Readington Township Public Schools

Grade 4 Math Curriculum
Advanced Grade 4 Math Curriculum

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I.   **OVERVIEW**

Readington Township Public Schools' K-5 mathematics curriculum provides students with a strong foundation in mathematics content while promoting and instilling the skills of problem solving, communication in mathematics, making mathematical connections, and reasoning. Throughout the delivery of the K-5 mathematics program, various tools and technology are employed, including manipulatives, calculators, software, apps, videos, websites, and computing devices (computers, tablets, interactive whiteboards, etc.). A strong focus of the program is on promoting high levels of mathematical thought through experiences which extend beyond traditional computation.

The Mathematics 4 course is designed to teach students grade level mathematics while promoting higher order thinking skills. The course is directly correlated to the New Jersey Student Learning Standards and covers such topics as number sense, geometry, measurement, number operations in base ten and fractions, and algebraic thinking.   The course also promotes and instills the skills of problem solving, communication in mathematics, and making mathematical connections. Students will utilize various tools and technology in the process, including manipulatives, calculators, websites, and computers to better enhance a well-rounded understanding of course topics. A strong focus of the program is on promoting high levels of mathematical thought through experiences which extend beyond traditional computation.   Students will use websites such as Reflex Math and IXL.

II.   **STUDENT OUTCOMES (Linked to New Jersey Student Learning Standards for Mathematics 2016)**

Grade 4 Math
OPERATIONS AND ALGEBRAIC THINKING (4.OA)
A. Use the four operations with whole numbers to solve problems.

1. Interpret a multiplication equation as a comparison, e.g., interpret $35 = 5 \times 7$ as a statement that 35 is 5 times as many as 7 and 7 times as many as 5. Represent verbal statements of multiplicative comparisons as multiplication equations.
2. Multiply or divide to solve word problems involving multiplicative comparison, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem, distinguishing multiplicative comparison from additive comparison.[1]
3. Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.

B. Gain familiarity with factors and multiples.

4. Find all factor pairs for a whole number in the range 1–100. Recognize that a whole number is a multiple of each of its factors. Determine whether a given whole number in the range 1–100 is a multiple of a given one-digit number. Determine whether a given whole number in the range 1–100 is prime or composite.

C. Generate and analyze patterns.

5. Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself. *For example, given the rule "Add 3" and the starting number 1, generate terms in the resulting sequence and observe that the terms appear to alternate between odd and even numbers. Explain informally why the numbers will continue to alternate in this way.*

NUMBER AND OPERATIONS IN BASE TEN (4.NBT)
A. Generalize place value understanding for multi-digit whole numbers.

1. Recognize that in a multi-digit whole number, a digit in one place represents ten times what it represents in the place to its right. *For example, recognize that $700 \div 70 = 10$ by applying concepts of place value and division.*
2. Read and write multi-digit whole numbers using base-ten numerals, number names, and expanded form. Compare two multi-digit numbers based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons.
3. Use place value understanding to round multi-digit whole numbers to any place.

B. Use place value understanding and properties of operations to perform multi-digit arithmetic.

4. Fluently add and subtract multi-digit whole numbers using the standard algorithm.
5. Multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers, using strategies based on place value and the properties of operations. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.
6. Find whole-number quotients and remainders with up to four-digit dividends and one-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.

NUMBER AND OPERATIONS—FRACTIONS (4.NF)

A. Extend understanding of fraction equivalence and ordering.

1. Explain why a fraction a/b is equivalent to a fraction $(n × a)/(n × b)$ by using visual fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size. Use this principle to recognize and generate equivalent fractions.
2. Compare two fractions with different numerators and different denominators, e.g., by creating common denominators or numerators, or by comparing to a benchmark fraction such as 1/2. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with symbols >, =, or <, and justify the conclusions, e.g., by using a visual fraction model.

B. Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers.

