Bloomingdale School District

Bloomingdale, NJ

Grade 5 Math

Adopted: September

2017

Grade 5 Mathematics is aligned to the NJSLS-M and will expand upon topics learned in Grade 4 as well as prepare students for various levels of Grade 6 Math.

Mathematics Department

Grade 5 Math

I. Course Synopsis

In Grade 5, instructional time should focus on three critical areas: (1) developing fluency with addition and subtraction of fractions, and developing understanding of the multiplication of fractions and of division of fractions in limited cases (unit fractions divided by whole numbers and whole numbers divided by unit fractions); (2) extending division to 2-digit divisors, integrating decimal fractions into the place value system and developing understanding of operations with decimals to hundredths, and developing fluency with whole number and decimal operations; and (3) developing understanding of volume.

1. 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.)
2. Students develop understanding of 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. They apply their 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 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.
3. Students 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.

II. Philosophy & Rationale

The mathematics curriculum is completely aligned to the New Jersey Student Learning Standards for Mathematics for fifth grade. Fifth grade content required by the New Jersey Student Learning Standards for Mathematics focuses on the procedures, concepts, and applications in following critical areas:

Operations and Algebraic Thinking

- Write and interpret numerical expressions.
- Analyze patterns and relationships. Number and Operations in Base Ten
- Understand the place value system.
- Perform operations with multi-digit whole numbers and with decimals to hundredths.

Number and Operations—Fractions

- Use equivalent fractions as a strategy to add and subtract fractions.
- Apply and extend previous understandings of multiplication and division to multiply and divide fractions.

Measurement and Data

- Convert like measurement units within a given measurement system.
- Represent and interpret data.
- Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition.

Geometry

- Graph points on the coordinate plane to solve real-world and mathematical problems.
- Classify two-dimensional figures into categories based on their properties.

As the content is taught, the New Jersey Student Learning Standards for Mathematics practices are also woven in, helping to develop the attitudes and habits of mind of those who know and enjoy mathematics and use it effectively. The practices include:

- Problem solving
- Multiple representations
- Reasoning
- Mathematical modeling
- Tool use
- Communication

The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education. The first of these are the NCTM process standards of problem solving, reasoning and proof, communication, representation, and connections. The second are the strands of mathematical proficiency specified in the National Research Council's report Adding It Up: adaptive reasoning, strategic competence, conceptual understanding (comprehension of mathematical concepts, operations and relations), procedural fluency (skill in carrying out procedures flexibly, accurately, efficiently and appropriately), and productive disposition (habitual inclination to see mathematics as sensible, useful, and worthwhile, coupled with a belief in diligence and one's own efficacy).

MP.1- Make sense of problems and persevere in solving them.

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, "Does this make sense?" They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

MP.2 - Reason abstractly and quantitatively.

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

MP.3 - Construct viable arguments and critique the reasoning of others.

Mathematically proficient students understand and use stated assumptions, definitions, and previously established results in constructing arguments. They make conjectures and build a logical progression of statements to explore the truth of their conjectures. They are able to analyze situations by breaking them into cases, and can recognize and use counterexamples. They justify their conclusions, communicate them to others, and respond to the arguments of others. They reason inductively about data, making plausible arguments that take into account the context from which the data arose. Mathematically proficient students are also able to compare the effectiveness of two plausible arguments, distinguish correct logic or reasoning from that which is flawed, and—if there is a flaw in an argument—explain what it is. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Later, students learn to determine domains to which an argument applies. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

MP.4 - Model with mathematics.

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables,

graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

MP.5 - Use appropriate tools strategically.

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.

MP.6 - Attend to precision.

Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

MP.7 - Look for and make use of structure.

Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have. Later, students will see 7×8 equals the well remembered $7 \times 5 + 7 \times 3$, in preparation for learning about the distributive property. In the expression $x^2 + 9x + 14$, older students can see the 14 as 2×7 and the 9 as $2 + 7$. They recognize the significance of an existing line in a geometric figure and can use the strategy of drawing an auxiliary line for solving problems. They also can step back for an overview and shift perspective. They can see complicated things, such as some algebraic expressions, as single objects or as being composed of several objects. For example, they can see $5 – 3(x – y)^2$ as 5 minus a positive number times a square and use that to realize that its value cannot be more than 5 for any real numbers x and y.

MP.8 - Look for and express regularity in repeated reasoning.

Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. Upper elementary students might notice when dividing 25 by 11 that they are repeating the same calculations over and over again, and conclude they have a repeating decimal. By paying attention to the calculation of slope as they repeatedly check whether points are on the line through (1, 2) with slope 3, middle school students might abstract the equation $(y – 2)/(x – 1) = 3$. Noticing the regularity in the way terms cancel when expanding $(x –1)(x+1)$,$(x–1)(x^2 +x+1)$,and$(x–1)(x^3 +x^2 +x+1)$might lead them to the general formula for the sum of a geometric series. As they work to solve a problem, mathematically proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

III. Scope & Sequence

Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June
1.5 - 1.12	2.1-2.14	3.1-3.6	3.7-3.15	4.1-4.15	5.1-5.15	6.1-6.14	7.1-7.14	8.1-8.8	8.9-8.13

Grade 5 has 8 instructional units.
Each unit is completed in approximately 4-6 weeks.

