paper, as well as measuring with inch and centimeter rulers
- Find an unknown side length of a figure given a specific perimeter.
- Find rectangles with the same perimeter and different areas, or with the same area and different perimeters.
- Discuss and identify the relationship between area and perimeter. For example, a rectangle with a perimeter of 12 could be three different shapes and areas.

Number & Operations – Fractions & Geometry

- Identify, model, understand, and use vocabulary such as numerator/denominator, and shaded/unshaded.
- Model the partitioning or splitting of an object into equal parts (Include "parts of a whole" models with circle, rectangles, squares, and number lines)
- Understand & explain that a fraction is made up (composed) of many pieces of a "unit fraction," which has a numerator of 1. (**Example**: The fraction 3/5 is composed of 3 pieces that each has a size of 1/5)
- Work with a number line to represent numbers in between whole numbers. (**Example**: between 0 and 1)
- Divide a number line between 0 and 1 into equal segments (i.e. ¼) and determine that each segment is equal in length. Similarly, determine the distance of segments (**Example:** 3 segments from 0 to 1 = ¾.)
- Use visual fraction models (area models) and number lines to explore the idea of equivalent fractions. (*Students should only explore equivalent fractions using models, rather than using algorithms or procedures.) Students should recognize and generate simple equivalent fractions, for example – 1/2 = 2/4 or 4/6 = 2/3.
- Write whole numbers as fractions. (This relates to fractions as division problems where the fraction 3/1 is 3 wholes divided into one group. Students must develop an understanding of a/1. (**Example:** If 6 brownies were divided by 2 people than 6/2 represents how to solve how many each person would get.)
- Understand that a/a is equal to 1. (Be able to locate 4/4 and 1 at the same point on a number line).
- Compare two fractions with the same numerator or the same denominator, with or without visual fraction models, including number lines. (**Example:** Encourage students to compare and reason about the size of pieces, and consider the fact that 1/3 of a piece of cake is larger than ¼ of the same cake. When the same (whole) cake is split into equal pieces, thirds are larger than fourths.
- Reason that when comparing fractions it is only valid if the wholes are identical in size. (**Example:** ½ of a large pizza is different than ½ of a small pizza.) *Students should be given opportunities to discuss and reason about which ½ is larger.
- Classify shapes by attributes and draw plane shapes that fit specific categories. For example, parallelograms include: squares, rectangles, rhombi, or other shapes that have two pairs of parallel sides. Also, the broad category quadrilaterals include all types of parallelograms, trapezoids and other four-sided figures. *Example:* Draw a picture of a quadrilateral. Draw a picture of a rhombus. How are they alike? How are they different? Is a quadrilateral a rhombus? Is a rhombus a quadrilateral? Draw a quadrilateral that is not a parallelogram. Justify your thinking.
- Identify and describe attributes of plane shapes, including numbers and sides of angles, types of angles, perpendicular and parallel lines.
- Describe and compare different types of quadrilaterals and triangles.
- Partition shapes into halves, thirds, fourths, sixths and eighths. For example, partition/divide an area into four equal parts. Explain that each part is ¼ of the total area of the figure.

Measurement and Data

- Tell and write time to the minute.
- Identify if an activity takes place in the AM or PM.

- Read and determine equivalent times of digital and analog clocks.
- Draw hands on a clock to represent a specific time.
- Write a schedule of events and match them with times.
- Show an understanding of elapsed time to the minute, using clock models or a number line to model. Apply this knowledge to solve and explain everyday life word problems.
- Read a calendar, and identify months, weeks, days, weekends, and weekdays.
- Measure and estimate liquid volumes in liters (l).
- Estimate and measure masses of objects using standard units of grams (g), kilograms (kg). (**Example:** A paper clip weighs about (a) a gram (b) 10 grams or (c) 100 grams?)
- Solve single step word problems (using addition, subtraction, multiplication, and division) within the same units (grams, kilograms, liters).
- While exploring data concepts students should pose a question, collect data, analyze data, and interpret data. Students should be graphing data that is relevant to their lives. (**Example:** Pose a question: Students should come up with a question. "What is the favorite genre read by students in our class?" Then, students should collect, organize, and display data.)
- Solve one- and two-step "how many more" and "how many less" problems using information represented in scaled bar graphs. (**For example:** Draw a bar graph in which each square in the bar graph might represent 5 pets…)
- Create and interpret tally charts, picture graphs, scaled bar graphs, and line plots.
- Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch.
- Show measurement data by making a line plot where the horizontal scale is marked off in appropriate units - whole numbers, halves, or quarters.

Terminology:

See pacing charts.

Assessments:

Unit-specific formative assessments

Unit Pre & Posttests (See pacing charts & Unit Guides)

3rd Grade End of the Year Test

21st Century Connections:

8.1 Technology: All students will use digital tools to access, manage, evaluate, and synthesize, information in order to solve problems individually and collaboratively and to create and communicate knowledge.
8.2 Technology: All students will develop an understanding of the nature and impact of technology, engineering, technological design, and the design world, as they relate to the individual, global society, and the environment.

9.1 Life and Career Skills: All students will demonstrate the creative, critical thinking, collaboration, and problem-solving skills needed to function successfully as both global citizens and workers in diverse ethnic and organizational cultures.

9.3 Career Awareness, Exploration, and Preparation: All students will apply knowledge about and engage in the process of career awareness, exploration, and preparation in order to navigate the globally competitive work environment of the information age.

Character Education:

The elementary core values of cooperation, assertion, responsibility, empathy, and self-control are addressed and stressed throughout each unit of study.

Cross Curricular / Interdisciplinary:

Integrated Math-Based Literature, Math journals
Science/Social Studies - measuring, observing, graphing, patterns, comparing and classifying, mapping-scale measurement, Morning Meeting-integrated math-based games and activities
Technology – Investigations Logopaths software

Course Resources:

Technologies: *Investigations Logopaths software, online websites and manipulatives, Smartboard, calculators*
Text: *TERC Investigations in Numbers, Data, and Space*
Houghton Mifflin On Core Mathematics
Scott Foresman Mathematics

Pacing Chart:

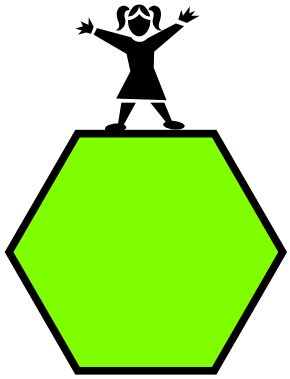
See Unit plans for Year-Long Pacing Chart and Assessments

Units of Study:

Number & Operations in Base 10
Multiplication & Division (Operations & Algebraic Thinking)
Measurement and Data – Area & Perimeter
Number & Operations – Fractions & Geometry
Measurement and Data

FOURTH GRADE

Units of Study



Place Value and Addition/Subtraction Operations
Operations in Base Ten and Algebraic Thinking
Geometry/ Geometric Measurement
Fractions and Decimals
Data Analysis and Measurement

CURRICULUM OVERVIEW: FOURTH GRADE MATH

Content: Fourth Grade Math

Content Overview:

This year, fourth graders generalize their understanding of place value to 1,000,000, understanding the relative sizes of numbers in each place. Students read and write numbers using standard, written, and expanded form. They investigate and compare numbers, fluently add and subtract them using multiple strategies, and solve everyday rounding, addition, and subtraction word problems.

