

2011 MA Mathematics Framework

And

The Common Core State Standards

A Brief Overview

And

Implications for Bedford

April 24, 2012



Some History

2008 and 2009:

The Massachusetts Department of Elementary and Secondary Education convened a team of educators to revise the existing Mathematics Curriculum Framework and, when the Council of Chief State School Officers (CCSSO) and the National Governors Association Center for Best Practice (NGA) began a multi-state standards development initiative. In 2009, the two efforts merged.

The Standards (as specified by CCSSO and NGA) are:

(1) research and evidence based, (2) aligned with college and work expectations, (3) rigorous, and (4) internationally benchmarked.



Common Core State Standards CCSS

- <http://www.corestandards.org/>
- Adopted in MA during the summer of 2010
- Multi-Year Nation-wide Initiative to ensure “college and career readiness”
- Currently adopted by 46 states –including Washington DC- (not Alaska, Texas, Nebraska, Minnesota, Virginia)
- Full compliance to Common Core expected 2012-2013



2011 MA Math Framework

- MA Math Framework Revision Panel provided additional standards (only 4% - could have been up to 15%). The Massachusetts additions are coded with "MA" at the beginning of the standard.
- Adopted in December, 2010
- Standards for individual grades Pre-K – Grade 8; High School Conceptual Categories and Courses
- Reduction in number of topics but increased conceptual focus in specific areas
- K-5 provide a solid foundation in whole numbers, addition, subtraction, multiplication, division, fractions and decimals with a balance of concepts, skills and problem solving. All in preparation for Algebra. Measurement and Geometry develop alongside Number Sense.
- Middle School: Multiplication, Division and Fractions develop into ratio and proportional reasoning. Properties of operations move into algebra. Push to introduce Algebra to all 8th graders. Quantitative relationships develop into formal notion of a function by grade 8. Focus also includes Statistics, and foundations for high school geometry.
- High School: Algebra, Functions, Geometry and Statistics develop with an emphasis on modeling. Students take a thinking approach to algebra, and made use of structure in algebraic expressions with growing complexity.
- <http://www.doe.mass.edu/frameworks/math/0111.pdf>



Assessment

- Transition to assessing new framework by 2014
 - 2011 – MCAS - same as before
 - 2012 – MCAS - focus on standards that are the same (assessable list has been provided by DESE)
 - 2013 – MCAS - begin to focus on new standards as they match old (assessable list has been provided by DESE)
 - 2014 – new test – full compliance expected (new PARCC benchmarking tests possible 2014-2015)



- PARCC:
 - “Partnership for Assessment and Readiness for College and Careers”
- Consortium of 25 states committed to building a “next-generation assessment system” for elementary and secondary schools that is based on the adoption of the Common Core State Standards (CCSS).
 - (Rhode Island and MA are the only New England states in this consortium)
 - Currently governed by Massachusetts and chaired by former Commissioner of Education Mitchell Chester
- In process of developing yearly assessments for Grades 3-11 (administration is “voluntary”) – MA will adopt if better than MCAS
 - Beginning of Year, Mid- year, Performance Assessment, End-of-Year
 - Computer-Based



Differences from Previous Frameworks

- Increased Focus and Coherence
- Standards of Mathematical Practice
- Grade Level “Critical Areas”
- Domains and Clusters
- Increased specificity of what is required
- Movement between grade levels of what is expected – some content has been eliminated entirely, some moved down to a lower grade, and other content moved up.



8 Standards for Mathematical Practice

(Complement content standards at each grade level)

- Make sense of problems and persevere in solving them.
- Reason abstractly and quantitatively.
- Construct viable arguments and critique the reasoning of others.
- Model with mathematics



Standards for Mathematical Practice continued

- Use appropriate tools strategically
- Attend to precision.
- Look for and make use of structure.
- Look for and express regularity in repeated reasoning.