Unit	Name	Weeks	Topics
1	Area and Volume	Weeks 1-4	• Area of rectangles • Volume Concepts • Developing volume formula • Volume applications • Expression and grouping symbols
2	Whole Number Place Value and Operations	Weeks 5-8	• Place- value patterns • Powers of ten and exponential notation • Understanding US traditional multiplication • Mental Division • Partial Quotients • Choosing division strategies • Interpreting the remainder
3	Fraction Concepts, Addition, and Subtraction	Weeks 9-16	• Connecting fractions and division • Estimation and building fraction number sense • Fractions on a number line • Exploring addition and subtraction with fractions and mixed numbers • Fraction word problems • Fraction-of problems

4	Decimal Concepts and Coordinate Grids	Weeks 18-22	• Extending place value concepts to decimals • Comparing, ordering, and rounding decimals • Coordinate grids • Decimal Addition & Subtraction
5	Operating with Fractions	Weeks 23-26	• Adding and subtracting fractions and mixed numbers • Multiplying fractions by whole numbers • Developing a fraction multiplication algorithm • Applying fraction multiplication concepts • Introduction to fraction and division • Area of Rectangle with Fractional Side Lengths
6	Investigations in Measurement; Decimal Multiplication and Division	Weeks 27-30	• Multiplying and dividing decimals by powers of 10 • Using line plots to represent and interpret measurement data • Extending volume concepts • Decimal multiplication and division
7	Multiplication of Mixed Numbers,	Weeks 31-34	• Mixed number multiplication • Using common denominators to divide fractions • Classifying shapes in a hierarchy • Analyzing patterns and relationships
8	Applications of Measurement, Computation, and Graphing	Weeks 35-41	• Synthesizing ideas through problem solving • Applications of area and volume • Using multiplication and division to solve real world problems • Graphing and analyzing data

IV. Unit Descriptions

Unit 1: Area and Volume (Weeks 1 – 4)

Enduring Understanding

In this unit, students build on their prior work with area and explore ways to find the area of rectangles. Students also learn about volume as an attribute of solid figures. Using improvised units, they explore volume and build toward using cubic units and volume formulas.

Essential Question(s)

1. Can I make explain how another student got their answer, just by looking at their work?
2. Can I use number models to solve real world volume problems?

Learning Objectives

Students will be able to:

1. Understand the Student Reference Book through exploration. They will practice grouping symbols
2. Find strategies to find area of rectangles with fractional side lengths
3. Find areas of rectangles with fractional side lengths through tiling
4. Understand volume by comparing the volume of 3D objects
5. Measure volumes of rectangular prisms, understand the importance of packing without overlaps or gaps when measuring volume of rectangular prisms
6. Use unit cubes to measure volume
7. Relate volume to multiplication and addition by thinking about the layers to find the volumes of prisms
8. Use two formulas to find the volume of a prism
9. Explore units of volume and convert between units
10. Find volumes of rectangular prisms and solve real world problems using volume
11. Play *Prism Pile-up* to practice finding volumes of rectangular prisms

New Jersey Student Learning Standards for Mathematics

- **5.OA.A.1** Use parentheses, brackets, or braces in numerical expressions, and evaluate expressions with these symbols.
- **5.NF.B.4.B** Find the area of a rectangle with fractional side lengths by tiling it with unit squares of the appropriate unit fraction side lengths, and show that the area is the same as would be found by multiplying the side lengths. Multiply fractional side lengths to find areas of rectangles, and represent fraction products as rectangular areas.
- **5.MD.C.3.A** A cube with side length 1 unit, called a "unit cube," is said to have "one cubic unit" of volume, and can be used to measure volume.
- **5.MD.C.3.B** A solid figure which can be packed without gaps or overlaps using *n* unit cubes is said to have a volume of *n* cubic units.

- **5.MD.C.4** Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and non-standard units.
- **5.MD.C.5.A** Find the volume of a right rectangular prism with whole-number side lengths by packing it with unit cubes, and show that the volume is the same as would be found by multiplying the edge lengths, equivalently by multiplying the height by the area of the base. Represent threefold whole-number products as volumes, e.g., to represent the associative property of multiplication.
- **5.MD.C.5b.** Apply the formulas V = l × w × h and V = B × h for rectangular prisms to find volumes of right rectangular prisms with whole- number edge lengths in the context of solving real world and mathematical problems
- **5.MD.C.5.C** Recognize volume as additive. Find volumes of solid figures composed of two non-overlapping right rectangular prisms by adding the volumes of the non- overlapping parts, applying this technique to solve real world problems

Suggested Activities/Modifications

Below is a list of suggested activities, modifications, accommodations, and enrichment opportunities. This includes, but is not limited to:

1. Activities
    a. Mental Math
    b. Math Message
    c. Journal pages
    d. Writing/Reasoning Prompts
    e. Open Response and Reengagement Lesson: Quilt Area
    f. Unit 1 Progress Check and Open Response Assessment
    g. Ongoing Assessment through Check Ins
    h. Games: *Name that Number, Baseball Multiplication, Buzz*
2. English Language Learners
    a. Help students understand the meaning of the terms *partial* and *partially* by underlining the base word *part*.
    b. Use visuals to extend knowledge i.e, a whole apple versus a *partially* eaten apple.
3. Special Education/504 Students
    a. Give students centimeter cubes to create rectangular prisms from. Ask students to find the volume of their prism by counting the number of cubes. Explain that the volume of their prism will always correlate to the number of cubes they have.
4. Gifted and Talented Students
    a. Use activity cards to create a polyhedron from other pattern blocks. Students should understand that the polyhedron is made up of *x* number of polygons.