3. Understand a fraction a/b with $a > 1$ as a sum of fractions $1/b$.
    a. Understand addition and subtraction of fractions as joining and separating parts referring to the same whole.
    b. Decompose a fraction into a sum of fractions with the same denominator in more than one way, recording each decomposition by an equation. Justify decompositions, e.g., by using a visual fraction model. *Examples: 3/8 = 1/8 + 1/8 + 1/8 ; 3/8 = 1/8 + 2/8 ; 2 1/8 = 1 + 1 + 1/8 = 8/8 + 8/8 + 1/8.*
    c. Add and subtract mixed numbers with like denominators, e.g., by replacing each mixed number with an equivalent fraction, and/or by using properties of operations and the relationship between addition and subtraction.
    d. d. Solve word problems involving addition and subtraction of fractions referring to the same whole and having like denominators, e.g., by using visual fraction models and equations to represent the problem.
4. Apply and extend previous understandings of multiplication to multiply a fraction by a whole number.
    a. Understand a fraction a/b as a multiple of $1/b$. *For example, use a visual fraction model to represent 5/4 as the product 5 × (1/4), recording the conclusion by the equation 5/4 = 5 × (1/4).*
    b. Understand a multiple of a/b as a multiple of $1/b$, and use this understanding to multiply a fraction by a whole number. *For example, use a visual fraction model to express 3 × (2/5) as 6 × (1/5), recognizing this product as 6/5. (In general, n × (a/b) = (n × a)/b.)*
    c. Solve word problems involving multiplication of a fraction by a whole number, e.g., by using visual fraction models and equations to represent the problem. *For example, if each person at a party will eat 3/8 of a pound of roast beef, and there will be 5 people at the party, how many pounds of roast beef will be needed? Between what two whole numbers does your answer lie?*

C. Understand decimal notation for fractions, and compare decimal fractions.

5. Express a fraction with denominator 10 as an equivalent fraction with denominator 100, and use this technique to add two fractions with respective denominators 10 and 100.[4] *For example, express 3/10 as 30/100, and add 3/10 + 4/100 = 34/100.*
6. Use decimal notation for fractions with denominators 10 or 100. *For example, rewrite 0.62 as 62/100; describe a length as 0.62 meters; locate 0.62 on a number line diagram.*
7. Compare two decimals to hundredths by reasoning about their size. Recognize that comparisons are valid only when the two decimals refer to the same whole. Record the results of comparisons with the symbols >, =, or <, and justify the conclusions, e.g., by using a visual model.

MEASUREMENT AND DATA (4.MD)

A. Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.

1. Know relative sizes of measurement units within one system of units including km, m, cm. mm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of a smaller unit. 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 a 4 ft snake as 48 in. Generate a conversion table for feet and inches listing the number pairs (1, 12), (2, 24), (3, 36), ...*

2. Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale.

3. 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 viewing the area formula as a multiplication equation with an unknown factor.*

B. Represent and interpret data.

4. Make a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). Solve problems involving addition and subtraction of fractions by using information presented in line plots. *For example, from a line plot find and interpret the difference in length between the longest and shortest specimens in an insect collection.*

C. Geometric measurement: understand concepts of angle and measure angles.

5. Recognize angles as geometric shapes that are formed wherever two rays share a common endpoint, and understand concepts of angle measurement:
    a. An angle is measured with reference to a circle with its center at the common endpoint of the rays, by considering the fraction of the circular arc between the points where the two rays intersect the circle. An angle that turns through 1/360 of a circle is called a "one-degree angle," and can be used to measure angles.
    b. An angle that turns through *n* one-degree angles is said to have an angle measure of *n* degrees.
6. Measure angles in whole-number degrees using a protractor. Sketch angles of specified measure.
7. Recognize angle measure as additive. When an angle is decomposed into non-overlapping parts, the angle measure of the whole is the sum of the angle measures of the parts. Solve addition and subtraction problems to find unknown angles on a diagram in real world and mathematical problems, e.g., by using an equation with a symbol for the unknown angle measure.

GEOMETRY (4.G)

A. Draw and identify lines and angles, and classify shapes by properties of their lines and angles.

1. Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.

2. Classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines, or the presence or absence of angles of a specified size. Recognize right triangles as a category, and identify right triangles.

3. Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded along the line into matching parts. Identify line-symmetric figures and draw lines of symmetry.

PERSONAL FINANCIAL LITERACY (9.1)

Income and Careers

A.1 Explain the difference between a career and a job, and identify various jobs in the community and the related earnings.

A.2 Identify potential sources of income.

A.3 Explain how income affects spending and take-home pay.

Money Management

B.1 Differentiate between financial wants and needs.

B.2 Identify age-appropriate financial goals.

B.3 Explain what a budget is and why it is important.

B.4 Identify common household expense categories and sources of income.

B.5 Identify ways to earn and save.

Credit and Debt Management

C.1 Explain why people borrow money and the relationship between credit and debt.

C.2 Identify common sources of credit (e.g., banks, credit card companies) and types of credit (e.g., loans, credit cards, mortgages).

C.3 Compare and contrast credit cards and debit cards and the advantages and disadvantages of using each.

C.4 Determine the relationships among income, expenses, and interest.

C.5 Determine personal responsibility related to borrowing and lending.