Students further their number sense understanding through the study of multiplication and division. They apply their understanding of models for multiplication (equal-sized groups, arrays, area models), place value, and properties of operations, in particular the distributive property, as they develop, discuss, and use efficient, accurate, and generalizable methods to compute products of multi-digit whole numbers. Depending on the numbers and the context, they select and accurately apply appropriate methods to estimate or mentally calculate products. They develop fluency with efficient procedures for multiplying whole numbers; understand and explain why the procedures work based on place value and properties of operations; and use them to solve problems. Students apply their understanding of models for division, place value, properties of operations, and the relationship of division to multiplication as they develop, discuss, and use efficient, accurate, and generalizable procedures to find quotients involving multi-digit dividends. They select and accurately apply appropriate methods to estimate and mentally calculate quotients, and interpret remainders based upon the context.

In geometry, students describe, analyze, compare, and classify two-dimensional shapes. Through building, drawing, and analyzing two-dimensional shapes, students deepen their understanding of properties of two-dimensional objects and the use of them to solve problems involving symmetry. Students will measure angles using protractors and reason about the measurement of degrees in a circle.

Through their study of fractions, students develop an understanding of fraction equivalence and operations with fractions. They recognize that two different fractions can be equal (e.g., 15/9 = 5/3), and they develop methods for generating and recognizing equivalent fractions. Students extend previous understandings about how fractions are built from unit fractions, composing fractions from unit fractions, decomposing fractions into unit fractions, and using the meaning of fractions and the meaning of multiplication to multiply a fraction by a whole number. Students will add and subtract fractions with like denominators. Students will relate fractions to decimals and recognize equivalent forms of the same part of a whole with both notations.

In measurement, students will work with both the metric and customary systems. They will solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit. Students will collect and display a data set of measurements in a line plot and solve problems related to that data representation.

Common Core State Standards (CCSS):

- Place Value and Addition/Subtraction Operations - 4.NBT.1, 4.NBT.2, 4. NBT.3, 4.NBT.4

- Operations in Base Ten and Algebraic Thinking – 4.NBT.5, 4.NBT.6, 4.OA.1, 4.OA.2, 4.OA.3, 4.OA.4, 4.OA.5, 3.OA.6
- Geometry/ Geometric Measurement - 4.MD.3, 4.MD.5 4.MD.6, 4.MD.7, 4.G.1, 4.G.2, 4.G.3
- Fractions and Decimals - 4. NF.1, 4.NF.2, 4.NF.3, 4.NF.4, 4.NF.5, 4.NF.6
- Data Analysis and Measurement – 4.MD.1, 4.MD.2, 4.MD.4

Enduring Understandings:

Place Value and Addition/Subtraction Operations:

- The value of numbers is determined by our base-ten number system.
- Symbols can be used to record number comparisons.
- Estimation skills are essential in daily life.

Operations in Base Ten and Algebraic Thinking:

- Factors and multiples can be used to determine part-whole relationships.
- By utilizing varied and efficient methods of multiplication and division, more complex problem solving is possible.
- You can use multiplication to solve division problems.

Geometry/ Geometric Measurement:

- Objects can be described, compared, and classified by geometric attributes.
- Angles within geometric shapes can be measured with a protractor.
- Area and perimeter can be found through using formulas.

Fractions and Decimals

- Fractions are built from unit fractions (fractions with a numerator of 1) through the process of addition and multiplication.
- You can use visual fraction models and equations for adding and subtracting fractions, and for multiplying a fraction by a whole number.
- Fractions and decimals can represent the same quantities.
- You can use visual models and place value to compare fractions and decimals.

Data Analysis and Measurement

- By utilizing varied and efficient methods, we can solve measurement problems.
- Within a system of measurement, the larger units are made from smaller units.
- Smaller units are divisions of a larger unit.
- Line plots can be used to represent data.

Essential Questions:

Place Value and Addition/Subtraction Operations:

- What is the relationship among the values of each digit in a multi-digit number?
- How can numbers be compared?
- How and why do we use both rounding and estimation?

Operations in Base Ten and Algebraic Thinking:

- What are factors and multiples?
- What are the different strategies that can be used to solve multiplication or division problems?
- What is the relationship between multiplication and division?

Geometry/ Geometric Measurement:

- How can geometric attributes be drawn, recognized, and classified?
- How can we measure angles?
- How can we find area and perimeter using formulas?

Fractions and Decimals

- What are fractions composed of? How can they be decomposed?
- What strategies can be used to add, subtract, and multiply fractions?
- How are fractions and decimals related?
- What strategies can be used to compare fractions and decimals**?**

Data Analysis and Measurement

- What strategies can be used to solve measurement problems?
- How can units be converted within a system of measurement?
- How can you represent data?

Knowledge and Skills:

Students will know and be able to:

Place Value and Addition/Subtraction Operations

- Understand and create models to show that in numbers through 1,000,000, a digit in one place represents ten times what it represents in the place to its right. *For example, "How is the 2 in the number 582 similar to and different from the 2 in 528?" The 2 in the second number is 2 tens vs. 2 ones in the first number.*
- Extend their understanding of place value to numbers less than or equal to 1,000,000 and be able to state the value and name the place of each digit. *For example, identify the value and place of the underlined digit in 9<u>3</u>4,562.*
- Read and write numbers to 1,000,000 using standard form (base-ten numerals), written form (number names), and expanded form. *For example, 934,562 (standard form), 900,000 + 30,000 + 4,000 + 500 + 60 + 2 (expanded form), nine hundred thirty-four thousand, five hundred sixty-two (written form).*
- Demonstrate equivalent forms of numbers using place value concretely, pictorially, and abstractly. *For example, 285 = 28 tens plus 5 ones or 1 hundred 18 tens and 5 ones. They can show this by using place value blocks, by drawing place value blocks, or representing with equations.*
- Compare two whole numbers through one million, using symbols <, =, > correctly. *For example, compare 976,321 and 967,321 using a number sentence.*
- Round multi-digit whole numbers through the millions to any place value, which extends beyond an algorithm or procedure for rounding. They can use a number line and hundreds chart as resources. *For example, if a student is asked to round 368 to the nearest hundred, they create a number line through plotting 300 on the left end, plotting 400 on the right end, and plotting 350 in the middle. Then, plot 368 on the number line. Visually, they can see that 368 is closer to 400. Therefore, it would round to 400.*

They can use a hundred chart as well, by pointing out 300 on the chart, 400 on the chart, 350 on the chart, and seeing which value 368 is closer to on the chart.