New Jersey Core Curriculum Standards – Standards 8, 9 and Career Readiness Practices

- See Technology & Career Readiness & 21st Century Skills Standards Curriculum Appendix

Unit 2: Whole Number Place Value and Operations (Weeks 5 - 8)

Enduring Understanding

In this unit, students explore patterns in the base-10 place-value system and ways of representing large numbers. They apply their understanding of place value when estimating and computing with multi-digit whole numbers. Students are introduced to U.S. traditional multiplication and review partial-quotients division.

Essential Question(s)

1. Do I know more than one strategy to solve a problem?
2. Can I explain my thinking to another person?

Learning Objectives

Students will be able to:

1. Explore the multiplicative relationships between places in multidigit numbers.
2. Explain patterns in the number of zeros when multiplying by powers of 10. They use whole-number exponents to denote powers of 10.
3. Estimate with powers of 10 to solve multiplication problems and check the reasonableness of products.
4. Use traditional multiplication to multiply 2-digit numbers by 1-digit numbers.
5. Use traditional multiplication to multiply multidigit numbers by 1-digit numbers.
6. Use unit conversions within the customary system to solve multistep problems.
7. Use traditional multiplication to multiply 2-digit numbers by 2-digit numbers.
8. Use traditional multiplication to multiply multidigit numbers.
9. Use the relationship between multiplication and division to mentally divide multidigit numbers.
10. Review and practice strategies for using partial-quotients division to divide whole numbers.
11. Use lists of multiples to find and choose partial quotients
12. Solve division number stories and practice interpreting remainders.

New Jersey Student Learning Standards for Mathematics

- **5.OA.A.2** Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them.
- **5.NBT.A.1** Recognize that in a multi-digit number, a digit in one place represent 10 times as much as it represents in a place to its right and 1/10 of what it represents in the place to its left.
- **5.NBT.A.2** Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole number exponents to denote powers of 10.

- **5.NBT.B.5** Fluently multiply multi-digit whole numbers using the standard algorithm.
- **5.NBT.B.6** Find whole-number quotients of whole numbers with up to four-digit dividends and two-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculations by using equations, rectangular arrays, and/or area models.
- **5.MD.A.1** Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real world problems.

Suggested Activities/Modifications

Below is a list of suggested activities, modifications, accommodations, and enrichment opportunities. This includes, but is not limited to:

1. Activities
    a. Mental Math
    b. Math Message
    c. Journal pages
    d. Writing/Reasoning Prompts
    e. Open Response and Reengagement Lesson: One Million Taps
    f. Unit 2 Progress Check and Cumulative Review
    g. Ongoing Assessment through Check Ins
    h. Games: *Number Top It, High-Number Toss, Power Up*
2. English Language Learners
    a. Use a concrete object such as a slinky or an extension cord to teach the terms *extend* and *extension.* Physically extend the object as you make statements such as *I can't reach the outlet, so I need an* ***extension*** *cord.*
3. Special Education/504 Students
    a. To prepare for using traditional multiplication to multiply larger numbers, multiply numbers in an increasing series. First have students solve 261*3 (783). Then, have students solve 3,261*3 (9,783). Discuss how the problems are similar and different. Finally, have students solve 23,261 * 3 (69,783). Discuss.
4. Gifted and Talented Students
    a. Make a poster comparing different multiplication strategies. Discuss with a partner why different strategies might be more efficient for different problems.

New Jersey Core Curriculum Standards – Standards 8, 9 and Career Readiness Practices

- See Technology & Career Readiness & 21st Century Skills Standards Curriculum Appendix

Unit 3: Fraction Concepts and Coordinate Grids (Weeks 9-16)

Enduring Understanding

In this unit, students build on fraction concepts from previous grades to understand fractions as division. They also use visual models such as number lines to make estimates, add and subtract fractions and mixed numbers, and check the reasonableness of their answers. Finally, students explore strategies for solving fraction-of problems.