Grade Level “Critical Areas”

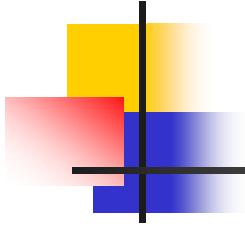
- Generally 3-4 per grade level
- Kindergarten (2 “critical areas”)
 - 1. Representing, relating and operating on whole numbers, initially with sets of objects
 - 2. Describing shapes in space



Grade Level “Critical Areas”

■ Grade 1

- 1. Developing understanding of addition, subtraction and strategies for addition and subtraction within 20.
- 2. Developing understanding of whole number relationships and place value, including grouping in tens and ones.
- 3. Developing understanding of linear measurement and measuring lengths as iterating length units.
- 4. Reasoning about attributes of, and composing and decomposing geometric shapes.



■ Grade 5

- 1. Developing fluency with addition and subtraction of fractions, and developing understanding of the multiplication of fractions and of division of fractions in limited cases (unit fractions divided by a whole number and whole numbers divided by unit fractions).
- 2. Extending division to 2-digit divisors, integrating decimal fractions into the place value system and developing understanding of operations with decimals to the hundredths, and developing fluency with whole number and decimal operations
- 3. Developing understanding of volume



Grade Level “Critical Areas”

■ Grade 6

- 1. Connecting ratio and rate to whole number multiplication and division and using concepts of ratio and rate to solve problems
- 2. Understanding division of fractions and extending the notion of number to the system of rational numbers, which includes negative numbers
- 3. Writing, interpreting, and using expressions and equations
- 4. Developing understanding of statistical thinking

<http://www.doe.mass.edu/candi/commoncore/0111mathcrosswalk.xls>



Grade Level “Critical Areas”

■ Grade 8

- 1. Formulating and reasoning about expressions and equations and solving linear equations and systems of linear equations
- 2. Grasping the concept of a function
- 3. Analyzing two- and three-dimensional space and figures and understanding and applying the Pythagorean Theorem



Domains and Clusters

- “Domains” instead of “Strands”

■ K	Counting and Cardinality	CC
■ K-5	Number and Operations in Base Ten	NBT
■ 3-5	Number and Operations (Fractions)	NF
■ 5-8	The Number System	NS
■ K-5	Operations and Algebraic Thinking	OA
■ K-5	Measurement and Data	MD
■ K-8	Geometry	G

- “Clusters” of related Standards



What's New For Elementary

- Increased emphasis on having students prove their answers with visual models and representations as well as numerical answers
- Decreased emphasis on “Traditional Algorithm” – increased use of finding different strategies for solving computation problems
- Focus on automaticity of Basic Facts
 - K Addition facts to 5
 - 1 Addition/Subtraction facts to 10
 - 2 Addition/Subtraction facts to 20
 - 4 Multiplication/Division facts 12 x 12
- More specificity in language for what is expected



What's Out Entirely for Elementary

- All probability (moved to grade 7)
- All transformations (-flips, turns, slides- moved to grade 8)
- All problems using proportional reasoning (moved to grade 7)
- All Combinations problems (moved to grade 7)
- Sum of the measures of the interior angles of triangles (no correlation)
- Statistical landmarks (to grade 6)



Example of Increased Specificity (for K)

- K.N.2 (2000)

“Match quantities up to at least 10 with numbers and words”

- KCC 4 (2011): 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.



Example of Increased Specificity (For Gr. 3)

- 3.N.4 (2005 – Gr 3)
- *Locate on a number line and compare fractions (between 0 and 1 with denominators 2, 3 or 4, e.g. $\frac{2}{3}$)*

3.NF

- a. Represent a fraction $\frac{1}{b}$ on a number line diagram by defining the interval from 0 to 1 as the whole and partitioning it into b equal parts. Recognize that each part has size $\frac{1}{b}$ and that the endpoint of the part based at 0 locates the number $\frac{1}{b}$ on the number line.
- b. Represent a fraction $\frac{a}{b}$ on a number line diagram by marking off a lengths $\frac{1}{b}$ from 0. Recognize that the resulting interval has size $\frac{a}{b}$ and that its endpoint locates the number $\frac{a}{b}$ on the number line.



