Readington Township Public Schools

Grade 5 Honors Math Curriculum

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Approval Date: January 18, 2022

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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. The Fifth Grade Honors course is a full-year course designed to provide honors level mathematics instruction to select students who exhibit a demonstrated need to increase content knowledge in mathematics while greatly accelerating the pace of instruction. The course is created with the goal of developing strong, cogent mathematical thinking, and independent mathematical problem solving skills.

The program is directly correlated to the sixth and seventh grade New Jersey Student Learning Standards (NJSLS). All 6^{th} grade content is covered and students study approximately half of the 7^{th} grade content. A typical progression for students successful in Honors Math 5 would be to move into 6^{th} grade Pre-Algebra to gain the remaining 7^{th} grade standards and all of the 8^{th} grade standards.

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

RATIOS AND PROPORTIONS (6.RP & 7.RP)

Understand ratio concepts and use ratio reasoning to solve problems.

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

Analyze proportional relationships and use them to solve real-world and mathematical problems.

1. Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units.
2. Recognize and represent proportional relationships between quantities.
3. Use proportional relationships to solve multistep ratio and percent problems. Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error.

THE NUMBER SYSTEM (6.NS & 7.NS)

1. Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem.
2. Fluently divide multi-digit numbers using the standard algorithm.
3. Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.
4. Find the greatest common factor of two whole numbers less than or equal to 100 and the least common multiple of two whole numbers less than or equal to 12. Use the distributive property to express a sum of two whole numbers 1-100 with a common factor as a multiple of a sum of two whole numbers with no common factor. *For example, express 36 + 8 as 4 (9 + 2).*
5. Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation.
6. Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates.
7. Understand ordering and absolute value of rational numbers.
8. Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane. Include use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate
9. Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram.
10. Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers. 11. Solve real-world and mathematical problems involving the four operations with rational numbers (extend to complex fractions).

EXPRESSIONS AND EQUATIONS (6.EE & 7.EE)
Apply and extend previous understandings of arithmetic to algebraic expressions.

1. Write and evaluate numerical expressions involving whole-number exponents.
2. Write, read, and evaluate expressions in which letters stand for numbers.
3. Apply the properties of operations to generate equivalent expressions. *For example, apply the distributive property to the expression 3 (2 + x) to produce the equivalent expression 6 + 3x; apply the distributive property to the expression 24x + 18y to produce the equivalent expression 6 (4x + 3y); apply properties of operations to y + y + y to produce the equivalent expression 3y*.
4. Identify when two expressions are equivalent (i.e., when the two expressions name the same

number regardless of which value is substituted into them).

Reason about and solve one-variable equations and inequalities.

1. Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true.
2. Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set.
3. Solve real-world and mathematical problems by writing and solving equations of the form $x + p = q$ and $px = q$ for cases in which p, q and x are all nonnegative rational numbers.
4. Write an inequality of the form $x > c$ or $x < c$ to represent a constraint or condition in a real-world or mathematical problem. Recognize that inequalities of the form $x > c$ or $x <$ c have infinitely many solutions; represent solutions of such inequalities on number line diagrams.
5. Represent and analyze quantitative relationships between dependent and independent variables. Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation.

Use properties of operations to generate equivalent expressions. (7.EE)

1. Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.
2. Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related.
3. Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.
4. Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.

GEOMETRY (6.G & 7.G)

1. Solve real-world and mathematical problems involving area, surface area, and volume. Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems.
2. Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths, and show that the volume is the same as would be found by multiplying the edge lengths of the prism. Apply the formulas $V = l\ w\ h$ and $V =$

B h to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems.

3. Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate. Apply these techniques in the context of solving real-world and mathematical problems.
4. Represent three-dimensional figures using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures. Apply these techniques in the context of solving real-world and mathematical problems.

STATISTICS AND PROBABILITY (6.SP)

1. Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers.
2. Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape.
3. Recognize that a measure of center for a numerical data set summarizes all of its values with a single number, while a measure of variation describes how its values vary with a single number.
4. Display numerical data in plots on a number line, including dot plots, histograms, and box plots.
5. Summarize numerical data sets in relation to their context.

Mathematical Practices

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning

III. ESSENTIAL QUESTIONS

The Number System

Numerical Expression and Factors

- How can you use repeated factors in real-life situations?
- Without dividing, how can you tell when a number is divisible by another number?
- How can you find the greatest common factor and least common multiple of two numbers?

Fractions and Decimals

- What does it mean to multiply or divide fractions?
- What does it mean to multiply or divide decimals?

