COURSE TITLE

RTI Math

LENGTH

One Semester

DEPARTMENT

STEM Department

SCHOOL

Rutherford High School

DATE

September 10, 2018

Initial BOE Approval Date (Born on): 5/11/2015

RTI Math

I. Introduction/Overview/Philosophy

RTI Mathematics is a course designed to remediate students who require Urgent Intervention or Intervention according to their score on the RTI assessment the previous school year. Since the program is one of individualized instruction, specific objectives and requirements are correlated directly to the specific student's Individual Student Improvement Plan.

The skills addressed in RTI Mathematics are divided into four categories: Number and Numerical Operations, Geometry and Measurement, Patterns and Algebra, and Data Analysis, Probability, and Discrete Mathematics. In addition, mathematical processes and test taking skills are stressed. These four skill categories emphasize mathematical understanding, not rote learning; applications, not abstractions; problem solving, not drill; and thinking, not recall.

II. Objectives

Course Outline:

1. Understand how different types of numbers are related to each other and how each can be used to describe a situation by:
    a. Making suitable approximations and estimations
    b. Understanding numbers and applying them in real life situations.
    c. Working with percents, fractions, and proportions in a variety of problems.
    d. Applying concepts such as real numbers, powers, exponents, and roots, absolute value, scientific notation, primes, factors, and multiples in problem solving situations.
2. Describe and interpret the physical environment using geometry and measurement by:
    a. Understanding and using the basic principles and relationships in geometry and measurement.
    b. Recognizing and identifying spatial relationships.
    c. Applying the principles of symmetry, congruence, and similarity.
    d. Identifying and applying geometric transformations.
    e. Using coordinate geometry to solve problems.
    f. Applying area and perimeter formulas to basic shapes.
    g. Using relationships in right triangles to solve problems.
    h. Representing situations using matrices and performing operations with vectors and matrices.
3. Understand the relationship between equations and graphs by:
    a. Recognizing patterns, sequences and series and methods to continue patterns.
    b. Using inductive reasoning to solve pattern and algebra problems.
    c. Utilizing algebraic processes and concepts to represent real-life situations.
    d. Demonstrating understanding of the concepts of slope, relations and functions and their graphs.
    e. Using variables, expressions, and equations to solve real-life problems.
4. Perform skills involving data analysis, probability, statistics and discrete mathematics by:
    a. Determining and using probabilities in real-life situations.
    b. Collecting, analyzing, and organizing data into charts and graphs and using that data to statistically represent a given situation.

c. Applying the methods and concepts of discrete mathematics.
d. Using patterns and processes to analyze and compare everyday experiences.

Student Outcomes:

After successfully completing this course, the student will:

- Solve problems that arise in mathematics and other contexts and select and apply a variety of appropriate problem-solving strategies.
- Communicate mathematical thinking coherently and clearly.
- Use connections among mathematical ideas to explain concepts.
- Select and use various types of reasoning and methods of proof.
- Create and use representations to organize, record and communicate mathematical ideas.
- Use technology to gather, analyze and communicate mathematical information.

New Jersey Student Learning Standards

CAREER READY PRACTICES

CRP1 Act as a responsible and contributing citizen and employee.

Career-ready individuals understand the obligations and responsibilities of being a member of a community, and they demonstrate this understanding every day through their interactions with others. They are conscientious of the impacts of their decisions on others and the environment around them. They think about the near-term and long-term consequences of their actions and seek to act in ways that contribute to the betterment of their teams, families, community and workplace. They are reliable and consistent in going beyond the minimum expectation and in participating in activities that serve the greater good.

CRP2 Apply appropriate academic and technical skills.

Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive. They make connections between abstract concepts with real-world applications, and they make correct insights about when it is appropriate to apply the use of an academic skill in a workplace situation

CRP4 Communicate clearly and effectively and with reason.

Career-ready individuals communicate thoughts, ideas, and action plans with clarity, whether using written, verbal, and/or visual methods. They communicate in the workplace with clarity and purpose to make maximum use of their own and others' time. They are excellent writers; they master conventions, word choice, and organization, and use effective tone and presentation skills to articulate ideas. They are skilled at interacting with others; they are active listeners and speak clearly and with purpose. Career-ready individuals think about the audience for their communication and prepare accordingly to ensure the desired outcome.

CRP6. Demonstrate creativity and innovation.