- Estimate to check reasonableness of an answer while solving problems with addition and subtraction operations. Students should use compatible numbers and/or rounding to estimate. *For example, "On vacation, your family travels 267 miles on the first day, 194 miles on the second day, and 34 miles on the third day. How many total miles did they travel?" Before finding an actual answer, one way students can estimate is by grouping 267 and 34 together to be about 300. Then adding about 200, to total approximately 500 miles.*
- Students should be able to solve everyday rounding problems and justify about the answers they got when they round. *For example, "Your class is collecting bottled water for a service project. The goal is to collect 300 bottles of water. On the first day, Max brings in 3 packs with 6 bottles in each container. Sarah wheels in 6 packs with 6 bottles in each container. About how many bottles will still need to be collected?" Students should be able to explain how they solved in pictures, numbers, and words.*
- Fluently add multi-digit whole numbers up to 1,000,000 using the standard algorithm. Students should also use previously learned strategies for addition. They should check their work using another addition strategy. *For example, students can add 654,321 and 543,210 using the standard algorithm. They can also break the number apart by place value and add to check their work. Emphasis should be on accuracy (getting the correct answer), efficiency (using a reasonable amount of steps and time), and flexibility (being open to a variety of strategies) while solving.*
- Fluently subtract multi-digit whole numbers up to 1,000,000 using the standard algorithm. Students should also use previously learned strategies for subtraction. They should check their work using addition strategies learned. *For example, students can subtract 654,321 and 543,210 using the standard algorithm. Emphasis should be on accuracy (getting the correct answer), efficiency (using a reasonable amount of steps and time), and flexibility (being open to a variety of strategies) while solving.*
- When adding and subtracting, determine whether solutions are reasonable.

Operations in Base Ten and Algebraic Thinking

- Interpret a multiplication equation as a comparison. *For example, interpret that 35 = 5 x 7 as a statement that 35 is 5 times as many as 7 and 7 times as many as 5.* Multiply or divide to solve word problems involving multiplicative comparison by using drawings and equations with a symbol for the unknown. *For example, "Sally is five years old. Her mom is eight times older. How old is Sally's mom?" Students should be able to identify that 5 x 8 = 40 represents a solution to this problem.*
- Translate multiplication and division situations into equations with an unknown and solve. *For example,"A blue scarf cost $3. The total cost for the blue scarves was $18. How many scarves were purchased? Students should be able to identify both equations to solve (3 x p = 18 or 18 ÷ 3 = p).*
- Solve multiplication and division problems of different types of unknowns- with an unknown product, with the group size unknown, or the number of groups unknown
- Estimate to check reasonableness of an answer while solving problems with multiplication and division operations. Students should use compatible numbers and/or rounding to estimate. *For example, "Most Americans throw away about 1,365 pounds of trash each year. Is it reasonable to estimate that Americans throw away over 10,000 pounds of trash in 5 years?"*
- Solve multi-step word problems for all four operations, by writing equations with a letter standing for the unknown quantity. *For example, "A bakery has 4 trays with 16 muffins in each tray. The bakery also has 3 trays of cupcakes with 24 cupcakes on each tray. If 15 cupcakes were sold, how many muffins and cupcakes are left?* Students need to write the equation: 4 x 16 + 3 x 24 -15 = n.
- Demonstrate understanding of factors and multiples of whole numbers. Find all factor pairs of a whole number in the range 1-100, recognizing that a whole number is a multiple of its factors. Determine

whether a given whole number in the range of 1-100 is a multiple of a given number. *For example, students should be able to determine that 12 has the factors 1, 2, 3, 4, 6, and 12.*

- Determine whether a given number in the range of 1-100 is prime or composite. *For example, the number 17 has the factors of 1 and 17. Therefore, it is prime. The number 12 has more than 2 factors, and is therefore composite. Students should understand that 1 is neither prime nor composite, and that not all prime numbers are odd numbers. The number 2 is an even prime number.*
- Generate a number or shape pattern that follows a given rule after reading a word problem. *For example, "There are 4 jelly beans in a jar. Each day 3 jelly beans are added. How many beans are in the jar for the first 5 days?" Students can create a table with the day, the operation (+3), and the total number of jelly beans. They need to interpret that the rule is +3, and they need to add it to the amount of jelly beans from the previous day.*
- Multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers using a variety of strategies. Emphasis should be on partial products and array area models rather than the standard algorithm. Students should check their work using another strategy. *For example, "There are 25 dozen cookies in the bakery. What is the total number of cookies at the bakery?" They can use the distributive property/partial products method by breaking the number apart into smaller multiplication sentences (25 x 10 = 250, 25 x 2 = 50, 250 + 50 = 300 cookies), or by using an array area model.*
- Find whole-number quotients and remainders with up to four-digit dividends and one-digit divisors using a variety of strategies. Emphasis should be on multiplication (partial quotients) rather than the standard algorithm. *For example, "There are 592 students participating in Field Day. They are put into teams of 8 for the competition. How many teams get created?" Students can solve by creating 50 groups of 8 to equal 400 students. Then 20 groups of 8 to equal 160 students. Then 4 groups of 8 to equal 32 students. When you add them together, that equals 74 groups of students.*
- Solve multistep word problems for division using a variety of strategies, including problems in which remainders must be interpreted. *For example, "The art teacher at a South Brunswick School bought new packages of construction paper. She is organizing 40 packages onto 6 shelves. How many shelves will be completely filled? How many packages will be on the shelf not completely filled?" Students will need to interpret the remainder, to say that 6 shelves will be completely filled, with 4 packages on the 7th shelf.*
- Solve word problems involving money using all four operations (addition, subtraction, multiplication, and division) using previously learned strategies for the operations. *For example, "You are at the store, and you buy 3 cartons of milk for $1.59. When you pay for the milk, you pay with a $10.00 bill. How much change will you receive?" or, "I bought the same 5 books for friends for $5.50. How much did each book cost? If I decided to buy 2 more books, how much would that cost? What would the total cost be for all the books?"*

Geometry/ Geometric Measurement:

- Identify angles as geometric shapes that are formed whenever two rays share a common endpoint. *For example, "Which one of these geometric shapes is an angle? Why?"*
- Relate angles and fractional parts of a circle. *For example, "Find out how many 1/6 turns make a complete circle." Students should identify that 6 turns makes a complete circle.*
- Understand that a circle has 360 degrees, can be partitioned into fractional parts, and that fractions can be used to find angle measurement. *For example, "Find the measure of an angle that turns 1/6 through a circle." Students should find equivalent fractions to identify that 1/6 is equivalent to 60/360. Therefore, 1/6 equals 60 degrees.*

