Mendham Borough Public Schools
Mendham, New Jersey

Curriculum and Instruction

Course of Study

Mathematics: Grade 2 **August 23, 2016**

I. RATIONALE, DESCRIPTION AND PURPOSE

We live in a mathematical world. Whenever we decide on a purchase, choose an insurance or health plan, or use a spreadsheet, we rely on mathematical understanding. Print and electronic media inundate us with quantitative information. The complexity of mathematical reasoning and problem solving needed in the workplace has increased dramatically.

In such a world, the ability to understand and use mathematics will yield opportunities in the workplace, in secondary and post-secondary study, and in the personal realm. Users of mathematics need to compute fluently and solve problems resourcefully.

Everyday Mathematics is designed to lead students to these two overarching mathematical competencies. Mathematics instruction in *Everyday Mathematics* proceeds in six strands. Overarching program goals are organized by strand and extend across grades pre-K-5. In *number and numeration*, students will understand the meanings, uses and representations of numbers; equivalent names for numbers; and common numerical relations. The *operations and computations* strand requires students to compute correctly; make reasonable estimates; and understand meanings of operations. *Data and chance* leads students to select and create appropriate graphical representations of collected or given data; analyze and interpret data; and understand and apply basic concepts of probability.

In *measurement and reference frames*, students will understand the systems and processes of measurement; use appropriate techniques, tools, units and formulas in making measurements; and use and understand reference frames. The *geometry* strand leads students to investigate characteristics and properties of two- and three-dimensional geometric shapes, and apply transformations and symmetry in geometric situations. In *patterns, functions and algebra*, students will understand patterns and functions, and use algebraic notation to represent and analyze situations and structures.

The goal of mathematics education in the primary grades is to develop a solid mathematical foundation. At the core of this understanding lie number and operations. It is essential that students develop a solid understanding of the base ten numeration system. They must recognize that the word "ten" may represent a single entity (one set of ten) or ten separate units (ten ones), and that these representations are interchangeable. In these grades, students are building beliefs about what mathematics is, about what it means to know and do mathematics, and about themselves as mathematical learners. These beliefs influence their thinking about, performance in, and attitudes toward mathematics in later years.

II. DISTRICT OBJECTIVES

The district adopts the "Standards for Mathematical Practice" as outlined in the Common Core State Standards.

"*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).*" (Common Core State Standards, 2010)

The standards are presented in the Common Core State Standards as follows:

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.

In addition, the mathematics curriculum will reflect the National Council of Teachers of Mathematics' "Curriculum Focal Points for Mathematics in Prekindergarten through Grade 8 Mathematics" through the incorporation of the following from the Focal Points document:

- *the use of mathematics to solve problems*
- *an application of logical reasoning to justify procedures and solutions; and*
- *an involvement in the design and analysis of multiple representations to learn, make connections among, and communicate about the ideas within and outside of mathematics*

III. ALIGNMENT TO STANDARDS

Mathematics development in second grade aligns with the following **New Jersey Student Learning Standards:**

Operations and Algebraic Thinking (OA)

• Represent and solve problems involving addition and subtraction.
• Add and subtract within 20.

• Work with equal groups of objects to gain foundations for multiplication.

Number and Operations in Base Ten (NBT)

• Understand place value.
• Use place value understanding and properties of operations to add and subtract.

Measurement and Data (MD)

• Measure and estimate lengths in standard units.
• Relate addition and subtraction to length.
• Work with time and money.
• Represent and interpret data.

Geometry (G)

• Reason with shapes and their attributes.

IV. CONTENT, SCOPE AND SEQUENCE, LEARNING OUTCOMES

The Common Core Standards for Mathematics in complete form are as follows:

CCSS.Math.Content.2.OA.A.1 Use addition and subtraction within 100 to solve one- and two-step word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.1

CCSS.Math.Content.2.OA.B.2 Fluently add and subtract within 20 using mental strategies.2 By end of Grade 2, know from memory all sums of two one-digit numbers.

CCSS.Math.Content.2.OA.C.3 Determine whether a group of objects (up to 20) has an odd or even number of members, e.g., by pairing objects or counting them by 2s; write an equation to express an even number as a sum of two equal addends.

CCSS.Math.Content.2.OA.C.4 Use addition to find the total number of objects arranged in rectangular arrays with up to 5 rows and up to 5 columns; write an equation to express the total as a sum of equal addends.

CCSS.Math.Content.2.NBT.A.1 Understand that the three digits of a three-digit number represent amounts of hundreds, tens, and ones; e.g., 706 equals 7 hundreds, 0 tens, and 6 ones. Understand the following as special cases:

CCSS.Math.Content.2.NBT.A.1a 100 can be thought of as a bundle of ten tens — called a “hundred.”

CCSS.Math.Content.2.NBT.A.1b The numbers 100, 200, 300, 400, 500, 600, 700, 800, 900 refer to one, two, three, four, five, six, seven, eight, or nine hundreds (and 0 tens and 0 ones).

CCSS.Math.Content.2.NBT.A.2 Count within 1000; skip-count by 5s, 10s, and 100s.

CCSS.Math.Content.2.NBT.A.3 Read and write numbers to 1000 using base-ten numerals, number names, and expanded form.

CCSS.Math.Content.2.NBT.A.4 Compare two three-digit numbers based on meanings of the hundreds, tens, and ones digits, using >, =, and < symbols to record the results of comparisons.

CCSS.Math.Content.2.NBT.B.5 Fluently add and subtract within 100 using strategies based on place value, properties of operations, and/or the relationship between addition and subtraction.
CCSS.Math.Content.2.NBT.B.6 Add up to four two-digit numbers using strategies based on place value and properties of operations.