Career-ready individuals regularly think of ideas that solve problems in new and different ways, and they contribute those ideas in a useful and productive manner to improve their organization. They can consider unconventional ideas and suggestions as solutions to issues, tasks or problems, and they discern which ideas and suggestions will add greatest value. They seek new methods, practices, and ideas from a variety of sources and seek to apply those ideas to their own workplace. They take action on their ideas and understand how to bring innovation to an organization.

CRP7. Employ valid and reliable research strategies.
Career-ready individuals are discerning in accepting and using new information to make decisions, change practices or inform strategies. They use reliable research process to search for new information. They evaluate the validity of sources when considering the use and adoption of external information or practices in their workplace situation.

CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
Career-ready individuals readily recognize problems in the workplace, understand the nature of the problem, and devise effective plans to solve the problem. They are aware of problems when they occur and take action quickly to address the problem; they thoughtfully investigate the root cause of the problem prior to introducing solutions. They carefully consider the options to solve the problem. Once a solution is agreed upon, they follow through to ensure the problem is solved, whether through their own actions or the actions of others.

CRP11. Use technology to enhance productivity.
Career-ready individuals find and maximize the productive value of existing and new technology to accomplish workplace tasks and solve workplace problems. They are flexible and adaptive in acquiring new technology. They are proficient with ubiquitous technology applications. They understand the inherent risks-personal and organizational-of technology applications, and they take actions to prevent or mitigate these risks.

TECHNOLOGY
Standard 8.1 Educational Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
Strand A. Technology Operations and Concepts: Students demonstrate a sound understanding of technology concepts, systems and operations.
8.1.12.A.1- Create a personal digital portfolio which reflects personal and academic interests, achievements, and career aspirations by using a variety of digital tools and resources.
8.1.12.A.5- Create a report from a relational database consisting of at least two tables and describe the process, and explain the report results.
Strand F: Critical thinking, problem solving, and decision making: Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.
8.1.12.F.1- Evaluate the strengths and limitations of emerging technologies and their impact on educational, career, personal and or social needs.

Standard 8.2 Technology Education, Engineering, Design, and Computational Thinking - Programming: All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.
Strand C. Design: The design process is a systematic approach to solving problems.
8.2.12.C.5- Create scaled engineering drawings of products both manually and digitally with materials and measurements labeled.

21ST CENTURY LIFE AND CAREERS
9.1 Personal Financial Literacy
Strand A: Income and Careers
9.1.12.A.3 Analyze the relationship between various careers and personal earning goals.

9.1.12.A.4 Identify a career goal and develop a plan and timetable for achieving it, including

Strand B: Money Management

9.1.12.B.8 Describe and calculate interest and fees that are applied to various forms of spending, debt, and saving.

9.2 Career Awareness, Exploration, and Preparation

Strand C: Career Preparation

9.2.12.C.2 Modify Personalized Student Learning Plans to support declared career goals.

NEW JERSEY STUDENT LEARNING STANDARDS- MATH

A.APR.A.1. Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.

A.APR.B.3. Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial.

A.CED.A.1. Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear functions and quadratic functions, and simple rational and exponential functions.

A.CED.A.2. Create equations in two or more variables to represent relationships between quantities; Graph equations on coordinate axes with labels and scales.

A.CED.A.3. Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.

A.CED.A.4. Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm's law V = IR to highlight resistance R.

A.REI.A.1. Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.

A.REI.B.3. Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.

A.REI.B.4. Solve quadratic equations in one variable.

> A.REI.B.4a. Use the method of completing the square to transform any quadratic equation in x into an equation of the form (x - p)2 = q that has the same solutions. Derive the quadratic formula from this form.
>
> A.REI.B.4b. Solve quadratic equations by inspection (e.g., for x2 = 49), taking square roots, completing the square, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as a ± bi for real numbers a and b.

A.REI.C.5. Prove that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions.

A.REI.C.6. Solve systems of linear equations exactly and approximately (e.g., with graphs), focusing on pairs of linear equations in two variables.

A.REI.D.10. Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line). [Focus on linear equations.]

A.REI.D.11. Explain why the x-coordinates of the points where the graphs of the equations y = f(x) and y = g(x) intersect are the solutions of the equation f(x) = g(x); find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where f(x) and/or g(x) are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.*

A.REI.D.12. Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.

A.SSE.A.1. Interpret expressions that represent a quantity in terms of its context.

A.SSE.A.1a: Interpret parts of an expression, such as terms, factors, and coefficients.