- Understand that an angle is a series of one-degree turns. *For example, a water sprinkler rotates one-degree at each interval. If the sprinkler rotates a total of 100 degrees, how many one-degree turns has the sprinkler made?*
- Measure and sketch angles in whole number degrees using a protractor. *For example, sketch an angle that is 125 degrees.*
- Decompose (break apart) an angle into smaller parts. *For example, "List 3 ways you could create a 45-degree angle." Students could list 40 degrees plus 5 degrees, 35 degrees plus 10 degrees, etc.*
- Use addition and subtraction equations to find unknown angles on a diagram and in mathematical problems. *For example, a 90-degree angle is divided into two parts. One part of the angle measures 35 degrees. How many degrees make up the remaining part?*
- Draw and identify in isolation and within two-dimensional figures: points, lines, line segments, rays, angles, perpendicular and parallel lines. *For example, draw two different types of quadrilaterals that have two pairs of parallel sides.*
- Classify two-dimensional figures using the attributes of sides (parallel and perpendicular) and angles. *For example, students can classify two-dimensional shapes in a Venn Diagram based on "At Least One Set of Parallel Sides" and "At Least One Right Angle."*
- Categorize triangles and angles as right, acute, or obtuse. *For example, students can sort different triangles/angles according to their type.*
- Identify and draw lines of symmetry in two-dimensional figures. *For example, "For each figure, draw all the lines of symmetry. What pattern do you notice? How many lines of symmetry do you think there would be for regular polygons with 9 and 11 sides? Sketch each picture and check your predictions.*
- Apply the area and perimeter formulas for rectangles in real world and mathematical problems. *For example, find the width of a rectangular room given the area of the flooring and the length, by using the area formula as a multiplication equation with an unknown factor.*
- Break apart irregular shapes into smaller rectangles in order to find the area.
- Given the perimeter or area, find the unknown measure of a side of a rectangle.

Fractions and Decimals

- Identify fractions (concretely, pictorially, abstractly) by using area models and number lines. *For example, dividing a square into halves, and shading one half (area model), and plotting where ½ would be on a number line in between 0 and 1 (number line).*
- Find equivalent fractions (concretely, pictorially, abstractly), by dividing a shaded region into various parts, and by multiplying both the numerator and denominator by the same number. *For example, drawing models for 1/2 and 2/4 to show that they are equal, or multiplying both the numerator and denominator by 2 to find the equivalent fractions. Emphasis should be on the visual fraction models rather than algorithms.*
- Compare fractions using >, <, = by creating visual fraction models and finding common denominators. *For example, drawing fraction models for 2/3 and 5/6 to show that 5/6 is greater, or by finding a common denominator of 6. Emphasis should be on the visual fraction models rather than algorithms.*
- Compare fractions drawing parallel number lines. *For example, plotting 1/2 and 7/12 on two separate number lines, and determining that 7/12 is greater by its position on the number line.*
- Compare fractions by using ½ as a benchmark. *For example, 4/6 is greater than ½, and 3/8 is less than 1/2, so 4/6 > 3/8.*
- Use manipulatives (pattern blocks, fraction bars, fraction circles, etc.) to model equivalent fractions and to compare fractions.

- Recognize that they must consider the size of a whole when comparing fractions. *For example, 1/2 and 1/8 of two medium pizzas are very different from 1/2 of one medium pizza and 1/8 of a large.*
- Compose unit fractions (fractions with 1 as the numerator) to form a larger fraction. *For example, 1/5 + 1/5 + 1/5 + 1/5 = 4/5.*
- Decompose fractions to determine the unit fractions (fractions with 1 as the numerator) that make them up to form a larger fraction. *For example, 4/5 = 1/5 + 1/5 + 1/5 + 1/5.*
- Decompose a fraction into a sum of fractions with the same denominator in more than one way, recording each decomposition with an equation. *For example, 3/8= 1/8 + 1/8 + 1/8 or 2/8 + 1/8.*
- Justify their breaking apart (decomposing) of fractions using visual fraction models. *For example, creating a model for 3/8, and showing how it is equivalent to 1/8 + 1/8 + 1/8 by creating separate models.*
- Convert mixed numbers into improper fractions (concretely, pictorially, abstractly). *For example, concretely using manipulatives to create 1 1/8, replacing the whole with 8/8 and counting the pieces to show that it is equal to 9/8. Pictorially representing the two amounts to demonstrate that they are the same. Abstractly, showing the equivalent amounts through using the standard algorithm. Emphasis should be on the visual fraction models rather than algorithms.*
- Convert improper fractions to mixed numbers (concretely, pictorially, abstractly). *For example, concretely using manipulatives to replace 9/8 with 1 whole and 1/8 left over. Pictorially representing the two amounts to demonstrate that they are the same. Abstractly, showing the equivalent amounts through using the standard algorithm. Emphasis should be on the visual fraction models rather than algorithms.*
- Add and subtract mixed numbers with like denominators through using a variety of strategies. *For example, 3 3/4 + 2 1/4, you could add the whole numbers first and then add the fractions, you can add one of the whole numbers to the mixed number and then add the remaining fraction, or you could turn both into improper fractions to add them.*
- Solve word problems involving the addition and subtraction of fractions with like denominators using visual models and equations to represent the problem. *For example, "A cake recipe calls for you to use ¾ cup of milk, 1/4 cup of oil, and 2/4 cup of water. How much liquid was needed to make the cake?" You can use visual representations and equations to show 3/4 + 1/4 + 2/4 = 6/4 = 1 1/4.*
- Multiply a whole number by a unit fraction (a fraction with a numerator of 1) by using number lines and area models. *For example, 3 x 1/6 = 3/6. Students can draw a number line starting with 0/6 and ending with 6/6, counting up three times to land on 3/6. Students can show the same through shading in 3/6 of a rectangle as a model for 3 x 1/6.*
- Understand that a fraction is a multiple of a unit-fraction, and use this knowledge to multiply fractions by whole numbers creating and using visual fraction models. *For example, use a visual fraction model to express 3 x 2/5 = (2/5 + 2/5 + 2/5) as 6 x 1/5.*
- Solve word problems involving the multiplication of fractions by a whole number by using visual fraction models and equations to represent the problem. *For example, "In a relay race, each runner runs ½ of a lap. If there are 4 team members, how long is the race?" You can draw a number line that shows 4 jumps of 1/2, or students draw an area model showing 4 pieces of ½ joined together to equal 2, or you can draw an area model representing 4 x 1/2 on a grid, dividing one row into 1/2 to represent the multiplier.*
- Express a fraction with the denominator 10 as an equivalent fraction with the denominator of 100, using both decimal grids and multiplication. *For example, use a tenths grid to show 3/10 (0.3) and a hundredths grid to show 30/100 (0.30), or multiply the numerator and denominator by 10 to find equivalent fractions.*
- Add two fractions with denominators of 10 or 100 using both decimal grids and multiplication. *For example, for 3/10 + 4/100, express 3/10 as 30/100, and add 30/100 + 4/100 = 34/100.*
- Use decimal notations for fractions, with denominators of 10 or 100, representing the decimal in a variety of situations. *For example, rewrite 0.62 as 62/100, describe a length as 0.62 meters, locate 0.62 on a number line diagram.*

