Mathematics Benchmarks - Kindergarten

The Newton Public Schools has fully transitioned to the 2011 *Massachusetts Mathematics Curriculum Frameworks, incorporating the Common Core State Standards*. The new standards, developed by education officials from 48 states, address the ongoing concerns at the national level about the focus and coherence of mathematics education, and about the depth of understanding of mathematics among students in the United States.

The focus of the new frameworks requires that we change the content of our curriculum by decreasing the number of topics to be taught each year, and by deliberately building concepts step-by-step from grade to grade. Increasing the depth of student understanding of mathematics requires changing some of our traditional instructional strategies.

With the transition, we adjusted mathematical content and our mathematical practices simultaneously. We continue to use *Everyday Mathematics* as our core text, eliminating topics that are no longer content expectations in kindergarten, adding materials that deepen the instruction on topics defined as critical areas for kindergarten, and adding materials that address topics not included in kindergarten *Everyday Math*.

In addition to providing new content, our new materials define a management structure to help teachers engage all children in the mathematics they are learning: in reasoning, problem solving, communicating their mathematical thinking and critiquing the reasoning of others - all mathematical practices identified in the Common Core State Standards.

It is our firm belief that the 2011 *Massachusetts Mathematics Curriculum Frameworks, incorporating the Common Core State Standards* - built on a foundation of mathematical practices and instructional strategies that deliberately and specifically promote student engagement with mathematics - will further the system-wide core value of Respect for Human Differences. With these frameworks as a structure, teachers will have additional tools for developing students' skills in:

- listening respectfully to different points of view.
- working cooperatively with people of different backgrounds and experiences

The complete text of the new frameworks can be downloaded from the Massachusetts Department of Elementary and Secondary Education website: www.doe.mass.edu/frameworks/current.html. Further information about the Common Core State Standards Initiative can be found at www.corestandards.org

Mathematical Practices - Kindergarten

Mathematical practices students will use in Kindergarten include:

1. Making sense of problems and persevering in solving them.
    Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, "Does this make sense?"

2. Reasoning abstractly and quantitatively.
    Mathematically proficient students make sense of the quantities and their relationships in problem situations.

3. Constructing viable arguments and critiquing the reasoning of others.
    Mathematically proficient students justify their conclusions, communicate them to others, and respond to the arguments of others. Elementary students can construct arguments using concrete referents such as objects, drawings, diagrams, and actions. Such arguments can make sense and be correct, even though they are not generalized or made formal until later grades. Students at all grades can listen or read the arguments of others, decide whether they make sense, and ask useful questions to clarify or improve the arguments.

4. Modeling with mathematics.
    Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense.

5. Using appropriate tools strategically.
    Mathematically proficient students consider the available tools when solving a mathematical problem.

6. Attending to precision.
    Mathematically proficient students try to communicate precisely to others. In the elementary grades, students give carefully formulated explanations to each other.

7. Looking for and making use of structure.
    Mathematically proficient students look closely to discern a pattern or structure. Young students, for example, might notice that three and seven more is the same amount as seven and three more, or they may sort a collection of shapes according to how many sides the shapes have.

8. Looking for and expressing regularity in repeated reasoning.
    Mathematically proficient students notice if calculations are repeated, and look both for general methods and for shortcuts. As they work to solve a problem, mathematically

proficient students maintain oversight of the process, while attending to the details. They continually evaluate the reasonableness of their intermediate results.

Mathematical Content - Kindergarten

Critical Areas:

Instructional time in Kindergarten will concentrate on two critical areas: (1) representing, relating, and operating on whole numbers, initially with sets of objects; and (2) describing shapes and space. More learning time in kindergarten will be devoted to number than to other topics.

(1) Students use numbers, including written numerals, to represent quantities and to solve quantitative problems, such as counting objects in a set; counting out a given number of objects; comparing sets or numerals; and modeling simple joining and separating situations with sets of objects, or eventually with equations such as $5 + 2 = 7$ and $7 - 2 = 5$. (Kindergarten students should see addition and subtraction equations, and student writing of equations in kindergarten is encouraged, but it is not required.) Students choose, combine, and apply effective strategies for answering quantitative questions, including quickly recognizing the cardinalities of small sets of objects, counting and producing sets of given sizes, counting the number of objects in combined sets, or counting the number of objects that remain in a set after some are taken away.

(2) Students describe their physical world using geometric ideas (e.g., shape, orientation, spatial relations) and vocabulary. They identify, name, and describe basic two-dimensional shapes, such as squares, triangles, circles, rectangles, and hexagons, presented in a variety of ways (e.g., with different sizes and orientations), as well as three-dimensional shapes such as cubes, cones, cylinders, and spheres. They use basic shapes and spatial reasoning to model objects in their environment and to construct more complex shapes.

Content Standards - Kindergarten

Counting and Cardinality   K.CC

Know number names and the count sequence.
1.   Count to 100 by ones and by tens.
2.   Count forward beginning from a given number within the known sequence (instead of having to begin at 1).
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).

Count to tell the number of objects.
4.   Understand the relationship between numbers and quantities; connect counting to cardinality.

    a. 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.

    b. 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.

    c. Understand that each successive number name refers to a quantity that is one larger.

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.

Compare numbers.

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]

7.   Compare two numbers between 1 and 10 presented as written numerals.

Operations and Algebraic Thinking   K.OA

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

1.   Represent addition and subtraction with objects, fingers, mental images, drawings[2], sounds (e.g., claps), acting out situations, verbal explanations, expressions, or equations.

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

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 $5 = 4 + 1$).

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.

5.   Fluently add and subtract within 5.

Number and Operations in Base Ten   K.NBT

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

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 (e.g., $18 = 10 + 8$); understand that these numbers are composed of ten ones and one, two, three, four, five, six, seven, eight, or nine ones.

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[5] Include groups with up to ten objects.

[6] Drawings need not show details, but should show the mathematics in the problem. (This applies wherever drawings are mentioned in the standards.)

Measurement and Data   K.MD

Describe and compare measurable attributes.

1.   Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object.
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.*

Classify objects and count the number of objects in each category.

3.   Classify objects into given categories; count the numbers of objects in each category and sort the categories by count.[3]

Geometry   K.G

Identify and describe shapes (squares, circles, triangles, rectangles, hexagons, cubes, cones, cylinders, and spheres).

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*.
2.   Correctly name shapes regardless of their orientations or overall size.
3.   Identify shapes as two-dimensional (lying in a plane, "flat") or three-dimensional ("solid").

Analyze, compare, create, and compose shapes.

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).
5.   Model shapes in the world by building shapes from components (e.g., sticks and clay balls) and drawing shapes.
6.   Compose simple shapes to form larger shapes. *For example, "Can you join these two triangles with full sides touching to make a rectangle?"*

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[3]   Limit category counts to be less than or equal to 10.