Mendham Borough Public Schools
Mendham, New Jersey

Curriculum and Instruction

Course of Study

Mathematics: Grade 1 **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 first grade aligns with the following **New Jersey Student Learning Standards:**

Operations and Algebraic Thinking

• Represent and solve problems involving addition and subtraction.

• Understand and apply properties of operations and the relationship between addition and subtraction.
• Add and subtract within 20.
• Work with addition and subtraction equations.

Number and Operations in Base Ten

• Extend the counting sequence.
• Understand place value.
• Use place value understanding and properties of operations to add and subtract.

Measurement and Data

• Measure lengths indirectly and by iterating length units.
• Tell and write time.
• Represent and interpret data.

Geometry

• 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.1.OA.A.1 Use addition and subtraction within 20 to solve word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using objects, drawings, and equations with a symbol for the unknown number to represent the problem.1

CCSS.Math.Content.1.OA.A.2 Solve word problems that call for addition of three whole numbers whose sum is less than or equal to 20, e.g., by using objects, drawings, and equations with a symbol for the unknown number to represent the problem.

CCSS.Math.Content.1.OA.B.3 Apply properties of operations as strategies to add and subtract.2 Examples: If 8 + 3 = 11 is known, then 3 + 8 = 11 is also known. (Commutative property of addition.) To add 2 + 6 + 4, the second two numbers can be added to make a ten, so 2 + 6 + 4 = 2 + 10 = 12. (Associative property of addition.)

CCSS.Math.Content.1.OA.B.4 Understand subtraction as an unknown-addend problem. For example, subtract 10 – 8 by finding the number that makes 10 when added to 8.

CCSS.Math.Content.1.OA.C.5 Relate counting to addition and subtraction (e.g., by counting on 2 to add 2).

CCSS.Math.Content.1.OA.C.6 Add and subtract within 20, demonstrating fluency for addition and subtraction within 10. Use strategies such as counting on; making ten (e.g., 8 + 6 = 8 + 2 + 4 = 10 + 4 = 14); decomposing a number leading to a ten (e.g., 13 – 4 = 13 – 3 – 1 = 10 – 1 = 9); using the relationship between addition and subtraction (e.g., knowing that 8 + 4 = 12, one knows 12 – 8 = 4);

and creating equivalent but easier or known sums (e.g., adding 6 + 7 by creating the known equivalent 6 + 6 + 1 = 12 + 1 = 13).

CCSS.Math.Content.1.OA.D.7 Understand the meaning of the equal sign, and determine if equations involving addition and subtraction are true or false. For example, which of the following equations are true and which are false? 6 = 6, 7 = 8 – 1, 5 + 2 = 2 + 5, 4 + 1 = 5 + 2.

CCSS.Math.Content.1.OA.D.8 Determine the unknown whole number in an addition or subtraction equation relating three whole numbers. For example, determine the unknown number that makes the equation true in each of the equations 8 + ? = 11, 5 = _ – 3, 6 + 6 = _.

CCSS.Math.Content.1.NBT.A.1 Count to 120, starting at any number less than 120. In this range, read and write numerals and represent a number of objects with a written numeral.

CCSS.Math.Content.1.NBT.B.2 Understand that the two digits of a two-digit number represent amounts of tens and ones. Understand the following as special cases:

CCSS.Math.Content.1.NBT.B.2a 10 can be thought of as a bundle of ten ones — called a “ten.”

CCSS.Math.Content.1.NBT.B.2b The numbers from 11 to 19 are composed of a ten and one, two, three, four, five, six, seven, eight, or nine ones.

CCSS.Math.Content.1.NBT.B.2c The numbers 10, 20, 30, 40, 50, 60, 70, 80, 90 refer to one, two, three, four, five, six, seven, eight, or nine tens (and 0 ones).

CCSS.Math.Content.1.NBT.B.3 Compare two two-digit numbers based on meanings of the tens and ones digits, recording the results of comparisons with the symbols >, =, and <.

CCSS.Math.Content.1.NBT.C.4 Add within 100, including adding a two-digit number and a one-digit number, and adding a two-digit number and a multiple of 10, 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. Understand that in adding two-digit numbers, one adds tens and tens, ones and ones; and sometimes it is necessary to compose a ten.

CCSS.Math.Content.1.NBT.C.5 Given a two-digit number, mentally find 10 more or 10 less than the number, without having to count; explain the reasoning used.

CCSS.Math.Content.1.NBT.C.6 Subtract multiples of 10 in the range 10-90 from multiples of 10 in the range 10-90 (positive or zero differences), 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.

CCSS.Math.Content.1.MD.A.1 Order three objects by length; compare the lengths of two objects indirectly by using a third object.

CCSS.Math.Content.1.MD.A.2 Express the length of an object as a whole number of length units, by laying multiple copies of a shorter object (the length unit) end to end; understand that the length measurement of an object is the number of same-size length units that span it with no gaps or overlaps.

Limit to contexts where the object being measured is spanned by a whole number of length units with no gaps or overlaps.

CCSS.Math.Content.1.MD.B.3 Tell and write time in hours and half-hours using analog and digital clocks.
Represent and interpret data.

CCSS.Math.Content.1.MD.C.4 Organize, represent, and interpret data with up to three categories; ask and answer questions about the total number of data points, how many in each category, and how many more or less are in one category than in another.

CCSS.Math.Content.1.G.A.1 Distinguish between defining attributes (e.g., triangles are closed and three-sided) versus non-defining attributes (e.g., color, orientation, overall size); build and draw shapes to possess defining attributes.

CCSS.Math.Content.1.G.A.2 Compose two-dimensional shapes (rectangles, squares, trapezoids, triangles, half-circles, and quarter-circles) or three-dimensional shapes (cubes, right rectangular prisms, right circular cones, and right circular cylinders) to create a composite shape, and compose new shapes from the composite shape.1

CCSS.Math.Content.1.G.A.3 Partition circles and rectangles into two and four equal shares, describe the shares using the words halves, fourths, and quarters, and use the phrases half of, fourth of, and quarter of. Describe the whole as two of, or four of the shares. Understand for these examples that decomposing into more equal shares creates smaller shares.

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: math message, mental math and reflexes, home links, name-collection boxes, math boxes, function machines
- 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 mathematical concepts
- Inquiry and inductive approaches to the discovery of mathematical concepts

- Teacher modeling/thinking aloud of mathematical reasoning and problem-solving processes
- "Hip-to-hip" partner talk to develop mathematical concepts
- Small group strategy lesson
- Flexible grouping (i.e., partners, small groups) according to readiness levels
- Flexible grouping (i.e., partners, small groups) according to learning profiles
- Individual conference
- Development of key vocabulary tied to mathematical concepts and skills
- Explorations and extensions of previously taught concepts and skills
- Writing about mathematics (problem-solving process)
- Modification of instructional materials based on readiness and learning styles
- Open-ended problem-solving response

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
- 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, problem-solving skills, cooperative activities [e.g.., math games])
- Teachers' observation of students' talk in math partnerships (performance assessment of thinking in mathematics problem solving)
- "Exit slips" to assess daily development of concepts and skills
- 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 first grade concepts and skills
- End-of-year “Skills to Review” checklist for each student