- Compare two decimals with the symbols >, <, = (pictorially, abstractly) through using a variety of strategies. *For example, using common denominators, decimal grids, decimal circles, number lines, and meter sticks.*

Data Analysis and Measurement

- Understand the relative sizes of measurement units within the metric and customary systems. *For example, a gram is smaller than a kilogram. A yard is greater than a foot.*
- Convert larger units to smaller units within the same system of measurement (including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec) and record measurement equivalents in a two-column table. *For example, know that 1 ft is 12 times as long as 1 in. Express the length of 4 ft snake as 48 in. Generate a conversion table for feet and inches listing the number pairs (1, 12), (2, 24), (3, 36)….*
- Solve word problems involving distances, intervals of time, liquid volumes, masses of objects, including simple fractions or decimals. Students should have ample opportunities to use number line diagrams. *For example, Charlie and 10 friends are planning for a pizza party. They purchased 3 quarts of milk. If each glass holds 8 oz, will everyone get at least one glass of milk?*
- Create a line plot to display a data set of measurements in fractions of a unit. *For example, create a line plot to display the length of insect specimens.*
- Solve problems involving addition and subtraction of fractions using information presented in the line plot. *For example, from a line plot find and interpret the difference in length between the longest and shortest specimens in an insect collection.*

Terminology:

See pacing charts.

Assessments:

Unit-specific formative assessments

Unit Pre & Posttests (See pacing charts & Unit Guides)

4th Grade End of the Year Test

21st Century Connections:

8.1 Technology: All students will use digital tools to access, manage, evaluate, and synthesize, information in order to solve problems individually and collaboratively and to create and communicate knowledge.
8.2 Technology: All students will develop an understanding of the nature and impact of technology, engineering, technological design, and the design world, as they relate to the individual, global society, and the environment.

9.1 Life and Career Skills: All students will demonstrate the creative, critical thinking, collaboration, and problem-solving skills needed to function successfully as both global citizens and workers in diverse ethnic and organizational cultures.

9.3 Career Awareness, Exploration, and Preparation: All students will apply knowledge about and engage in the process of career awareness, exploration, and preparation in order to navigate the globally competitive work environment of the information age.

Character Education:

The elementary core values of cooperation, assertion, responsibility, empathy, and self-control are addressed and stressed throughout each unit of study.

Cross Curricular / Interdisciplinary:

Integrated Math-Based Literature, Math journals
Science/Social Studies - measuring, observing, graphing, patterns, comparing and classifying, mapping-scale measurement, Morning Meeting-integrated math-based games and activities, Art- dimensions and angles
Technology – Investigations Logopaths software

Course Resources:

Technologies: *Investigations Logopaths software, online websites and manipulatives, Smartboard, calculators*
Text: *TERC Investigations in Numbers, Data, and Space*
Houghton Mifflin On Core Mathematics
Scott Foresman Mathematics

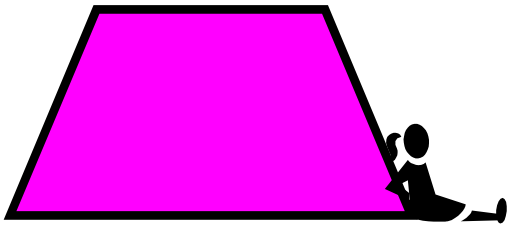
Pacing Chart:

See Unit plans for Year-Long Pacing Chart and Assessments

Units of Study:

Place Value and Addition/Subtraction Operations
Operations in Base Ten and Algebraic Thinking
Geometry/ Geometric Measurement
Fractions and Decimals
Data Analysis and Measurement

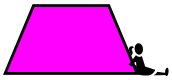
FIFTH GRADE



Units of Study

Multiplication and Division
Numbers in Base 10
Number and Operations - Fractions
Geometry, Measurement, and Data

CURRICULUM OVERVIEW: FIFTH GRADE MATH



Content: Fifth Grade Math

Content Overview:

Fifth grade students further develop their number sense understanding. They focus on why division procedures work based on the meaning of base-ten numerals and properties of operations. They finalize fluency with multi-digit addition, subtraction, multiplication, and division. Students use the relationship between decimals and fractions, as well as the relationship between finite decimals and whole numbers (i.e., a finite decimal multiplied by an appropriate power of 10 is a whole number), to understand and explain why the procedures for multiplying and dividing finite decimals make sense. They compute products and quotients of decimals to hundredths efficiently and accurately. Students work with numerical expressions and the order of operations to solve mathematical problems. Fifth graders apply their base-10 understandings of models for decimals, decimal notation, and properties of operations to add and subtract decimals to hundredths. They develop fluency in these computations, and make reasonable estimates of their results.

Students apply their understanding of fractions and fraction models to represent the addition and subtraction of fractions with unlike denominators as equivalent calculations with like denominators. They develop fluency in calculating sums and differences of fractions, and make reasonable estimates of them. Students also use the meaning of fractions, of multiplication and division, and the relationship between multiplication and division to understand and explain why the procedures for multiplying and dividing fractions make sense. (Note: this is limited to the case of dividing unit fractions by whole numbers and whole numbers by unit fractions.)

In geometry, students will classify two-dimensional figures into categories based on their properties. For three-dimensional objects, students will recognize volume as an attribute of three-dimensional space. They understand that volume can be measured by finding the total number of same-size units of volume required to fill the space without gaps or overlaps. They understand that a 1-unit by 1-unit by 1-unit cube is the standard unit for measuring volume. They select appropriate units, strategies, and tools for solving problems that involve estimating and measuring volume. They decompose three-dimensional shapes and find volumes of right rectangular prisms by viewing them as decomposed into layers of arrays of cubes. They measure necessary attributes of shapes in order to determine volumes to solve real world and mathematical problems. Students use coordinate grids to graph points and represent real-world problems.

Common Core State Standards (CCSS):

- Multiplication and Division - 5.NBT.5, 5.NBT.6, 5. NBT.7, 5.OA.1, 5.OA.2
- Numbers in Base 10 – 5.NBT.1, 5.NBT.2, 5.NBT.3, 5.NBT.4
- Number and Operations - Fractions - 5. NF.1, 5.NF.2, 5.NF.3, 5.NF.4, 5.NF.5, 5.NF.6, 5.NF.7
- Geometry, Measurement, & Data – 5.G.1, 5.G.2, 5.G.3, 5.OA.3, 5.MD.1, 5.MD.2, 5.MD.3, 5.MD.4 4.MD.5

Enduring Understandings:

Multiplication and Division:

- There is a functional relationship between multiplication and division.
- Flexible methods of computation involve grouping numbers in strategic ways.