C.6 Summarize ways to avoid credit problems.

Planning, Saving, and Investing

D.1 Determine various ways to save.

D.2 Explain what it means to "invest."

D.3 Distinguish between saving and investing.

Becoming A Critical Consumer

E.1 Determine factors that influence consumer decisions related to money.

E.2 Apply comparison shopping skills to purchasing decisions.

Civic Financial Responsibility

F.1 Demonstrate an understanding of individual financial obligations and community financial obligations.

F.2 Explain the roles of philanthropy, volunteer service, and charitable contributions, and analyze their impact on community development and quality of living.

Insuring and Protecting

G.1 Describe how valuable items might be damaged or lost and ways to protect them.

Advanced Grade 4 Math additional Fifth Grade Standards

OPERATIONS AND ALGEBRAIC THINKING (5.OA)

A. Write and interpret numerical expressions.

1. Use parentheses, brackets, or braces in numerical expressions, and evaluate expressions with these symbols.

NUMBER AND OPERATIONS IN BASE TEN (5.NBT)

A. Understand the place value system.

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.

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.

3. Read, write, and compare decimals to thousandths.

    a. Read and write decimals to thousandths using base-ten numerals, number names, and expanded form, e.g., $347.392 = 3 \times 100 + 4 \times 10 + 7 \times 1 + 3 \times (1/10) + 9 \times (1/100) + 2 \times (1/1000)$.

    b. Compare two decimals to thousandths based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons.

4. Use place value understanding to round decimals to any place

B. Perform operations with multi-digit whole numbers and with decimals to hundredths.

5. Fluently multiply multi-digit whole numbers using the standard algorithm.

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

NUMBER AND OPERATIONS—FRACTIONS (5.NF)
A. Use equivalent fractions as a strategy to add and subtract fractions.
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, $a/b + c/d = (ad + bc)/bd$.
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 $3/7 < ½$

MEASUREMENT AND DATA (5.MD)
C. Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition.
3. Recognize volume as an attribute of solid figures and understand concepts of volume measurement.
    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.
    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.
4. Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and non-standard units.
5. Relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume.
    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.
    b. 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.
    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.

GEOMETRY (5.G)
A. Graph points on the coordinate plane to solve real-world and mathematical problems.
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).
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.

III. **ESSENTIAL QUESTIONS**
Grade 4 Math
Operations and Algebraic Thinking
- What is multiplication?
- How do you use multiplication and division to solve comparison problems?
- How can you identify multiples of a number?
- How can numbers be broken down into its smallest factors?
- How do you figure out and describe patterns?

- How can you model and solve multi-step word problems

Number and Operations in Base Ten
- How can you use place value to understand and compare very large numbers?
- What strategies and understandings allow you to successfully add, subtract, multiply and divide multi-digit whole numbers?
- How can multi-digit whole numbers be rounded?

Number and Operations in Fractions
- How does finding equivalent fractions help you to compare them?
- What is the process of adding and subtracting fractions and mixed numbers with like denominators?
- How can understanding repeated addition of fractions help you to multiply fractions by whole numbers?
- How can you express a fraction as a decimal?
- How can you compare decimals through hundredths?

Measurement and Data
- How can you convert measurements of the U.S. customary system and the metric system?
- What strategies can you use to solve measurement word problems?
- How can you use an understanding of money and time to complete real world problems?
- How can you determine what situations you would use area and perimeter in and how do you solve them?
- How are you able to use a line plot to organize data and answer questions about the data?
- What are angles and how do you measure and draw them?
- How can you use addition and subtraction to solve problems involving angles?

Geometry
- How can you identify a point, line, line segment, ray, and angle?
- How can you use parallel and perpendicular lines to classify two dimensional shapes?
- What is a line of symmetry and how do you find it?

Advanced Grade 4 Math additional Fifth Grade Essential Questions
Operations and Algebraic Thinking
- What is the method of evaluating expressions when they include parentheses?

Number and Operations in Base Ten
- What is the relationship between digits in different place values?
- What is the relationship between the number of zeros in a number and placement of the decimal in a number when multiplying or dividing by a power of 10?
- How can you read and write decimals using expanded form to the thousandths?
- How can you use what you know about place value to compare decimals?
- How do you round decimals?
- What is the process of multiplying multi-digit whole numbers using the standard algorithm?
- What is the process of adding, subtracting and multiplying decimals?

Number and Operations in Fractions
- How can you use equivalent fractions to add and subtract fractions with unlike denominators?

Measurement and Data
- When is volume used and how do you solve for it?
- What is the process of finding volume of composite figures?