Essential Question(s)

1. Can I pick the best tools to help me solve a problem?
2. Can I use a rule to help me solve problem more efficiently?

Learning Objectives

Students will be able to

1. Solve division number stories that lead to fractional answers
2. Solve division number stories and write number models to build an understanding of fractions as division
3. Apply their understanding of fractions as division to report remainders as fractions
4. Use number lines to represent, compare, and rename fractions
5. Use fraction number sense to estimate and assess the reasonableness of answers to fraction addition and subtraction problems
6. Use benchmarks to estimate sums and differences of fractions
7. Rename mixed numbers and fractions greater than 1 by composing and breaking apart wholes
8. Explore strategies and tools for adding and subtracting fractions and mixed numbers
9. Use fraction circle pieces to generate equivalent fractions and add fractions
10. Learn a new game to practice breaking apart and adding fractions
11. Identify problem-solving strategies and solve a variety of fraction number stories
12. Solve fraction-of problems to build readiness for multiplying fractions by whole numbers
13. Solve fraction-of problems with fractional answers to continue building readiness for multiplying fractions by whole numbers

New Jersey Student Learning Standards for Mathematics

- **5.NF.A.1** Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators.
- **5.NF.A.2** Solve word problems involving addition and subtraction of fractions referring to the same whole, including cases of unlike denominators, e.g., by using visual fraction models or equations to represent the problem. Use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers.
- **5.NF.B.3** Interpret a fraction as division of the numerator by the denominator ($a/b = a \div b$). Solve word problems involving division of whole numbers leading to answers in the form of fractions or mixed numbers, e.g., by using visual fraction models or equations to represent the problem.

- **5.NF.B.4** Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction.
- **5.NF.B.4.A** Interpret the product $(a/b) \times q$ as a parts of a partition of q into b equal parts; equivalently, as the result of a sequence of operations $a \times q \div b$.

Suggested Activities/Modifications

Below is a list of suggested activities, modifications, accommodations, and enrichment opportunities. This includes, but is not limited to:

1. Activities
    a. Mental Math
    b. Math Message
    c. Journal pages
    d. Writing/Reasoning Prompts
    e. Open Response and Reengagement Lesson: Game Strategies
    f. Unit 3 Progress Check and Open Response Assessment
    g. Ongoing Assessment through Check Ins
    h. Games: *Power Up, Prism Pile Up, Build-It*
2. English Language Learners
    a. Build on students understanding of *remainder* as what is left over to help them make the connections between *remain* and *remainder*.
3. Special Education/504 Students
    a. Use fractional circle pieces to make sense of fractional remainders. Start by distributing 13 whole circles to 4 to demonstrate 13/4. Each child will get 3 circles, with one remaining. 13/4= 3 R1. Ask if it makes sense to just abandon the final circle. Lead students to the concept of splitting the circle into four equal pieces. Have students model other fractional division problems using the circles.
4. Gifted and Talented Students
    a. To extend work with fraction on a number line, students split a ruler into fourths, eighths, and sixteenths of an inch. Show a student sample (provided in the book) of incorrect work, and have students correct the mistakes. Remind them that " is inches.

New Jersey Core Curriculum Standards – Standards 8, 9 and Career Readiness Practices

- See Technology & Career Readiness & 21st Century Skills Standards Curriculum Appendix

Unit 4: Decimal Concepts and Coordinate Grids (Weeks 18-22)

Enduring Understanding

In this unit, students extend their understanding of the base-10 place-value system to include decimals. They read, write, and represent decimals through thousandths in a variety of ways and learn strategies to compare, order, and round decimals. Students are also introduced to the first quadrant of the coordinate grid. Finally, they apply whole-number algorithms to add and subtract decimals.

Essential Question(s)

1. Can I make a mathematical representation using graphs, tables, words, AND numbers?
2. Can I use patterns to help me solve problems?

Learning Objectives

Students will be able to:

1. Extend place-value patterns to decimals and practice reading and writing decimals to the thousandths.
2. Represent decimals to the thousandths place using base-10 numerals, number names, fractions, and thousandths grids.
3. Are introduced to expanded form for decimals.
4. Use place-value strategies to compare decimals to thousandths.
5. Use number lines and place-value understanding to round decimals to a given place.
6. Are introduced to the coordinate grid and use ordered pairs to plot and identify points.
7. Play a game to practice plotting points on a coordinate grid.
8. Represent mathematical problems on a coordinate grid by plotting points to form pictures and applying rules to ordered pairs.
9. Form ordered pairs, graph them, and interpret coordinate values in context.
10. Shade grids to represent and solve decimal addition and subtraction problems.
11. Review whole-number addition algorithms and use them to add decimals.
12. Review whole-number subtraction algorithms and use them to subtract decimals.
13. Apply decimal addition and subtraction strategies to add and subtract money.

New Jersey Student Learning Standards for Mathematics

- **5.NBT.A.1** Recognize that in a multi-digit number, a digit in one place represents 10 times as much as it represents in the place to its right and 1/10 of what it represents in the place to its left.
- **5.NBT.A.3.A** Read and write decimals to thousandths using base-ten numerals, number names, and expanded form, e.g., $347.392 = 3 \times 100 + 4 \times 10 + 7 \times 1 + 3 \times (1/10) + 9 \times (1/100) + 2 \times (1/1000)$.
- **5.NBT.A.3.B** Compare two decimals to thousandths based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons.
- **5.NBT.A.4** Use place value understanding to round decimals to any place.
- **5.NBT.B.7** Add, subtract, multiply, and divide decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used.