Numbers in Base 10:
- Numbers have relative value, determined by a Base 10 number system.

Number and Operations - Fractions
- A quantity can be represented numerically and visually.
- How can we represent real-world problems mathematically?

Geometry, Measurement, & Data
- Objects can be described, compared, and classified by geometric properties.
- Standard units provide a common language for communicating measurement.
- Data can be organized in meaningful ways so it can be interpreted and analyzed**.**

Essential Questions:

Multiplication and Division:
- How do mathematical operations relate to one another?
- What strategies can be used to find products and quotients?

Numbers in Base 10:
- How does a number's position affect its value?
- How are place value patterns repeated in numbers?

Number and Operations - Fractions:
- How are numbers between 0 and 1 represented?
- What methods, other than standard algorithms, can be used to add, subtract, multiply, and divide fractions?

Geometry, Measurement, & Data
- How are geometric properties used in everyday life?
- Where are patterns found in the world?
- Why do we use measurement?
- How and why do we organize information?

Knowledge and Skills:

Students will know and be able to:

Multiplication and Division
- Multiply multi-digit whole numbers using the standard algorithm (3 digits by 2 digits). Students will have learned multiple strategies for solving these problems, however at this time, the standard algorithm is required. It may be used with other strategies to build conceptual understanding.

- Divide whole-number quotients with up to four-digit dividends and two-digit divisors using a variety of strategies. Make sure students are exposed to problems where the divisor is the number of groups and where the divisor is the size of the groups.
- Illustrate and explain division by using equations, rectangular arrays, place value blocks, and/or area models.
- Use the order of operations to evaluate numerical expressions.
- Recognize the use of parentheses, brackets, braces in an **expression** (series of numbers and symbols without an equals sign). 4(5+3) is an **expression**. The expression equals 32. 4(5+3)=32 is an **equation**.
- Evaluate expressions with parentheses, brackets, braces. Students should have experiences working with the order of first evaluating terms in parentheses, then brackets, and then braces. Example:
  Evaluate the expression 2{5[12+5(500-100) + 399]}
  The first step would be to subtract 500-100=400.
  Then multiply 400 by 5 = 2,000.
  Inside the bracket, there is now [12+2,000+399]. That equals 2,411.
  Next multiply by the 5 outside of the bracket. 2,411 x 5 = 12,055.
  Next multiply by the 2 outside of the braces. 12,055 x 2 = 24,110.
  Mathematically, there cannot be brackets or braces in a problem that does not have parentheses. Likewise, there cannot be braces in a problem that does not have both parentheses and brackets.
- Write an expression for calculations given in words such as "divide 144 by 12, and then subtract 7/8." They write (144 ÷ 12) – 7/8.
- Recognize that 0.5 x (300 ÷ 15) is ½ of (300 ÷ 15) without calculating the quotient. This refers to verbally describing the relationship between expressions.
- Utilize various estimation strategies (compatible numbers, rounding) to attack complex division problems.
- Explain how multiplication and division are related.
- Use concrete models and drawings to represent decimal operations.
- Add and subtract decimals recognizing the importance of the position and value of each digit. (See pacing chart for examples – 5.NBT.7.)
- Multiply and divide decimals to hundredths using various strategies. (See pacing chart for examples – 5.NBT.7.)
- Explain in writing the process and reasoning used to add, subtract, multiply, and divide decimals. (See pacing chart for examples – 5.NBT.7.)
- Check for reasonableness of answers.
- Make reasonable estimates of decimal sums and differences
- Estimate quotients using compatible numbers.

Numbers in Base 10

- Identify the place value position and the value of a digit in a number. Note the pattern in our base 10 number system; all places to the right continue to be divided by 10 and that places to the left of a digit are multiplied by 10. (Example: The 2 in the number 542 is different from the value of the 2 in 324. The 2 in 542 represents 2 ones, or 2, while the 2 in 324 represents 2 tens or 20. Since the 2 in 324 is one place to the left of the 2 in 542, the value of the 2 is 10 times greater.
- Explain the meaning of "Base Ten".
- Read and write whole numbers through hundred millions.
- Use place value understanding to round numbers to any place value. Students should be able to explain and reason about the answers they get when they round, using a number line to support their work

- Example: Round 14.235 to the nearest tenth. Students recognize that the possible answer must be in tenths, thus it is either 14.2 or 14.3. They then identify that 14.235 is closer to 14.2 (14.200) than to 14.3 (14.300). They may state in words 235 thousandths is closer to 200 thousandths than to 300 thousandths.

- Recognize and explain how the placement of a decimal point changes when a number is multiplied or divided by a power of 10.
- Use whole number exponents to denote powers of 10. Students should reason that the exponent above the 10 indicates how many places the decimal point is moving (not just that the decimal point is moving, but that your are multiplying, making the number 10 times greater, three times) when you multiply by a power of 10. Since we are multiplying by a power of 10, the decimal point moves to the right. Students should understand that when we divide by a power of 10, the exponent above the 10 indicates how many times the decimal point is moving to the left (the number becomes ten times smaller). (Examples: $2.5 \times 10^3 = 2.5 \times (10 \times 10 \times 10) = 2.5 \times 1{,}000 = 2{,}500$ AND $350 \div 10^3 = 350 \div 1{,}000 = 0.350 = 0.35$) This will relate well to working with fractions (350/10=35, 35/10=3.5, 3.5/10=0.035, OR 350 x 1/10, 35x1/10, 3.5x1/10)
- Find patterns when multiplying and dividing by powers of 10.
- Read, write and compare decimals to thousandths based on the meaning of the digits, using >,<,=.
- Recognize expanded form of whole numbers using base ten numerals. (Ex: 300=3x100)
- Read and write decimals through thousandths using standard form (base-ten numerals), written form (number names), and expanded form.

