Mendham Borough Public Schools
Mendham, New Jersey

Curriculum and Instruction

Course of Study

Mathematics: Grade K **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 kindergarten aligns with the following **New Jersey Student Learning Standards:**

Counting and Cardinality

• Know number names and the count sequence.

• Count to tell the number of objects.
• Compare numbers.

Operations and Algebraic Thinking

• Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from.

Number and Operations in Base Ten

• Work with numbers 11–19 to gain foundations for place value.

Measurement and Data

• Describe and compare measurable attributes.
• Classify objects and count the number of objects in categories.

Geometry

• Identify and describe shapes.
• Analyze, compare, create, and compose shapes.

IV. CONTENT, SCOPE AND SEQUENCE, LEARNING OUTCOMES

The Standards for Mathematics in complete form are as follows:

CCSS.Math.Content.K.CC.A.1 Count to 100 by ones and by tens.

CCSS.Math.Content.K.CC.A.2 Count forward beginning from a given number within the known sequence (instead of having to begin at 1).

CCSS.Math.Content.K.CC.A.3 Write numbers from 0 to 20. Represent a number of objects with a written numeral 0-20 (with 0 representing a count of no objects).

CCSS.Math.Content.K.CC.B.4 Understand the relationship between numbers and quantities; connect counting to cardinality.

CCSS.Math.Content.K.CC.B.4a When counting objects, say the number names in the standard order, pairing each object with one and only one number name and each number name with one and only one object.

CCSS.Math.Content.K.CC.B.4b Understand that the last number name said tells the number of objects counted. The number of objects is the same regardless of their arrangement or the order in which they were counted.

CCSS.Math.Content.K.CC.B.4c Understand that each successive number name refers to a quantity that is one larger.

CCSS.Math.Content.K.CC.B.5 Count to answer “how many?” questions about as many as 20 things arranged in a line, a rectangular array, or a circle, or as many as 10 things in a scattered configuration; given a number from 1–20, count out that many objects.

CCSS.Math.Content.K.CC.C.6 Identify whether the number of objects in one group is greater than, less than, or equal to the number of objects in another group, e.g., by using matching and counting strategies.1

CCSS.Math.Content.K.CC.C.7 Compare two numbers between 1 and 10 presented as written numerals.

CCSS.Math.Content.K.OA.A.1 Represent addition and subtraction with objects, fingers, mental images, drawings1, sounds (e.g., claps), acting out situations, verbal explanations, expressions, or equations.

CCSS.Math.Content.K.OA.A.2 Solve addition and subtraction word problems, and add and subtract within 10, e.g., by using objects or drawings to represent the problem.

CCSS.Math.Content.K.OA.A.3 Decompose numbers less than or equal to 10 into pairs in more than one way, e.g., by using objects or drawings, and record each decomposition by a drawing or equation (e.g., 5 = 2 + 3 and 5 = 4 + 1).
CCSS.Math.Content.K.OA.A.4 For any number from 1 to 9, find the number that makes 10 when added to the given number, e.g., by using objects or drawings, and record the answer with a drawing or equation.

CCSS.Math.Content.K.OA.A.5 Fluently add and subtract within 5.

CCSS.Math.Content.K.NBT.A.1 Compose and decompose numbers from 11 to 19 into ten ones and some further ones, e.g., by using objects or drawings, and record each composition or decomposition by a drawing or equation (such as 18 = 10 + 8); understand that these numbers are composed of ten ones and one, two, three, four, five, six, seven, eight, or nine ones.

CCSS.Math.Content.K.MD.A.1 Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object.

CCSS.Math.Content.K.MD.A.2 Directly compare two objects with a measurable attribute in common, to see which object has “more of”/“less of” the attribute, and describe the difference. For example, directly compare the heights of two children and describe one child as taller/shorter.

CCSS.Math.Content.K.MD.B.3 Classify objects into given categories; count the numbers of objects in each category and sort the categories by count.1

CCSS.Math.Content.K.G.A.1 Describe objects in the environment using names of shapes, and describe the relative positions of these objects using terms such as above, below, beside, in front of, behind, and next to.

CCSS.Math.Content.K.G.A.2 Correctly name shapes regardless of their orientations or overall size.

CCSS.Math.Content.K.G.A.3 Identify shapes as two-dimensional (lying in a plane, "flat") or three-dimensional ("solid").

CCSS.Math.Content.K.G.B.4 Analyze and compare two- and three-dimensional shapes, in different sizes and orientations, using informal language to describe their similarities, differences, parts (e.g., number of sides and vertices/"corners") and other attributes (e.g., having sides of equal length).

CCSS.Math.Content.K.G.B.5 Model shapes in the world by building shapes from components (e.g., sticks and clay balls) and drawing shapes.

CCSS.Math.Content.K.G.B.6 Compose simple shapes to form larger shapes. For example, "Can you join these two triangles with full sides touching to make a rectangle?"

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 informs 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: number of the day, attendance, job chart, monthly calendar, daily schedule, weather observation, recording daily temperature, surveys
- Use of manipulatives 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
- Small group strategy lesson
- Flexible grouping (i.e., partners, small groups) according to readiness levels
- Partnerships based on learning profiles
- Individual conference
- Daily and weekly math centers and stations to reinforce previously learned concepts
- Anchor activities to support choice and independent work

VI. ASSESSMENT

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

- Daily routines: number of the day, attendance, job chart, monthly calendar, daily schedule, weather observation, recording daily temperature, surveys
- Lesson and unit pre-assessment to differentiate instruction
- Ongoing and end-of-unit assessments
- Periodic teacher-student conferences to assess development of unit skills (performance assessment of application of concepts and problem-solving strategies) and concepts
- Teachers' observation of students' independent mathematics work (i.e., stamina for focused work and problem-solving skills), including math center tasks
- Students' self-reflections regarding their understanding of math concepts and skills (i.e., "thumbs up, thumbs down")
- Mid-year assessment (formative for 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 first semester)
- End-of-year assessment to measure mastery of kindergarten concepts and skills
- End-of-year "Skills to Review" checklist for each student