Integers

- How can you represent numbers on a coordinate plane or number line in relation to 0?

- How can you use a number line to better understand integers?
- How can you use integers to represent real-life situations including the velocity and speed of an object?
- How can you tell if the sum or quotient of two integers is positive, negative or zero?
- How are adding integers and subtracting integers related?

Rational Numbers

- How can you use a number line to order rational numbers?
- How can you use what you know about adding integers to add rational numbers?
- Why is the product of two negative rational numbers positive?

Expressions and Equations

Algebraic Expression and Properties

- How can you write and evaluate an expression that represents a real-life problem?
- How can you write an expression that represents an unknown quantity?
- Does the order in which you perform an operation matter?

Equations, Inequalities & Equations

- How can you use addition, subtraction, multiplication and/or division to solve an equation?
- How can you write an equation with two variables?
- How can you represent the solution to an inequality?
- How can you simplify an algebraic expression?
- How can you use algebra tiles to solve one-step and two-step equations?

Ratios and Proportional Relationships

Ratios and Rates

- How can you find, represent, and compare the relationship between two quantities?
- What is the connection between ratios, fractions, and percent?
- How can you compare lengths between the customary and metric systems Proportions
- How do rates help you describe real-life problems in words and graphically?
- How can proportions help you decide when things are “fair”?
- How can you use a graph or equation to show the relationship between two quantities that vary directly?

Percents

- How does the decimal point move when you rewrite a percent as a decimal and vice versa?
- How can you order numbers that are written as fractions, decimals, and percents?
- How can you use models to estimate percent questions?
- What is the percent of decrease and percent of increase?

Geometry

Areas of Polygons

- How can you derive a formula for the area of a parallelogram, triangle, and trapezoid?
- How do you find the lengths of the line segments in a coordinate plane?

Surface Area and Volume

- How can you draw a three-dimensional figure?
- How can you find the area of the entire surface of a prism?
- How can you find the volume of a rectangular prism with fractional edge lengths?

Statistics and Probability

Statistical Measures

- How can find and describe the average of a data set?
- How can you describe the spread of a data set? Data Displays
- How can you use intervals, tables, and graphs to organize data?
- How can you describe the shape of a distribution of a data set?
- How can you use quartiles to represent data graphically?

IV. STRATEGIES

The curriculum will be presented through a variety of strategies, based in educational best practices. Students will be engaged in meaningful lessons and activities using guided and independent practice and cooperative learning. Students will participate in hands-on activities, use manipulatives or technology where appropriate, and participate actively in class discussions. Students will have the opportunity to work online, both in and out of class, to enhance their academic studies.

Teachers will encourage students to employ a number of problem-solving strategies, relevant to the situations they are in. They will demonstrate evidence of understanding through modeling, verbal descriptions and oral presentations. Students may also use tools of technology where needed to better enhance their ability to complete and defend their mathematical reasoning. Specific strategies that may be used include, but are not limited to:

- Teacher presentation and direct instruction
- Inquiry-based problem solving
- Math Talk (solve, explain, question, and justify)
- Whole & Small Group instruction - Guided and independent
- Problem-solving independently, in pairs and in small groups
- Online videos and other instructional methods inside and/or outside of class
- Online practice such as Reflex Math and IXL
- Online tutorials

V. ACCOMMODATIONS

- **Accommodations and Modification Addendum**

VI. ASSESSMENTS

- **Formative**
  - Independent student work
  - Homework assignments
  - Notebooks
  - Teacher observations

- **Summative**
  - End of Year Test
  - Unit Test
  - Unit Quizzes
- **Alternative**
  - Student projects

- **Benchmark**
  - Performance-based assessments
  - I-Ready Diagnostic (given September, March, and June)

VII. MATERIALS

- **Core**
  - *Big Ideas Math: Advanced 1 Common Core Curriculum*,Larson, R. and Boswell, L. (2013).
    - Teaching Edition (Green) features Chapters 1-10
    - Teaching Edition (Orange) features Chapters 11-15
    - Student Edition textbook (Orange)
    - Student Edition Record and Practice Journal (Orange)
    - Online Teacher Dashboard Internet Access

- **Supplemental Resources**
  - **Technology**
    - Brain Pop
    - IXL
    - Estimation180
    - Freckle
    - Gizmos
    - Google Classroom
    - Illustrative Mathematics
    - Padlet
    - Reflex Math
  - Lappan, G. (2009). *Connected Mathematics 2*. Boston, MA: Pearson.