Suggested Activities/Modifications

Below is a list of suggested activities, modifications, accommodations, and enrichment opportunities. This includes, but is not limited to:

1. Activities
    a. Mental Math
    b. Math Message
    c. Journal pages
    d. Writing/Reasoning Prompts
    e. Open Response and Reengagement Lesson: Folder Art
    f. Unit 4 Progress Check and Open Response Assessment
    g. Ongoing Assessment through Check Ins
    h. Games: *Fraction Of, Fraction Capture, Decimal Top-It*
2. English Language Learners
    a. To prepare for describing place value patterns, introduce the word *pattern* by using tools like pattern blocks to create simple patterns and non-examples of patterns.
3. Special Education/504 Students
    a. Use place value chart, base ten blocks, and hundreds grid to give students visual representations of decimals.
4. Gifted and Talented Students
    a. To extend work by comparing decimals, have students calculate and compare baseball player's batting averages. Identify the strongest hitter and explain reasoning.

New Jersey Core Curriculum Standards – Standards 8, 9 and Career Readiness Practices

- See Technology & Career Readiness & 21st Century Skills Standards Curriculum Appendix

Unit 5: Operations with Fractions (Weeks 23-26)

Enduring Understanding

In this unit, students deepen their understanding of fractions and develop strategies for adding and subtracting fractions and mixed numbers with unlike denominators. They also connect fraction-of thinking to multiplication and generalize a fraction multiplication algorithm. Finally, students are introduced to fraction division.

Essential Question(s)

1. Can I create an argument and defend my answer to a mathematical question?
2. Can I create and use mathematical models such as paper folding to find fractions of fractions?

Learning Objectives

Students will be able to:

1. Use equivalent fractions to find common denominators and solve problems
2. Solve problems involving the addition of fractions and mixed numbers
3. Solve problems involving the subtraction of fractions and mixed numbers.
4. Solve fraction-of problems and connect these problems to multiplication of fractions by whole numbers.
5. Discuss and apply strategies for multiplying fractions by whole numbers
6. Apply and extend their understanding of finding fractions of whole numbers to find fractions of fractions.
7. Use area models to find fraction products
8. Use area models to understand and apply an algorithm for fraction multiplication
9. Relate the multiplication rule for equivalent fractions to the effect of multiplying by 1
10. Create story contexts for fraction multiplication problems
11. Use visual models to divide unit fractions by whole numbers.
12. Use visual models to divide whole numbers by unit fractions

New Jersey Student Learning Standards for Mathematics

- **5.NBT.B.5** Fluently multiply multi-digit whole numbers using the standard algorithm.
- **5.NF.A.1** Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators. *For example, 2/3 + 5/4 = 8/12 + 15/12 = 23/12. (In general, a/b + c/d = (ad + bc)/bd.)*
- **5.NF.A.2** Solve word problems involving addition and subtraction of fractions referring to the same whole, including cases of unlike denominators, e.g., by using visual fraction models or equations to represent the problem. Use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers. *For example, recognize an incorrect result 2/5 + 1/2 = 3/7, by observing that 3/7 < 1/2*.
- **5.NF.B.4.A** Interpret the product $(a/b) \times q$ as a parts of a partition of q into b equal parts; equivalently, as the result of a sequence of operations $a \times q \div b$. *For example, use a visual fraction model to show (2/3) × 4 = 8/3, and create a story context for this equation. Do the same with (2/3) × (4/5) = 8/15. (In general, (a/b) × (c/d) = ac/bd.)*
- **5.NF.B.4.B** Find the area of a rectangle with fractional side lengths by tiling it with unit squares of the appropriate unit fraction side lengths, and show that the area is the same as would be found by

multiplying the side lengths. Multiply fractional side lengths to find areas of rectangles, and represent fraction products as rectangular areas.

- **5.NF.B.5.A** Interpret multiplication as scaling (resizing), by: comparing the size of a product to the size of one factor on the basis of the size of the other factor, without performing the indicated multiplication.
- **5.NF.B.5.B** Interpret multiplication as scaling (resizing), by: explaining why multiplying a given number by a fraction greater than 1 results in a product greater than the given number (recognizing multiplication by whole numbers greater than 1 as a familiar case); explaining why multiplying a given number by a fraction less than 1 results in a product smaller than the given number; and relating the principle of fraction equivalence $a/b = (n \times a)/(n \times b)$ to the effect of multiplying a/b by 1.

- **5.NF.B.6** Solve real world problems involving multiplication of fractions and mixed numbers, e.g., by using visual fraction models or equations to represent the problem
- **5.NF.B.7** Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions.

Suggested Activities/Modifications

Below is a list of suggested activities, modifications, accommodations, and enrichment opportunities. This includes, but is not limited to:

1. Activities
    a. Mental Math
    b. Math Message
    c. Journal pages
    d. Writing/Reasoning Prompts
    e. Open Response and Reengagement Lesson: Sharing Breakfast
    f. Unit 5 Progress Check and Open Response Assessment
    g. Ongoing Assessment through Check Ins
    h. Games: *Decimal Top-It: Subtraction; Hidden Treasure; Buzz or Bizz-Buzz*
2. English Language Learners
    a. To help build on students' prior knowledge of the words in and out to help them understand how these words are used in function machines, use Total Physical Response prompts to direct students to come in to the room, go out of the room.
    b. Help them understand that a number has one value going into the function machine and another value coming out.
    c. Have students point to where values go in and come out on a large function machine.
3. Special Education/504 Students
    a. Use counters to represent and solve fraction-of problems with unit fractions
4. Gifted and Talented Students
    a. To extend work with fraction-of problems, students fill in blanks in various fraction-of situations and number sentences on *Math Masters* page 181.