A.SSE.A.1b: Interpret complicated expressions by viewing one or more of their parts as a single entity. For example, interpret P(1+r)n as the product of P and a factor not depending on P.

A.SSE.A.2. Use the structure of an expression to identify ways to rewrite it.

A.SSE.B.3. Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.

A.SSE.B.3a. Factor a quadratic expression to reveal the zeros of the function it defines.

A.SSE.B.3b. Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.

A.SSE.B.3c. Use the properties of exponents to transform expressions for exponential functions. For example the expression 1.15t can be rewritten as $(1.151/12)12t \approx 1.01212t$ to reveal the approximate equivalent monthly interest rate if the annual rate is 15%.

F.BF.A.1. Write a function that describes a relationship between two quantities.

F.BF.A.1a. Determine an explicit expression, a recursive process, or steps for calculation from a context.

F.BF.B.3. Identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), f(kx), and f(x + k) for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. Include recognizing even and odd functions from their graphs and algebraic expressions for them.

F.IF.A.1. Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then f(x) denotes the output of f corresponding to the input x. The graph of f is the graph of the equation y = f(x).

F.IF.A.2. Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.

F.IF.A.3. Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. For example, the Fibonacci sequence is defined recursively by $f(0) = f(1) = 1$, $f(n+1) = f(n) + f(n-1)$ for $n \geq 1$.

F.IF.B.4. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.

F.IF.B.5. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.

F.IF.B.6. Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.

F.IF.C.7. Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.

F.IF.C.7a. Graph linear and quadratic functions and show intercepts, maxima, and minima.

F.IF.C.7b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.

F.IF.C.8. Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.

F.IF.C.8a. Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context.

F.IF.C.9. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).

F.LE.A.1. Distinguish between situations that can be modeled with linear functions and with exponential functions.

F.LE.A.1a. Prove that linear functions grow by equal differences over equal intervals, and that exponential functions grow by equal factors over equal intervals.

F.LE.A.1b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another.

F.LE.A.1c. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another.

F.LE.A.2. Construct linear and exponential functions - including arithmetic and geometric sequences - given a graph, a description of a relationship, or two input-output pairs (include reading these from a table).

F.LE.A.3. Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.

F.LE.B.5. Interpret the parameters in a linear or exponential function in terms of a context.

For example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.

N.Q.A.1. Use units as a way to understand problems and to guide the solution of multi-step problems; Choose and interpret units consistently in formulas; Choose and interpret the scale and the origin in graphs and data displays.

N.Q.A.2. Define appropriate quantities for the purpose of descriptive modeling.

N.Q.A.3. Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

N.RN.B.3. Explain why the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational.

III. Proficiency Levels

RTI Math is appropriate for students who require Urgent Intervention or Intervention.

IV. Methods of Assessment

Student Assessment

The teacher will provide a variety of assessments during the course of the year. The assessment may include but is not limited to: tests and quizzes, simulations, group work, class participation, homework, and activities.

Curriculum/Teacher Assessment

The teacher will provide the subject area supervisor with suggestions for changes on an ongoing basis.

V. Grouping

RTI Math is required for students who have been identified as requiring remediation as a result of an Urgent Intervention or Intervention.

VI. Articulation/Scope & Sequence/Time Frame

Course length is one semester.

VII. Resources

Texts/Supplemental Reading/References

Resources may include: `

www.ixl.com
Algebra 1 Texts
Geometry Texts

VIII. Suggested Activities

Appropriate activities are listed in the map below.

IX. Methodologies

The following methods of instruction are suggested: teacher guided explorations, working in groups/working with a partner, working with manipulatives and discovery activities.

X. Interdisciplinary Connections

At this grade level, connections to many other disciplines are appropriate and natural. Reading and writing become an integral part of the mathematics process. Connections with science are frequent throughout both curricula. Technology plays an important part in learning mathematics as well.

XI. Differentiating Instruction for Students with Special Needs: Students with Disabilities, Students at Risk, English Language Learners, and Gifted & Talented Students

Differentiating instruction is a flexible process that includes the planning and design of instruction, how that instruction is delivered, and how student progress is measured. Teachers recognize that students can learn in multiple ways as they celebrate students' prior knowledge. By providing appropriately challenging learning, teachers can maximize success for all students.