CCSS.Math.Content.2.NBT.B.7 Add and subtract within 1000, 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. Understand that in adding or subtracting three-digit numbers, one adds or subtracts hundreds and hundreds, tens and tens, ones and ones; and sometimes it is necessary to compose or decompose tens or hundreds.

CCSS.Math.Content.2.NBT.B.8 Mentally add 10 or 100 to a given number 100–900, and mentally subtract 10 or 100 from a given number 100–900.

CCSS.Math.Content.2.NBT.B.9 Explain why addition and subtraction strategies work, using place value and the properties of operations.1

CCSS.Math.Content.2.MD.A.1 Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes.

CCSS.Math.Content.2.MD.A.2 Measure the length of an object twice, using length units of different lengths for the two measurements; describe how the two measurements relate to the size of the unit chosen.

CCSS.Math.Content.2.MD.A.3 Estimate lengths using units of inches, feet, centimeters, and meters.

CCSS.Math.Content.2.MD.A.4 Measure to determine how much longer one object is than another, expressing the length difference in terms of a standard length unit.

CCSS.Math.Content.2.MD.B.5 Use addition and subtraction within 100 to solve word problems involving lengths that are given in the same units, e.g., by using drawings (such as drawings of rulers) and equations with a symbol for the unknown number to represent the problem.

CCSS.Math.Content.2.MD.B.6 Represent whole numbers as lengths from 0 on a number line diagram with equally spaced points corresponding to the numbers 0, 1, 2, ..., and represent whole-number sums and differences within 100 on a number line diagram.

CCSS.Math.Content.2.MD.C.7 Tell and write time from analog and digital clocks to the nearest five minutes, using a.m. and p.m.

CCSS.Math.Content.2.MD.C.8 Solve word problems involving dollar bills, quarters, dimes, nickels, and pennies, using $ and ¢ symbols appropriately. Example: If you have 2 dimes and 3 pennies, how many cents do you have?

CCSS.Math.Content.2.MD.D.9 Generate measurement data by measuring lengths of several objects to the nearest whole unit, or by making repeated measurements of the same object. Show the measurements by making a line plot, where the horizontal scale is marked off in whole-number units.

CCSS.Math.Content.2.MD.D.10 Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems1 using information presented in a bar graph.

CCSS.Math.Content.2.G.A.1 Recognize and draw shapes having specified attributes, such as a given number of angles or a given number of equal faces.1 Identify triangles, quadrilaterals, pentagons, hexagons, and cubes.

CCSS.Math.Content.2.G.A.2 Partition a rectangle into rows and columns of same-size squares and count to find the total number of them.

CCSS.Math.Content.2.G.A.3 Partition circles and rectangles into two, three, or four equal shares, describe the shares using the words halves, thirds, half of, a third of, etc., and describe the whole as two halves, three thirds, four fourths. Recognize that equal shares of identical wholes need not have the same shape.

V. INSTRUCTIONAL TECHNIQUES

Mathematics instruction incorporates a variety of techniques to meet the continuum of learners' interests, learning profiles and readiness levels. Differentiation is the commitment and mechanism through which the developmental needs of a range of readiness levels are met. Differentiated instruction is accomplished through pre-assessment and ongoing formative assessment that inform independent work, the small group strategy lesson and the individual conference. Differentiation in content, product and/or process addresses the needs of exceptionally able students, and scaffolding of varying degree is provided to support less ready students in meeting worthy and appropriately rigorous learning outcomes. Instructional objectives, strategies and materials emphasize relevance, authenticity, and student-centered learning.

Instructional techniques include the following:

- Mini-lessons (connection, teaching point, modeling, active student engagement, link to independent work)
- Daily routines for ongoing practice and application: mental math and reflexes, home links, name-collection boxes, math boxes, function machines
- Math message to activate prior knowledge and provide formative assessment for readiness grouping
- Flexible grouping (i.e., partners, small groups) according to readiness levels and learning profiles
- Daily routines to develop math fact automaticity; e.g., fact families/fact triangles
- Regular cooperative routines; e.g., math games
- Use of manipulatives and simulations to model math concepts
- Teacher modeling/thinking aloud of mathematical reasoning and problem-solving processes

- Partner talk to develop mathematical concepts
- Small group strategy instruction
- Individual conference
- Development of key vocabulary tied to mathematical concepts and skills
- Explorations and extensions of previously taught concepts and skills
- Anchor activities to provide practice of specific skills to meet individual needs
- Writing about mathematics (problem-solving process)
- Open-ended problem-solving response
- Exit slips

VI. ASSESSMENT

Assessment in mathematics education includes **interim/formative assessments, including performance assessment:**

- Daily routines: math message, mental math and reflexes, home links, name-collection boxes, math boxes, function machines, math games
- Lesson and unit pre-assessment to differentiate instruction (i.e., curriculum compacting)
- End-of-unit assessments ("Progress Checks"), including open-ended problem-solving response
- Periodic teacher-student conferences to assess development of unit skills (performance assessment of application of concepts and problem-solving strategies) and concepts
- Periodic review of the math journal to assess mathematical reasoning strategies and processes
- Teachers' observation of students' independent mathematics work (i.e., stamina for focused work, algorithms and problem-solving skills) and cooperative activities (e.g., math games)
- Teachers' observation of students' accountable talk in math partnerships (performance assessment of thinking in mathematics problem solving)
- Students' self-reflections regarding their mastery of specific skills at the end of each unit
- Exit slips
- Timed weekly math-fact tests
- Mid-year assessment (formative for the second semester)

Assessment in mathematics education includes **summative assessments, including performance assessment:**

- Baseline grade-level assessment to measure mastery of previously taught concepts and skills (pre-assessment)

- Mid-year assessment (summative for the first semester)

- End-of-year assessment to measure mastery of second grade concepts and skills