Implications

- For Davis:
 - Professional Development of new Frameworks
 - Align Bridges in Mathematics to CCSC
 - Adjust Scope and Sequence of Curriculum
 - Redo Beginning, Unit and End-of-Year Assessments
 - Ensure enough time and staffing for most effective instruction



Implications

- For Lane:
 - Ongoing alignment of units and beginning-of year, mid-year, end-of-year and unit assessments with what will be assessed on MCAS – 3 years of making changes each year
 - Need for new topics or lessons with more in-depth focus – specifically of fractions at all grade levels
 - Adopt a new curriculum series that is totally aligned to CCSC and is current with assessment requirements
 - Professional Development related to new curriculum



Implications

- For JGMS

- Ongoing alignment of units, prioritizing with what will be assessed on MCAS – 3 years of making changes each year. (MCAS will be based exclusively on the new frameworks in spring 2014)
<http://www.doe.mass.edu/MCAS/transition/?section=math3-8>
- Standards previously in grades 5, 7, and 8 have now moved to grade 6
- In 8th grade specifically, the CCSS include a significant amount of Algebra I content
- Algebra I course will have to cover more content



Implications

- For JGMS (continued)
 - Possible options being considered include:
 - Increasing the pacing and rigor in 6th grade through flexible groupings or leveling
 - Adding a “Algebra 1a” course in 8th grade
 - Optional online summer work to strengthen and reinforce skills
 - Special Math Committee has been set up and meets once a month



Implications

- For Bedford High School
 - Algebra I course will have to cover more content
 - Increased enrollment in Continuing Course
 - Exploring changing Trig/Stats course to “Intro to Calculus”
 - Statistical content will need to be embedded in other courses



Implications

- For Bedford High School (continued again)
 - Ongoing alignment of unit, including reordering, supplementation, and reduction
 - Conditional Probability in Geometry
 - Common language for the 8 standards of practice
 - 4 years of math requirement
 - Added Personal Finance level 4



Future

- Partnership with Wolfram
- Development of our own texts
- Partnership with WPI and a product called ASSISTments
- Use of iPad to deliver content



ASSISTments

- Three main uses

- 1. **ASSISTments** can be used for formative assessment like "clickers."
- 2. **ASSISTments** can be used to adapt to individual students in response to data.
 - Scaffolding, at the question level.
 - "Data Driven" Actions, at the teachers level.
 - ARRS, Automatic Reassessment and Relearning System. The computer is in charge of spacing practice over time.
- 3. **ASSISTments** can be used for nightly homework.
 - You can use WPI's prebuilt content.
 - You can write your own questions.
 - You can use your current textbook or write your own open source textbook.

Student/Problem [Unanonymize]	Average New!	#254835 Data driven	#254833 Data driven	#254838 Data driven	#254842 Data driven	Total hints
Problem average	63% Data driven	38%	67%	67%	81%	
Help requested percentage		0%	0%	0%	0%	
Common Wrong Answers		70,42% +feedback 80,19% +feedback	C. 12 inches, 100%	1/3, 54%		
<u>xxxxx</u> *	75%	✓ 60	✓ D. 7 inches	✗ 8/15	✓ 22	0
<u>xxxxx</u> *	50%	✗ 55 1 times	✗ C. 12 inches 2 times	✓ 2/3	✓ 22	8
<u>xxxxx</u> *	50%	✗ 70 1 times	✓ D. 7 inches	✗ 8/15	✓ 22	3
<u>xxxxx</u> *	50%	✗ 70 2 times	✗ C. 12 inches	✓ 2/3	✓ 22	6

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- Allow textbook writing
- New breed of text including and allowing...
 - “Traditional” Info, Examples, Practice
 - Video links to problem being solved
 - Widgets
 - Demonstrations
 - Link to ASSISTments for immediate feedback and data analysis
 - Flipped Classrooms



iPads

- Waiting for CDF or iPad for text viewing
- Use of Kahn Academy
- ASSISTments
- Professional Development this week with Donna to learn ScreenCasts
- Exploring delivery of material
 - Modeling unit on statistics