

Middle School Mathematics

May 17, 2010

Middle School Mathematics

- Grounded in research
- Brookings Institute, Loveless
- National Mathematics Advisory Panel Report
- www.natickps.org

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Middle School Mathematics

- Brookings Institute, Loveless
 - "The goal must not be for students to take an algebra course by eighth grade; it must be for more students to learn algebra." (p. 13)
 - "Two groups of students pay a price. The misplaced eighth graders waste a year of mathematics, lost in a curriculum of advanced mathematics when they have not yet learned elementary arithmetic. They should be taught whole number and fraction arithmetic so that they can move on to successfully learn advanced mathematics. Their classmates lose – students who are good at math and ready for algebra." (p.8)

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- ♦ National Mathematics Advisory Report (2008)
 - Focus of President Bush's charge: the preparation of students for entry into and success in algebra
 - Comprehensive approach to K-12 mathematics that includes all 5 content strands, with problem solving and communication as the unifying thread
 - Number sense, Geometry, Measurement, Data Analysis/Statistics, Patterns/Relations/Algebra - embedded K-8 for all students to provide a grounding in all aspects of mathematics
 - Massachusetts Mathematics standards are a model for the nation

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- ♦ National Mathematics Advisory Report, (2008) con't
 - "Proficiency in whole numbers, fractions, and particular aspects of geometry and measurement should be understood as critical foundations of algebra"
 - During the 2006 Natick Public Schools Mathematics Curriculum Review, Natick adopted these benchmarks for automaticity/mastery
 - Grade 2 – addition and subtraction of whole numbers to 10, 2 digit/2 digit
 - Grade 4 – multiplication of whole numbers to 10, multi-digits
 - Grade 5 - division of whole numbers
 - Grade 6 – addition and subtraction of fractions
 - Grade 7 – multiplication and division of fractions
 - "Strong grounding in high school mathematics through Algebra II or higher correlates powerfully with access to college, graduation from college, and earning in the top quartile of income." (p. xii)

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- Based on the research, the Natick Public Schools believes that all students need to be successful in algebra by the end of grade 9
 - ♦ Note: Students who are ready for algebra honors in grade 7 or 8 are afforded this opportunity

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Middle School Mathematics

- Comprehensive Mathematics Approach
 - Learn the concepts behind mathematical operations
 - Build mathematical understanding and number fact fluency starts as early as grade 1
 - All 5 mathematical content strands support comprehensive mathematics learning
 - Enable students to develop efficient and flexible problem-solving strategies
 - Traditional skill building
 - Working with algorithms - operations
 - Problem solving – reasoning
 - Building a platform for success in high school coursework in both algebra and geometry

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Patterns, Relations and Algebra Concepts K-8

- Elementary – some examples
 - **Kindergarten**
 - Identify, reproduce, describe, extend, and create color, rhythmic, shapes, and number with simple attributes.
 - **1st grade**
 - Construct and solve open addition sentences that have variables with sums up to 10
 - **2nd grade**
 - Construct and solve open sentences that have variables
 - **3rd grade**
 - Use symbols and letter variables to represent unknowns or quantities
 - **4th grade**
 - Determine simple variables in simple equations

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Patterns, Relations and Algebra Concepts K-8

- Middle School – some examples
 - **5th grade**
 - Replace variables with given values and then evaluate and simplify the expression
 - **6th grade**
 - Identify and describe relationships between two variables in everyday situations
 - **7th grade**
 - Identify, describe, and analyze linear relationships between two variables
 - **8th grade**
 - Evaluate simple algebraic expressions for given variable tables

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2009-2010 Current Mathematics Programming, grades 7-8

- Grade 7
 - Accelerated Connected Mathematics
 - Connected Mathematics
 - [Honors Algebra (for those students who meet the criteria)]
- Grade 8
 - Honors Algebra
 - Integrated Approach to Algebra and Geometry
 - [Geometry (for those students who completed Honors Algebra in grade 7)]

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Current course descriptions 7th grade

- Accelerated Connected Mathematics
 - provide a solid foundation of seventh grade topics following the Massachusetts Curriculum Frameworks at a complex in-depth level and accelerated pace
- Connected Mathematics
 - provide a solid foundation of seventh grade topics following the Massachusetts Curriculum Frameworks
 - Some topics:
 - Solving linear equations using variables, tables, graphs and algebraic methods, creating and using linear equations to model and analyze problems involving proportional relationships

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Current course descriptions 8th grade

- Honors Algebra
 - Provides a rigorous study of traditional algebra topics, such as: graphing and solving linear and quadratic equations, solving systems of equations, working with polynomials and factoring
 - Taking this course means that students skip the 8th grade mathematics course
- Integrated Approach to Algebra and Geometry
 - Provides solid foundation of grade 8 math topics
 - Provides opportunities for students to improve their algebra readiness skills, such as: algebraic reasoning, nonlinear relationships, irrational numbers

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Curriculum Resources

- Middle School Mathematics
 - ♦ 7th Grades - Connected Mathematics (CMP)
 - ♦ 8th Grade - CMP and Passport to Alg/Geo, Pre-Algebra (McDougal Littell)
 - ♦ Honors Algebra 1 (McDougal Littell)

Note: Teacher-created materials are used at every grade level.