VIII. CAREER READINESS, LIFE LITERACIES, AND KEY SKILLS AND COMPUTER SCIENCE

The Number System

- **Career Ready Practices**
  Act as a responsible and contributing community member and employee
  Utilize critical thinking to make sense of problems and persevere in solving them.
  Activity: Students have a problem solving board from which they select a new problem, at least weekly. These problems require logical thinking and utilization of multiple strategies in order to reach a solution successfully. Students must describe their solution, in writing or video, to convince the reader they are correct.

- **9.2 Career Awareness, Exploration, and Preparation**
  9.2.5.CAP.3: Identify qualifications needed to pursue traditional and non-traditional careers and occupations.
  Activity: Students, in small groups, will create a newsletter to be sent to families. They will include a short description of a career that frequently involves arithmetic. This will require students to identify the qualifications for the career they chose.

- **9.4 Life Literacies and Key Skills**
  9.4.5.CT.3: Describe how digital tools and technology may be used to solve problems.

  Activity: Using the teacher-created word problems involving typical household finances, students will discuss what tools/technology could be used to help solve household financial problems.

- **Computer Science**
  8.1.5.DA.5: Propose cause and effect relationships, predict outcomes, or communicate ideas using data.
  Activity: Students will use a spreadsheet to analyze the impact of exponents on numbers. They will understand that while a calculator can be used for this purpose, when repeatedly making the same computation, a spreadsheet is a more effective tool.

Expressions and Equations

- **Career Ready Practices**
  Act as a responsible and contributing community member and employee.
  Attend to financial well-being.
  Activity: Students will utilize equations to determine how long to reach a savings goal. When working together in class and online, students will show respect for each other, provide each other with necessary information and assistance through this challenging unit, and work together cooperatively to develop and describe their equations, and the life situations that are represented. They will choose a savings goal, and determine under different circumstances, how much they would have to save to reach it in different time periods. Also, consider how they would earn the money necessary to save.

- **9.2 Career Awareness, Exploration, and Preparation**
  9.2.5.CAP.1: Evaluate personal likes and dislikes and identify careers that might be suited to personal likes.
  Activity: The activity above will include communication, collaboration and leadership skills required in a career. It will also require students to research the minimum wage in NJ and other jobs to determine pay scale.

- **9.4 Life Literacies and Key Skills**
  9.4.5.CT.4: Apply critical thinking and problem-solving strategies to different types of problems such as personal, academic, community, and global.
  Activity: Students will utilize equations to determine how long to reach a savings goal.

- **Computer Science**
  8.1.5.DA.1: Collect, organize, and display data in order to highlight relationships and support a claim.
  Activity: The activity above will provide an opportunity to use digital tools to create line graphs in a coordinate plane. Students will then print that image, and add it to a document, with text, to demonstrate to their readers the importance of saving money over time to reach their goal.

Ratios & Proportions

- **Career Ready Practices**
  Act as a responsible and contributing community member and employee.
  Utilize critical thinking to make sense of problems and persevere in solving them.
  Activity: Students will complete Chapter 5, Alternate Assessment as an in class activity.

- **9.2 Career Awareness, Exploration, and Preparation**
  9.2.5.CAP.4: Explain the reasons why some jobs and careers require specific training, skills, and certification and examples of these requirements.
  Activity: Students will complete Chapter 5, Alternate Assessment as an in class activity. This involves the above standards, and can be extended to include a self-created survey of families and community members to further enhance its applicability to career standards. Survey question to include topics related to position of employment and education achieved.

- **9.4 Life Literacies and Key Skills**
  9.4.5.CT.1: Identify and gather relevant data that will aid in the problem-solving process.
  Activity: Students will complete Chapter 5, Alternate Assessment as an in class activity. This involves the above standards.

- **Computer Science**
  8.1.5.DA.1: Collect, organize, and display data in order to highlight relationships or support a claim.
  Activity: In the activity above, students will use calculators, spreadsheets and graphing tools to graph their results and explain their findings.

Geometry

- **Career Ready Practices**
  Act as a responsible and contributing community member and employee.
  Consider the environmental, social and economic impacts of decisions.
  Demonstrate creativity and innovation
  Use technology to enhance productivity, increase collaboration and communicate effectively.
  Work productively in teams while using cultural/global competence.
  Activity: Students will make several models of a juice box package. For each, students will analyze the impacts various designs have on cost, material usage and societal enjoyment of the resulting product. They will select the best product packaging based on their analysis and present to the company design selection committee.

- **9.2 Career Awareness, Exploration, and Preparation**
  9.2.5.CAP.7: Identify factors to consider before starting a business.
  Activity: During the course of the project above, students will discuss the factors involved in starting a juice box business.