New Jersey Core Curriculum Standards – Standards 8, 9 and Career Readiness Practices

- See Technology & Career Readiness & 21st Century Skills Standards Curriculum Appendix

Unit 6: Investigations in Measurement; Decimal Multiplication and Division (Weeks 27-30)

Enduring Understanding

In this unit, students apply their understanding of place value to multiply and divide decimals by powers of 10. They investigate how patterns in powers of 10 can be used to convert measurements in metric units, learn how line plots can be used to organize and analyze measurement data, and explore a method of finding volumes of figures that are not rectangular prisms. Students also extend whole-number methods to multiply and divide decimals.

Essential Question(s)

1. Can I use clear mathematical language such as *exponent*, *base*, and *exponential notation* to describe the patterns I notice when working with decimals and powers of 10?
2. Can I look for patterns in the placement of decimal points as I multiply and divide decimals?

Learning Objectives

Students will be able to:

1. Use a calculator to multiply and divide decimals by powers of 10. They describe and explain patterns in the placement of the decimal point.
2. Learn a game to practice multiplying and dividing decimals by powers of 10.
3. Apply their understanding of multiplication and division by powers of 10 to convert measurements in metric units
4. Create line plots to display measurement data in fractions of a unit. They use operations with fractions to solve problems based on the information in the line plots.
5. Use information presented in line plots to solve problems, including problems about redistributing measurement data
6. Apply their knowledge of volume concepts to calculate the volume of a building.
7. Use displacement to measure the volume of objects.
8. Use estimation and number sense to predict the relative size of decimal products and quotients.
9. Learn two strategies for solving decimal multiplication problems.
10. Discuss how estimation can be used to place the decimal point when dividing decimals by whole numbers.
11. Create equivalent problems to help them solve division problems involving decimal dividends and divisors
12. Collect reaction-time data and create a line plot. They compute with decimals to identify typical reaction times and to estimate a total class reaction time.

New Jersey Student Learning Standards for Mathematics

- **5.NBT.A.1** Recognize that in a multi-digit number, a digit in one place represents 10 times as much as it represents in the place to its right and 1/10 of what it represents in the place to its left.
- **5.NBT.A.2** Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10.
- **5.NBT.A.3** Read, write, and compare decimals to thousandths.
- **5.NBT.B.6** Find whole-number quotients of whole numbers with up to four-digit dividends and two-digit divisors, using strategies based on place value, the properties o

operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.

- **5.NBT.B.7** Add, subtract, multiply, and divide decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used.
- **5.MD.B.2** Make a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). Use operations on fractions for this grade to solve problems involving information presented in line plots. *For example, given different measurements of liquid in identical beakers, find the amount of liquid each beaker would contain if the total amount in all the beakers were redistributed equally*.
- **5.MD.C.3** Recognize volume as an attribute of solid figures and understand concepts of volume measurement
- **5.MD.C.5** Relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume.

<u>Suggested Activities/Modifications</u>

Below is a list of suggested activities, modifications, accommodations, and enrichment opportunities. This includes, but is not limited to:

1. Activities
    a. Mental Math
    b. Math Message
    c. Journal pages
    d. Writing/Reasoning Prompts
    e. Open Response and Reengagement Lesson: Fundraising
    f. Unit 6 Progress Check and Open Response Assessment
    g. Ongoing Assessment through Check Ins
    h. Games: *Exponent Ball; Decimal Top-It; Prism Pile-Up*
2. English Language Learners
    a. Use role play to introduce the term nearest, connecting it to *near* and *nearer* and contrasting it with *far away*
    b. Model terms with other projects while directing the student to place objects

near, nearer, and nearest, to a point of reference

3. Special Education/504 Students
    a. To prepare for creating line-plot scales with fractional units, students label number lines with different beginning points and fractional increments.
4. Gifted and Talented Students
    a. To extend work, students conduct a measurement investigation. Collect measurement data about a topic of their choice and create a line plot that models their data on poster paper.

<u>New Jersey Core Curriculum Standards – Standards 8, 9 and Career Readiness Practices</u>

- See Technology & Career Readiness & 21st Century Skills Standards Curriculum Appendix

Unit 7: Multiplication of Mixed Numbers (Weeks 31-34)

Enduring Understanding

In this unit students learn two methods for multiplying mixed numbers. They use these methods to find the areas of rectangles with fractional side lengths and to solve problems involving fractional data in line plots. Students also review attributes of 2-dimensional figures and classify shapes in a hierarchy based on properties. Finally, students graph points on coordinate grids to visualize numerical patterns and represent real-world problems.

Essential Question(s)

1. Can I create, use, and make connections among a variety of geometric shapes?
2. Can I create rules and shortcuts for dividing fractions?