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Challenge is Built In...

- Classroom structures supports challenge
 - ♦ a glimpse of a classroom
- Teacher manual has explicit directions for extension activities
- In-class work-outs, logic problems, math team work, available in the department
- Math resources website (challenge and support materials included)
- Teachers work individually with families who express a need

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Middle School Leveling Grades 7 and 8

- 2009-2010
 - ♦ Eliminated lowest level of mathematics to create more opportunities for students access to core mathematics
 - ♦ Continued Honors classes for those students who were academically ready
 - ♦ Afforded opportunity for any and all students to enter an honors mathematics class at Natick High School, which then allowed for continued placement in honors levels during the high school career and for college admissions – important inclusion on the high school transcript

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Why did we eliminate Algebra level 1?

- **Rationale:**
 - ♦ Research tells us that we must provide a solid mathematical foundation to ensure we are preparing students for success in high school mathematics
 - ♦ *Integrated Approach to Algebra and Geometry* includes the content areas of algebra, geometry and geometric measurement, number sense, statistics and data analysis that prepares our students for success in both high school algebra and geometry

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Program evaluation – 2 levels of mathematics

- **Goals:**
 - ♦ To assess the effectiveness of the current mathematics program
- **Tools:**
 - ♦ Family and student surveys
 - ♦ Data from current 9th grade placements
 - ♦ Data from current 8th grade prospective placement

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Student Surveys

- ♦ On a scale of 1-5, how much do you enjoy math (1=not at all, 5=a great deal)
 - Wilson – 36.7% rated 4 or 5 (n=381)
 - Kennedy - 50.5% rated 4 or 5 (n=206)
- ♦ Do you feel successful in math so far this year?
 - Wilson – 63.%% indicated "yes"
 - Kennedy - 59.2% indicated "yes"
- ♦ Open response section – please give us details about your math experience so far this year

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Family Surveys

- ♦ On a scale of 1-5, how much does your child(ren) enjoy math (1=not at all, 5=a great deal)
 - Wilson – 57.1% rated 4 or 5 (n=41)
 - Kennedy – 64.1% rated 4 or 5 (n=30)
- ♦ Has your child felt successful in this first half of math class this year?
 - Wilson – 60% indicated “yes”
 - Kennedy – 56.4% indicated “yes”

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Wilson Middle School High School Math Placement

<ul style="list-style-type: none"> ♦ Current grade 9 ♦ Algebra Honors = 13 ♦ Algebra level 1 = 62 ♦ Geometry Honors = 50 ♦ Geometry level 1 = 59 	<ul style="list-style-type: none"> ♦ Current grade 8 ♦ Algebra Honors = 45 ♦ Algebra level 1 = 71 ♦ Geometry Honors = 56 ♦ Geometry level 1 = 7
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n=number of students in each level

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Kennedy Middle School High School Math Placement

<p>Current grade 9</p> <ul style="list-style-type: none"> ♦ Algebra Honors = 16 ♦ Algebra level 1 = 68 ♦ Geometry Honors = 22 ♦ Geometry level 1 = 22 ♦ Algebra II Honors = 2 	<p>Current grade 8</p> <ul style="list-style-type: none"> ♦ Algebra Honors = 30 ♦ Algebra level 1 = 73 ♦ Geometry Honors = 20 ♦ Geometry level 1 = 6 ♦ Algebra II Honors = 3
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n=number of students in each level

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8th grade teachers

- We strongly endorse the changes made last year to the middle school math program with the change in math levels.
- We believe the new structure gives students the strongest foundation for success in rigorous mathematics study in the future.
- Mark Baranoff, Jeanne Watts, Dave Walker, Kelly Marino, Adrienne Norris

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Middle School Mathematics Placement: Guiding Framework

- Students develop math/cognitive readiness at different times
- First duty is to ensure that students leave middle school with a solid middle school math foundation – to prepare them for the rigor of high school mathematics, as noted in National Math Advisory Report
- Math levels allow teachers to tailor learning to groups of students--students learn with their math peers
- Placement is based on math ability at time of placement
- Assessments that are used to inform placement are assessments that are already in place
- Placement is a data-driven process – see next slide – informed by teacher recommendation
- Teachers work together to place students and review data
- Honors courses allow us to create opportunities for elite math students