Geometry
- How can you use a coordinate plane to plot points?

IV. **STRATEGIES**
- Group discussions
- Teacher presentation
- Student projects
- Guided groups
- One to one instruction
- Interactive SMARTBoard lessons

- Tutorials
- Online practice such as Reflex Math and IXL

V. EVALUATION
- Assessments may include but are not limited to:
- Teacher Observations
- Class Participation
- Class Discussions
- Class Assignments
- Homework Assignments
- Notebooks
- Student Projects
- Unit Tests and Quizzes
- Performance Assessments
- Anecdotal Records
- End of year Assessment

VI. REQUIRED RESOURCES
- *Math Expressions Common Core Grade 4*, by Dr. Karen Fuson; Published by Houghton Mifflin Harcourt
- *Math Expressions Common Core Grade 5*, by Dr. Karen Fuson; Published by Houghton Mifflin Harcourt

Supplemental Materials
- IXL
- Brain Pop
- Reflex Math
- **Think Central**
- *Ready Grade 4,* by Dr. Mark Ellis and Dr. Gladis Kersaint, Published by Curriculum Associates
- *Ready Grade 5,* by Dr. Mark Ellis and Dr. Gladis Kersaint, Published by Curriculum Associates

VII. SCOPE AND SEQUENCE
Fourth Grade
Operations and Algebraic Thinking (30 days)
- Multiply and divide to solve comparison problems
- Identify factor pairs and multiples of a number
- Identify prime and composite numbers
- Analyze patterns
- Model and solve multi-step word problems

Number and Operations in Base Ten (30 days)
- Read and write numbers
- Compare multi-digit whole numbers
- Add multi-digit whole numbers
- Subtract multi-digit whole numbers
- Multiply multi-digit whole numbers
- Divide multi-digit numbers
- Round multi-digit whole numbers

Number and Operations in Fractions (50 days)
- Find equivalent fractions
- Compare fractions with unlike denominators
- Add and subtract fractions with like denominators
- Multiply a fraction by a whole number
- Write a decimal as a fraction
- Compare decimals

Measurement and Data (40 days)
- Convert units of weight, length, liquid volume and time
- Solve word problems about time, money, distance, liquid volumes and masses
- Find the area of rectangles
- Find perimeter for rectangles
- Measure angles using a protractor
- Solve addition and subtraction problems with angles

Geometry (15 days)
- Identify points, line segments, rays and perpendicular and parallel lines
- Draw and identify angles
- Classify two-dimensional figures
- Draw and identify lines of symmetry

PERSONAL FINANCIAL LITERACY (9.1)
Income and Careers (2 days)
- Define careers and jobs
- Identify potential sources of income
- Explore the relationship between income, spending, and take-home pay

Money Management (3 days)
- Financial wants and needs
- Age-appropriate financial goals
- Budgets
- Expenses and sources of income
- Earning and saving

Credit and Debt Management (2 days)
- Relationship between credit and debt
- Sources of credit (e.g., banks, credit card companies) and types of credit (e.g., loans, credit cards, mortgages)
- Credit cards and debit cards
- Relationships among income, expenses, and interest
- Personal responsibility related to borrowing and lending.

Planning, Saving, And Investing (1 day)
- Distinguish between saving and investing

Becoming A Critical Consumer (1 day)
- Apply comparison shopping skills to purchasing decisions

Civic Financial Responsibility (1 day)
- Individual financial obligations and community financial obligations
- Roles of philanthropy, volunteer service, and charitable contributions

Insuring and Protecting (1 day)
- Describe how valuable items might be damaged or lost and ways to protect them.

Advanced Grade 4 Math additional Fifth Grade Scope and Sequence
Advanced Grade 4 Math moves at an accelerated pace by compacting the fourth and fifth grade standards.

Operations and Algebraic Thinking (5 days)
- Evaluate expressions

Number and Operations in Base Ten (35 days)
- Read and write decimals
- Compare decimals
- Round decimals

- Multiply whole numbers
- Add and subtract decimals
- Multiply decimals

Number and Operations in Fractions (10 days)
- Add and subtract fractions with unlike denominators

Measurement and Data (20 days)
- Find volume of a solid figure by counting unit cubes
- Find volume by using a formula
- Find the volume of composite figures

Geometry (10 days)
- Graph points on a coordinate plane
- Find the distance between two points on a coordinate plane
- Graph quantities that represent real-world situations on a coordinate plane and use the graph to solve a problem

Additional time will be spent on reviewing concepts that may need to be revisited and looking ahead to next year's curriculum.