Learning Objectives

Students will be able to:

1. Use area models and partial products to multiply mixed numbers
2. Multiply mixed numbers by renaming factors as fractions and using a fraction multiplication algorithm
3. Multiply mixed numbers to find the areas of rectangles with fractional side lengths. They confirm areas by tiling with squares of unit fraction side lengths
4. Solve fraction division problems by renaming dividends and divisors with a common denominator.
5. Classify triangles in a hierarchy based on properties
6. Classify quadrilaterals in a hierarchy based on properties
7. Learn a game to practice naming and classifying quadrilaterals based on properties
8. Organize and represent fractional data on line plots. They use operations on fractions to solve problems
9. Use rules to generate sequences, identify relationships between corresponding terms, and graph points on a coordinate grid to visualize patterns and relationships.
10. Analyze patterns and rules in tables of values, create graphs to represent the data, and answer questions using rules, tables, and graphs.
11. Use rules, tables, and graphs to compare real-world relationships and solve problems
12. Identify relationships between patterns. They graph ordered pairs from corresponding terms of patterns and use the graph to analyze a real-world phenomenon.

Grade 5 MATH

New Jersey Student Learning Standards for Mathematics

- **5.OA.B.3** Generate two numerical patterns using two given rules. Identify apparent relationships between corresponding terms. Form ordered pairs consisting of corresponding terms from the two patterns, and graph the ordered pairs on a coordinate plane. *For example, given the rule "Add 3" and the starting number 0, and given the rule "Add 6" and the starting number 0, generate terms in the resulting sequences, and observe that the terms in one sequence are twice the corresponding terms in the other sequence. Explain informally why this is so*.
- **5.NF.A.1** Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators. *For example, 2/3 + 5/4 = 8/12 + 15/12 = 23/12. (In general, a/b + c/d = (ad + bc)/bd.)*
- **5.NF.B.4** Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction.
- **5.NF.B.4.B** Find the area of a rectangle with fractional side lengths by tiling it with unit squares of the appropriate unit fraction side lengths, and show that the area is the same as would be found by multiplying the side lengths. Multiply fractional side lengths to find areas of rectangles, and represent fraction products as rectangular areas.
- **5.NF.B.7** Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions.1
- **5.MD.B.2** Make a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). Use operations on fractions for this grade to solve problems involving information presented in line plots. *For example, given different measurements of liquid in identical beakers, find the amount of liquid each beaker would contain if the total amount in all the beakers were redistributed equally*.
- **5.G.B.3** Understand that attributes belonging to a category of two-dimensional figures also belong to all subcategories of that category. For example, all rectangles have four right angles and squares are rectangles, so all squares have four right angles.
- **5.G.B.4** Classify two-dimensional figures in a hierarchy based on properties.

Suggested Activities/Modifications

Below is a list of suggested activities, modifications, accommodations, and enrichment opportunities. This includes, but is not limited to:

1. Activities
    a. Mental Math
    b. Math Message
    c. Journal pages
    d. Writing/Reasoning Prompts
    e. Open Response and Reengagement Lesson: A Hierarchy of Polygons
    f. Unit 7 Progress Check and Open Response Assessment
    g. Ongoing Assessment through Check Ins
    h. Games: *Spoon Scramble; Exponent Ball; Doggone Decimal*
2. English Language Learners
    a. Help students understand term **common** in **common denominator** by building on understanding of the word *same*. Display objects, such as cubes of different

colors and sizes. Isolate those that share a common attribute such as the color red. *These are cubes. Some are large. Some are small. But they are all red. These cubes have the same color. They all have the color red in common*.

3. Special Education/504 Students
    a. To prepare for common denominator division, students review how to use visual models to solve fraction division problems
4. Gifted and Talented Students
    a. To extend work, students use the common denominator method to divide fractions by fractions. They make an argument about whether or not the method will always work.

<u>New Jersey Core Curriculum Standards – Standards 8, 9 and Career Readiness Practices</u>

- See Technology & Career Readiness & 21st Century Skills Standards Curriculum Appendix

Unit 8: Applications of Measurement, Computation, and Graphing (Weeks 35-41)

Enduring Understanding

In this unit students apply and extend many skills and concepts they learned throughout the year to engaging, real-world contexts. Problems include planning an athletic center, selecting fish tanks based on area and volume guidelines, creating a budget for an animal shelter, and calculating how long it would take to earn one million dollars. Students also graph and analyze data from heart-rate and pendulum investigations. If time permits, many of the activities in this unit can be extended over multiple days.

Essential Question(s)

1. Can I draw a series of pictures to determine what a treasure hunt problem is asking and to make a plan for solving it?
2. Can I sketch models of rectangular playing areas as I plan an athletic center?