Number and Operations - Fractions:

- Use fractions and decimals to represent equivalent forms of the same number, using equivalent fractions or division. (Ex: 2/5 = 4/10 = 0.4 or 2/5 = 2 ÷ 5= 0.4).
- Build on their knowledge of equivalent fractions (4^{th} grade) in order to create common denominators. They should understand that finding the product of unlike denominators is will always yield a common denominator, however, it is not the least common denominator.
- Use visual fraction models to understand a problem. (See pacing chart for examples)
- Use various visual models to solve addition and subtraction of fractions word problems, referring to the same whole. (See pacing chart for examples)
- Use visual models to add and subtract fractions and mixed numbers with unlike denominators. (See pacing chart for examples)
- Use equations to represent fraction addition and subtraction problems.
- Solve word problems involving addition and subtraction of fractions.
- Use a number line to estimate and to check the reasonableness of their answers. (Ex. 7/8 is greater than ¾ because 7/8 is missing only 1/8 and ¾ is missing ¼. So, 7/8 is closer to a whole than ¾ on a number line. AND 5/8 is greater than 6/10 because 5/8 is 1/8 larger than 4/8, which is ½ and 6/10 is only 1/10 larger than 5/10, which is ½).
- Recognize that a fraction is a division problem (numerator ÷ denominator). Students should read 3/5 as "three fifths" and learn that 3/5 can also be interpreted as 3 divided by 5.
- Solve word problems involving division of whole numbers leading to answers in the form of fractions or mixed numbers. (Ex. Ten team members are sharing 3 boxes of cookies. How much of a box will each member get? 3 boxes are being divided into 10 groups. This should be seen as the solution to 10 x n = 3 (10 groups of some number equals 3). Using a model or diagram, they divide each box into 10 pieces (groups), resulting in each member getting 3/10 of a box.)
- Extend the work done in 4^{th} grade (3/5 = 3 pieces that are 1/5 each). Understand that multiplication of a whole number by a fraction is repeated addition of a unit fraction. (Ex. 2 x ¼ = ¼ + ¼)

- Multiply fractions less than 1. (Ex. Three-fourths of the class is boys. Two-thirds of the boys are wearing sneakers. What fraction of the class are boys with sneakers? This question is asking what 2/3 of ¾ is, or what is 2/3 x 3/4. In this case you have 2/3 groups of size ¾. A way to think about it in terms of the language for whole numbers is 4x5; you have 4 groups of size 5.) (See pacing chart for examples)
- Find areas of rectangles with fractional dimensions. Represent fraction products as rectangular areas.
- Find the area of rectangles with fractional side lengths by tiling it with unit squares of unit fraction lengths. Compare the method of tiling with finding the area by multiplying the side lengths.
- Compare the size of a product when one factor is changed to the size of the original product. (Ex. How does the product of 225 x 60 compare to the product of 225 x 30? How do you know? Since 30 is half of 60, the product of 225 x 60 will be twice as large as the product of 225x30).
- Explain why multiplying a given number by a fraction greater than 1 results in a product that is greater than the given number. (Ex. 2 2/3 x 8 must be more than 8 because 2 groups of 8 is 16 and 2 2/3 is almost 3 groups of 8. So the answer must be close to, but less than 24.)
- Explain why multiplying a given number by a fraction less than 1 will result in a product that is less than the given number. (3/4 x 7 is less than 7 because 7 is multiplied by a factor less than 1, so the product must be less than 7.)
- Use various strategies to solve real-world problems involving multiplication of fractions and mixed numbers. (See pacing chart for examples)
- Divide unit fractions by whole numbers using a visual model. (Example: You have 1/8 bag of pens and you need to share them among 3 people. How much of the bag does each person get? (See pacing chart for examples)
- Create a story context (word problem) for fraction division based on a given expression. (For unit fractions divided by whole numbers, and whole numbers divided by unit fractions) (See pacing chart for examples)
- Solve real-world problems involving fraction division (unit fraction divided by whole number and vice versa). (Ex. How many 1/3-cup servings are in 2 cups of raisins? I know that there are three 1/3-cup servings in 1 cup of raisins. Therefore, there are 6 servings in 2 cups of raisins. I can also show this since 2 divided by 1/3 = 2x3=6 servings of raisins.)

Geometry, Measurement, & Data

- Define a coordinate system as a pair of perpendicular number lines, label x (horizontal) and y (vertical) axes, and locate the origin (point of intersection, 0,0). Students will work with only the first quadrant (positive numbers).
- Identify the x-coordinate and the y-coordinate in an ordered pair.
- Understand that the x and y coordinates represent the distance from the point of origin.
- Locate and label given ordered pairs (coordinates) on the coordinate plane.
- Recognize that function tables show relationships between numbers that can be graphed on a coordinate plane.
- Derive and graph ordered pairs from function tables.
- Given two rules, compare the numerical patterns that can be graphed on a coordinate plane. Students are given two rules and generate two numerical patterns. The graphs that are created should be line graphs to represent the pattern. (See pacing chart for examples.)
- Solve real-world problems by extending patterns, generalizing rules, and graphing results on the coordinate plane.
    - Example 1: Sara has saved $20. She earns $8 for each hour she works. If Sara saves all of her money, how much will she have after working 3 hours? 5 hours? 10 hours? Create a

graph that shows the relationship between the hours Sara worked and the amount of money she has saved. (See pacing chart for additional examples.)

- Identify attributes of two-dimensional figures.
- Make connections between similar 2-dimensional figures. (See pacing chart for examples.)
- Classify two-dimensional figures based on properties. Figures from previous grades that students should be able to work with include: polygon, rhombus/rhombi, rectangle, square, triangle, quadrilateral, pentagon, hexagon, cube, trapezoid, half/quarter circle, circle**.**
    - Answer questions about the attributes of shapes, such as: What are ways to classify triangles? Why can't trapezoids and kites be classified as parallelograms? Which quadrilaterals have opposite angles congruent?
- Convert measurements within the same system of measurement in the context of multi-step, real-world problems. Both systems, metric and customary (U.S.) are included. Students are introduced to both in Second Grade.
- Explore how the base-ten system supports conversions within the metric system. (Example 100cm=1m and 5 cm= 0.05m)
- Measure objects to one-eighth of a unit.
- Make a line plot of data and add and subtract fractions based on the data in the line plot.
    - Example: Students measured objects in their desk to the nearest 1⁄2, 1⁄4, or 1/8 of an inch then displayed data collected on a line plot. How many object measured 1⁄4? 1⁄2? If you put all the objects together end to end what would be the total length of **all** the objects?
- Identify and describe prisms and pyramids and compare their attributes. Review cylinders, cones, and spheres. Students will not be finding the volume of anything except prisms, however, they have not been exposed to solids since Kindergarten.
- Recognize that volume is an attribute of solid figures
    - Understand that a cube with a side length of 1 unit is called a "unit cube" and has a volume of "one cubic unit"
- Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic feet, and nonstandard units.
- Extend the concept of volume (Third Grade) with the idea that students are covering an area (the base) with a layer of unit cubes and then adding layers of unit cubes on top of the base. (volume=area of the base x height, V=bxh)). Students should have ample experiences with concrete manipulatives and then move to pictorial representations. (See pacing chart for examples.)
- Find the volume of a right rectangular prism with whole-number side lengths by packing it with unit cubes – relate this to the formula Volume = length x width x height
- Break apart (decompose) 3-dimensional figures into separate rectangular prisms. They should find the volume of each separate figure, then add them together to get the volume of the original 3-d figure. (See pacing chart for examples.)

Terminology:

See pacing charts.