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Recommendation for 2010-2011 School Year

- Continue to focus on preparing our students for success in high school mathematics - algebra and geometry
- Continue to offer 2 levels of mathematics for grade 7 and 8
- Continue to offer Honors Algebra to grade 7 students who meet the criteria
- Continue to offer Honors Geometry to students who successfully complete Honors Algebra in grade 7

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The Process for Middle School Placement

- Data analysis of national, state and local assessments, coupled with teacher recommendation and student grades
- Class sections for each level are created based on the number of eligible students (changes yearly)
- Criteria for levels remain constant

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Portfolio of Assessment

- Many opportunities to demonstrate skill/knowledge
- Assessments are administered as part of our routine process to determine student progress
- Variety of assessments give a comprehensive picture of learner's skill/knowledge
 - Nationally-normed
 - State
 - Locally-created
 - Writing tasks
 - Inquiry tasks
 - Computation tasks
 - Readiness tasks

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Placement process

- These assessments are uniformly administered as a district, across both schools
- Our teachers, department heads and administrators work as a team to develop, score and review assessments
- We look at all and make decisions based on each individual student
- Develop a profile of individual students

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Assessment Information

<ul style="list-style-type: none"> • 6th to 7th Grade <ul style="list-style-type: none"> • 5th Grade MCAS • Nationally norm-referenced mathematics test (Scantron) • 6th Mid-Year Exam • Teacher Recommendation • Grades from Term 1 & 2 	<ul style="list-style-type: none"> • 7th to 8th Grade <ul style="list-style-type: none"> • 6th Grade MCAS • 7th Mid-Year Exam • Nationally norm-referenced Algebra Readiness test (Iowa) <ul style="list-style-type: none"> ▪ Definitive indicator • Teacher Recommendation • Grades from Term 1 & 2
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Assessment Information – Grade 8

Name	6- MCAS 266-280 265 or below	7- MIDYEAR 25-28 24 or below	IOWA Algebra Readiness 54-60 53 or below	7-T1	7-T2
Jill	266	28	54	A	A
Jack	256	25	48	B+	B

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How are placement recommendations made?

- Assessments administered throughout the year – teachers score and analyze together
- Teachers review data during month of May
- Departmental meeting for grade level determinations
- Recommendation letters May 28
- Q an A forums at each middle school - June 1st
- Parents requested to submit override form by June 11

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Placement Assessment Timeline

Assessment	Date of Administration
MCAS (all grades)	Last May 12-13, 2009
6 th Grade - Nationally Norm Referenced Assessment	November-December, 2009
Mid-year Tests (all grades)	Week of January 20-23, 2010
Nationally Norm Referenced Assessment	April 2010
Placement recommendation letters mailed home	May 28, 2010
Parent Question and Answer session	June 1, 2010
Parent override feedback due	June 11, 2010 (need to plan appropriate staffing)

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- ### Communication to Students and Families
- Open House, Math Night, PTO meetings
 - Letters sent home at each assessment point
 - Teams are available to speak to families at any time
 - Recommendation letter sent home May 28
 - Question and Answer session June 1
 - Final placement confirmed by June 11
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- ### High School Math
- Research shows pushing children into Algebra too early is a disservice to student success in high school and college math
 - No 2 level classes in grade 9
 - Students gain admission to elite colleges with and without having taken Algebra in grade 8
 - College and high school math teachers state strong foundation in middle school mathematics is best asset for students
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Middle School Grade 8 Math as it relates to Physics

- Students need to be able to solve two variable equations to be successful in Physics First
- Students who meet the criteria set by NHS may enroll in Honors Physics, as is the case with any Freshman Honors course
 - ♦ A- or better in Integrated Approach to Algebra and Geometry

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FAQs

Are all of the math teachers able to teach all levels of math?
Yes! All teachers in grade 7 and 8 are certified to teach all math levels and subjects for middle school.

Do you limit the number of sections of each level of math or make the number of sections based on eligible students?
We make as many sections as there are students eligible for sections.

Are grades used in placement decisions?
Yes, as a part of the portfolio of data points used to make the decisions.

Are teachers involved in the placement process?
Yes! Teachers and administrators sit together to review data points and place students according to test data, grades and discussion of student aptitude and performance.

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Parent Resources

Natick Website: www.natickps.org

5th-8th Grade Middle School Parent Guide

- ♦ Under Departments
- ♦ Select Curriculum and Assessments
- ♦ Select Mathematics

- Which includes the following:
 - ♦ Math content help for units of study
 - ♦ CMP Website (topics of study)
 - ♦ Helpful math websites
 - ♦ Challenge websites

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- The School Administration recommends a two-year extension of the current program for leveling in middle school mathematics.

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