Learning Objectives

Students will be able to:

1. Make unit conversions to find areas of sports playing surfaces in square feet. They use their findings to plan an athletic center.
2. Apply their understanding of rectangular areas to find areas of nonrectangular shapes.
3. Apply length, area, and volume concepts to plan a home aquarium.
4. Devise a plan for spending $1,000,000 to open and operate an animal shelter for one year.
5. Calculate how long it would take to earn $1,000,000 at different hourly wages.
6. Calculate how long it would take to pay off the national debt at different pay scales.
7. Convert measurement units and perform operations with multidigit whole numbers and decimals to solve time and distance problems
8. Collect heart-rate data. They apply their knowledge of multiplication and unit conversions to find the number of times their hearts beat in different units of time.
9. Graph their heart-rate data and use the graphs to analyze the data. They multiply and divide to calculate and compare their cardiac outputs before and after exercise.
10. Apply their knowledge of place value and coordinate grids to investigate the effect of pendulum length on pendulum swing time
11. Use graphs to investigate the effect of arc size on a pendulum's swing time.

New Jersey Student Learning Standards for Mathematics

- **5.NBT.A.4** Use place value understanding to round decimals to any place.
- **5.NBT.B.7** Add, subtract, multiply, and divide decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used.
- **5.NF.B.4** Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction.
- **5.NF.B.5.A** Interpret multiplication as scaling (resizing), by comparing the size of a product to the size of one factor on the basis of the size of the other factor, without performing the indicated multiplication.
- **5.NF.B.5.B** Interpret multiplication as scaling (resizing), by explaining why multiplying a given number by a fraction greater than 1 results in a product greater than the given number (recognizing multiplication by whole numbers greater than 1 as a familiar case); explaining why

multiplying a given number by a fraction less than 1 results in a product smaller than the given number; and relating the principle of fraction equivalence a/b = (n × a)/(n × b) to the effect of multiplying a/b by 1.

- **5.NF.B.6** Solve real world problems involving multiplication of fractions and mixed numbers, e.g., by using visual fraction models or equations to represent the problem.
- **5.MD.A.1** Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real world problems.
- **5.G.A.1** Use a pair of perpendicular number lines, called axes, to define a coordinate system, with the intersection of the lines (the origin) arranged to coincide with the 0 on each line and a given point in the plane located by using an ordered pair of numbers, called its coordinates. Understand that the first number indicates how far to travel from the origin in the direction of one axis, and the second number indicates how far to travel in the direction of the second axis, with the convention that the names of the two axes and the coordinates correspond (e.g., x-axis and x-coordinate, y-axis and y-coordinate).
- **5.G.A.2** Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation.

Suggested Activities/Modifications

Below is a list of suggested activities, modifications, accommodations, and enrichment opportunities. This includes, but is not limited to:

1. Activities
    a. Mental Math
    b. Math Message
    c. Journal pages
    d. Writing/Reasoning Prompts
    e. Open Response and Reengagement Lesson: A Treasure Hunt
    f. Unit 8 Progress Check and Open Response Assessment
    g. Ongoing Assessment through Check Ins
    h. Games: *Exponent Ball; Property Pandemonium; Decimal Domination*
2. English Language Learners
    a. To use role play and think-alouds to help students understand the term guideline as an instruction telling how something should be done.
3. Special Education/504 Students
    a. To prepare review measurement concepts, students find the length, area, and volume of a composite figure. Tape together 2 or 3 empty boxes to form a composite figure and ask students to imagine that it represents a house for a hamster. Students should measure and display the dimensions of the figure to the nearest ½ inch.
4. Gifted and Talented Students
    a. To extend their understanding of volume concepts, students a fish tank that meets specific area guidelines.

New Jersey Core Curriculum Standards – Standards 8, 9 and Career Readiness Practices

- See Technology & Career Readiness & 21st Century Skills Standards Curriculum Appendix

V. **Course Materials** (included, but not limited to)

- Textbook: Everyday Mathematics, McGraw Hill Education Copyright 2015
- Materials: Math Masters, Classroom Posters, Assessment Handbook, *Home Connection Handbook*, Student Math Journal: Volumes 1 and 2, Homelinks, *My Reference Book*, Activity Cards, Interactive Notebook
- Manipulatives: base-10 blocks, counters, dice, Everything Math Deck, fraction circle pieces, marker board, meter stick, number line, pattern blocks, ruler, stopwatch, tape measure
- Computer Programs: MobyMax, LinkIt
- Internet Resources: ConnectED, eToolkit, ePresentations, Smart Notebook, PARCC Practice Tests
- Supplemental Lessons: Investigations Unit 2, lesson 2.3, Unit 3, Lessons 1.1 Unit 6, Lessons 1.3 & 1.4, Unit 4, Lesson 2.2

VI. **Assessments** (included, but not limited to)

- Sept: Baseline Fact Mastery +,-
- Dec/Jan: Mid Year Fact Mastery +,-
- May: End of Year Fact Mastery +,-
- Unit 1-8 Progress Checks
- Odd Units- Open Response Assessment
- Even Units- Cumulative Assessments
- Ongoing Assessment Check Ins
- Writing/Reasoning Prompts
- Mid Chapter Quizzes

VII. **Cross Curricular Aspects**

- Whenever the opportunity arises, teachers should tie in literacy links to the daily math lesson. This will help incorporate the study of literature into math instruction. Teachers should also incorporate science into the curriculum when possible. This can be done through observing and graphing the weather, rainfall, etc.