- **9.4 Life Literacies and Key Skills**
  9.4.5.CI.4: Research the development process of a product and identify the role of failure as a part of the creative process.
  Activity: During the course of the project above, students will research and discuss the process of developing a product.

- **Computer Science**
  8.1.5.AP.2: Create programs that use clearly named variables to store and modify the data.
  Activity: Students will create a program to compute the volume of their juice box that will modify their data as they change their juice box dimensions.

Statistics and Probability

- **Career Ready Practices**
  Act as a responsible and contributing community member and employee
  Demonstrate creativity and innovation.
  Utilize critical thinking to make sense of problems and persevere in solving them.
  Activity: Students will create and send surveys to students and/or parents to analyze and create a "What's Typical about a 5th grader" product at the conclusion of this unit.

- **9.2 Career Awareness, Exploration, and Preparation**
  9.2.5.CAP.1: Evaluate personal likes and dislikes and identify careers that might be suited to personal likes.
  Activity: This will be incorporated into the project as described above.

- **9.4 Life Literacies and Key Skills**
  9.4.5.CI.3: Participate in a brainstorming session with individuals with diverse perspectives to expand one's thinking about a topic of curiosity.
  Activity: This will be incorporated into the project as described above.

- **Computer Science**
  8.1.5.DA.1: Collect, organize, and display data in order to highlight relationships or support a claim.
  Activity: This will be incorporated into the project as described above

IX. PACING

The approximate duration of each segment of the units is provided, along with the chapter of the Big Ideas textbook in which those topics are covered. As noted, other resources may also be utilized to best meet the students' needs for these topics.

The Number System

Numerical Expressions and Factors (15 days, Ch 1)
Fractions and Decimals (15 days, Ch 2)
Integers and the Coordinate Plane (10 days, Ch 6)
Integers (10 days, Ch 11)
Rational Numbers (10 days, Ch 12)
Interdisciplinary Connections:
Science 5-ESS-1-2 Represent data in graphical displays to reveal patterns.
Activity: During the Big Ideas activities described in this unit, students will create tables and graphs to record patterns in multiplying and dividing integers, using the pattern visible to generate an algorithm. They will also read graphs to determine how negative and positive numbers are used to represent real world altitude above and below sea level.

Expressions and Equations

Algebraic Expressions and Properties (10 days, Ch 3)
Equations and Inequalities (15 days, Ch 7)
Expressions and Equations (10 days, Ch 13)
Interdisciplinary Connections:
ELA RI.5.1. Quote accurately from a text and make relevant connections when explaining what the text says explicitly and when drawing inferences from the text.
Activity: During the Big Ideas activities described in this unit, students will learn to carefully attend to the words in context and relate key phrases to different mathematical operation symbols and inequality symbols. Students will also tend carefully to text to write numerical and algebraic expressions to represent the word problem.

Ratios and Proportional Relationships

Ratios and Rates (10 days, Ch 5)
Ratios and Proportions (10 days, Ch 14) Percent (10 days, Ch 15)
Interdisciplinary Connections:
Science: 5-PS1-2 Measure and graph quantities such as weight to address scientific and engineering questions and problems.
Activity: During the Big Ideas activities described in this unit, students will measure the amount of food coloring added to an icing to make different shades. They will compare the resulting colors. The students will

graph the relationships between food coloring drops and icing amount, to determine how the graph shows which ratio is greater.

Geometry

Areas of Polygons (10 days, Ch 4)
Surface Area and Volume (10 days, Ch 8)
Interdisciplinary Connections:
Science 5-PS1-3 Make observations and measurements to identify materials based on their properties.
Activity: During the Big Ideas activities described in this unit, students will categorize and find the area of polygons based on their properties. They will demonstrate understanding of which properties apply to ALL shapes or SOME shapes in each category. They will use these properties to determine shape type and then apply the correct formula to find its area/surface area/volume.

Statistics and Probability

Statistical Measures (10 days, Ch 9)
Data Displays (8 days, Ch 10)
Interdisciplinary Connections:
ELA NJSLSA.SL5. Make strategic use of digital media and visual displays of data to express information and enhance understanding of presentations.
Activity: During the Big Ideas activities described in this unit, and a survey students create to describe what is typical of a 5th grader, students will analyze data using measures of center and spread. They will decide on a pictorial representation for this data and make posters for each characteristic measured. The class, as a whole, will create a book or bulletin board display with what is typical (e.g., height, age, eye color, favorites, etc).