Differentiating in this course includes but is not limited to:

Differentiation for Support (ELL, Special Education, Students at Risk)

- Peer mentoring on problems
- Differentiated teacher feedback on assignments
- Modeling out problems on whiteboard
- Visual aids as we project problems on whiteboard
- Study guides
- Tiered assignments
- Scaffolding of materials and assignments
- Re-teaching and review
- Guided note taking
- Exemplars of varied performance levels
- Multi-media approach to accommodating various learning styles

Differentiation for Enrichment

- Supplemental reading material for independent study
- Flexible grouping
- Tiered assignments
- Topic selection by interest
- Enhanced expectations for independent study
- Elevated questioning techniques using Webb's Depth of Knowledge matrix

XII. Professional Development

The teacher will continue to improve expertise through participation in a variety of professional development opportunities.

XII. Curriculum Map/Pacing Guide

Unit Topic	Time Allocated	Differentiating Instruction for Students with Disabilities, Students at Risk, English Language Learners, & Gifted & Talented Students	Standards	Assessments
Algebra Foundations • Real Numbers • Exponents • Estimation/Approximation • Scientific Notation • Ratio and Proportion • Percents	5 weeks	*For Support:* • Guided notes • Teacher modeling • Scaffolding (breaking down acronym i.e.; PEMDAS backwards into parts) • Use of algebra manipulative • Assessment accommodations (extended time, use of calculator) *For Enhancement:* • Advanced problems involving fractions, decimals. • Khan Academy Practice/Khan SAT • Use of IXL	A-CED.A.1 A-SSE.A.1a A-CED.A.4 A-REI.A.1 A-REI.B.3 CRP1,2,4,6,7,8,11 9.1.12.A.8	*Formative Assessments:* Questioning, Do nows, classwork, homework *Summative Assessments:* Quiz Project Test
Geometry • Perimeter/Circumference/Area • Surface Area • Volume • Angle Relationships • Pythagorean Theorem • Coordinate Plane • Transformational Geometry	5 weeks	*For Support:* • Guided notes • Teacher modeling • Visual learning, including graphic organizer • Use of note card for cues • Assessment accommodations (extended time, use of	A-REI.B.3 A-CED.A.1 A-CED.A.3 A-CED.A.4 CRP1,2,4,6,7,8,11 8.2.12.C.5	*Formative Assessments:* Questioning, Do nows, classwork, homework *Summative Assessments:* Quiz Project Test

Unit Topic	Time Allocated	Differentiating Instruction for Students with Disabilities, Students at Risk, English Language Learners, & Gifted & Talented Students	Standards	Assessments
• Similar Figures		calculator) *For Enhancement:* • Use of IXL • Real-world problems and scenarios • Student choice		
Statistics and Probability • Mean, Median, Mode • Bar, Line, and Circle Graphs • Scatter Plots • Frequency Tables	5 weeks	*For Support:* • Use of IXL • Use of graphing calculator • Use of graphic organizers • Use of visual formats • Assessment accommodations (extended time, use of calculator) *For Enhancement:* • Use of IXL • Illustrative Mathematics Activities • Representing real-world sceneries using linear graphs • Using graph to predict real-world solutions	F-IF.A.1 F-IF.A.2 F-IF.B.4 F-IF.B.5 F-IF.B.6 F-IF.C.7a A-REI.D.10 CRP1,2,4,6,7,8,11 8.1.12.A.5	*Formative Assessments:* Questioning, Do nows, classwork, homework *Summative Assessments:* Quiz Project Test
Algebra • Solving/Graphing Equations • Slope of a Line • Writing Equations of Lines • Patterns and Functions	5 weeks	*For Support:* • Use of graphic organizer • Assessment accommodations (extended time, use of calculator)	F-BF.A.1a F-BF.A.2 F-LE.2 A-CED.A.2 A-CED.A.4	*Formative Assessments:* Questioning, Do nows, classwork, homework

Unit Topic	Time Allocated	Differentiating Instruction for Students with Disabilities, Students at Risk, English Language Learners, & Gifted & Talented Students	Standards	Assessments
• Functions and Graphs		• Use of note card with formulas *For Enhancement:* • Use of IXL • Student-driven projects	A-REI.D.10 F-LE.A.2 A-SSE.A.1 A-SSE.B.3 CRP1,2,4,6,7,8,11 8.1.12.A.1 8.1.12.F.1 9.1.12.A.3,4 9.1.12.B.8 9.2.12.C.2	*Summative Assessments:* Quiz Project Test