Assessments:

Unit-specific formative assessments

Unit Pre & Posttests (See pacing charts & Unit Guides)

5th Grade End of the Year Test

21st Century Connections:

8.1 Technology: All students will use digital tools to access, manage, evaluate, and synthesize, information in order to solve problems individually and collaboratively and to create and communicate knowledge.
8.2 Technology: All students will develop an understanding of the nature and impact of technology, engineering, technological design, and the design world, as they relate to the individual, global society, and the environment.

9.1 Life and Career Skills: All students will demonstrate the creative, critical thinking, collaboration, and problem-solving skills needed to function successfully as both global citizens and workers in diverse ethnic and organizational cultures.

9.3 Career Awareness, Exploration, and Preparation: All students will apply knowledge about and engage in the process of career awareness, exploration, and preparation in order to navigate the globally competitive work environment of the information age.

Character Education:

The elementary core values of cooperation, assertion, responsibility, empathy, and self-control are addressed and stressed throughout each unit of study.

Cross Curricular / Interdisciplinary:

Integrated Math-Based Literature, Math journals
Science/Social Studies - measuring, observing, graphing, patterns, scientific calculations, comparing and classifying, mapping- scale measurement, timelines, ancient mathematics, Morning Meeting-integrated math-based games and activities, Art- dimensions and angles
Technology – Investigations Logopaths software

Course Resources:

Technologies: *Investigations Logopaths software, online websites and manipulatives, Smartboard, calculators*
Text: *TERC Investigations in Numbers, Data, and Space*
Houghton Mifflin On Core Mathematics
Scott Foresman Mathematics

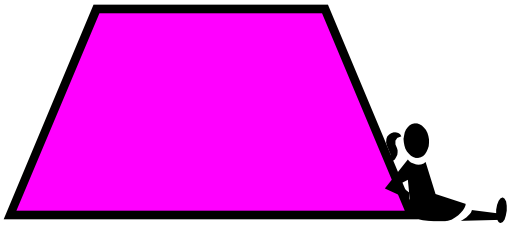
Pacing Chart:

See Unit plans for Year-Long Pacing Chart and Assessments

Units of Study:

Multiplication and Division
Numbers in Base 10
Number and Operations - Fractions
Geometry, Measurement, and Data

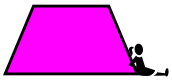
FIFTH GRADE



Accelerated Math

Units of Study

FIFTH GRADE ACCELERATED MATH CURRICULUM



Accelerated Math Mission Statement

The goal of the South Brunswick Acceleration Math Program is to provide a challenging environment that fosters critical thinking, higher order reasoning skills through differentiated real-life application for students who have the motivation and aptitude in mathematics.

- Best Practices and Philosophies to nurture the accelerated math student:
- Provide inquiry based, discovery, and project based activities
- Use of variety of authentic assessment for both formative and summative purposes
- Address multiple intelligence through differentiation and cooperative learning
- Promote mathematical reasoning through modeling and providing opportunities such as journaling and peer teaching
- Develop skills to allow students to understand, create implement and evaluate solutions to real life problems
- Encourage conceptual understanding of mathematics

South Brunswick School District

DISTRICT APPENDIX

There are the various strands that cross content.

They have relevance to every curricular area and all grade levels.

The strands are interwoven into content and integrated into instruction.
They do not stand alone.

A synopsis of each strand is included in this document.

The full SBSD K-12 District Appendix, with detailed information about each strand,
can be found as a separate document.

Topics

Teaching for the 21st Century

Educational Technology Standards

21st Century Life and Career Education Skills

Character Education

Differentiation

Understanding by Design (UbD): "Reader's Digest" Version

Topic
Teaching for the 21st Century: **What does this mean and how do you do it?** Students need to gain skills that will enable them to learn on their own, think critically and creatively, and apply knowledge to new situations. An emphasis needs to be placed on problem solving, teamwork skills, global awareness, and proficiency in using technology. Students need to learn to collaborate and work on authentic problems that they will likely encounter in their future careers. This section will outline what this means and how you "teach" for the 21st century: Elementary, Middle and High.
Tools for the 21st Century: **Life, Careers, and Digital Environments** 21st Century Life and Career Education Skills and Educational Technology Skills outline the NJ Core Curriculum Content Standards for these areas that align with PK-12 learning. These standards are written into the curriculum documents for all areas of content—English Language Arts, Mathematics, Science, Social Studies, PE/Health Education, Visual Art, Music, World Language and Library-Media. They are integrated into curriculum and instruction in places where it is relevant and meaningful to do so, and in ways that enhance learning. You will see these integrations explicitly noted in the curriculum guides: Elementary, Middle and High.
Character Education: **Safe and Caring Learning Communities** South Brunswick takes an "approach" to character education that fosters the social, emotional and academic growth of each child. The intent is to create a safe and caring community while building life skills based on the five core values (CARES): C Cooperation A Assertion R Responsibility (and Respect) E Empathy S Self-Control For over ten years, the K-5 teachers have been trained in and have followed the *Responsive Classroom (RC)* approach. The middle school teachers have studied and/or been trained in the *Developmental Designs (DD)* approach to character education.

The high school approach has been named "Strive for Five" and includes an annual theme with related activities to bring Character Education to the forefront. There is always a service-learning project connected to the theme. In addition, the high school also follows the *Institute of Excellence and Ethics* (IEE) approach. The IEE approach allows for explicit teaching of Character Education through a series of multimedia lessons that are embedded into the students' schedules.

Differentiation

Differentiation of instruction is a deliberate and conscious method of planning and teaching that provides multiple avenues of learning. It means different challenges to different students. It is characterized by strategies that use an assessment of each individual student for readiness, interest and learning style to modify instruction in three ways: by content, process and product.

In this document, there is a brief description of several approaches and methods that have long been utilized in South Brunswick to meet the differentiated needs of students within the classroom.

- Bloom's Taxonomy
- Gardner's Multiple Intelligences
- Learning Styles
- Inclusion Classrooms
- Kagan Cooperative Learning
- Principles of Differentiation

It is expected that classroom instruction will be differentiated. This expectation is predicated upon the belief or disposition that "all students can learn."

Understanding by Design

For nearly two decades, the South Brunswick School District has held much value in the Understanding by Design (UbD) or Backward Design model of curriculum writing by Grant Wiggins. This model and the process of curriculum development, has been used in the district for many years. The curriculum template—which was recommended by the State of NJ and adopted/adapted by the District, includes elements of the UbD approach.)

You will note that in every curricular area, we begin with the end in mind (that is, the big idea). Enduring understandings, essential questions and performance assessments—all based on standards--- are used in the process of curriculum development.

With this being said, it is not only important to understand the process of UbD, but also how to implement curriculum designed in such a way.

A brief overview of how to use Understanding by Design in delivering curriculum is included in the Appendix.