Mathematics
Program Review
Phase 1 Report

Sharon Public Schools
April 2013

1. Introduction

1.1 District Mission

The Sharon Public Schools is a dynamic and respectful learning community that values diversity, fosters critical and creative thinking, challenges students to reach their academic potential, and prepares them to succeed in, and contribute to, a changing world.

1.2 Beliefs of the Sharon Public Schools Math Program

The Math Department strives to provide mathematics education that emphasizes depth of understanding, reasoning, problem solving, written and oral communication, connections among disciplines, integration of technology, the use of formative assessment, Differentiated Instruction and Response to Intervention.

1.3 Process for the Selection of Committee Members

Committee members submitted a written statement to the Superintendent to express their interest in serving on the Math Program Review Committee. Staff was culled from the Children's Center and the five schools in the district including a special educator in order to provide a diverse membership that was knowledgeable about multiple facets of the Math program. The committee also included a building administrator and the district's two Math Coordinators.

Mathematics Program Review Committee Members

Christina Kemp	K-5 Math Coordinator
Susan Luciani	6-12 Math Coordinator
Elizabeth Murphy	East Elementary Principal
Amy Steinberg	Early Childhood Coordinator
Florence Smith	Cottage Street School
Deborah Pruell	East Elementary
Rachel Diamond	East Elementary
Kathleen Joyce	Heights Elementary
Theodora Nikopoulos	Heights Elementary
Stephanie Kraft	Sharon Middle School
Elise McCann	Sharon Middle School
Ashley Monty	Sharon Middle School
Emmanuel Sodbinow	Sharon High School

1.4 Math Curriculum Review Process

The committee first convened in November of 2011 to determine how best to initiate the review process for the year. The group began the process by studying an array of articles that highlight best practices.

The committee continued meeting as a whole and in subgroups to develop questions for teacher, parent, and student surveys. The aim of the surveys was to produce feedback that the committee could consider in making programmatic recommendations and commendations for the following academic years.

The committee met in whole and subgroups on a monthly basis from November to June. K-12 meetings were held on the following dates: 10/14, 11/29, 2/14, 2/27, 4/2, and 5/9, and 6/6. Subgroup meetings were held informally over the course of the academic year. Given that the Math and Science curriculum review processes were occurring simultaneously, coordinators from each discipline met together several times throughout the year to collaborate and reflect upon ongoing developments.

This committee was charged with the following key tasks:

- Review current literature and best practices in mathematics with a focus on the 2011 Massachusetts Curriculum Frameworks which include the following:
    - Guiding Principles
    - Standards for Mathematical Practice
    - Standards for Mathematical Content
- Generate questions for teacher, parent, and student surveys for the purpose of gathering feedback regarding the following: effectiveness of instructional materials, current content practices implemented in the district, and professional development needs
- Evaluate the alignment of core instructional resources to the Massachusetts Curriculum Frameworks for Mathematics
- Explore alternative core programs and consider possible pilots
- Discuss and reflect upon the integration of math and science

The committee has produced a report for the Sharon School Committee and the Superintendent that summarizes the existing program, identifies commendable practices currently in place and offers recommendations for improvement.

2. Background of the Math Program

2.1 History of Curricular Programs Utilized by the District

2.1.1 Kindergarten Through Grade 5

Everyday Mathematics

The Sharon Public Schools adopted Everyday Mathematics in September of 2003 as its core instructional program for grades K-5. After using the program for two years, it was determined that supplementary materials for problem solving and supporting documents for pacing were needed to enhance the Everyday Math Program. Thus, unit planners were created in 2006 by the elementary coordinator and math specialists for each unit of Everyday Math at Grades 1-5. The unit planners aligned lessons to the existing Massachusetts State Frameworks, identified learning objectives for each lesson and suggested modifications to enhance the lessons. Lessons that did not align to state standards were identified as "optional lessons". Exemplars, a published program that encourages an inductive approach to problem solving, and Creative Publications Problem Solver, a published program guiding the direct instruction of problem solving strategies, were purchased to supplement the teaching of problem solving.

In September of 2007, Sharon adopted the Third Edition of Everyday Mathematics. This edition included additional open response questions for problem solving as well as a differentiation handbook for teachers. In the summer of 2008, committees of teachers created differentiated versions of the open response questions for Grades 1-5 as well as a collection of differentiated lessons (Math Stations) based on the Grade 2 Everyday Math program. Math Stations based on the Everyday Math lessons were created for the following grades in the following years: Grade 5, 2009, Grade 3, 2010, Grade 1, 2011, Grade K, 2011.

In 2011, the unit planners were revised to align Everyday Math lessons to the 2011 MA Curriculum Frameworks. Unit planners for Kindergarten were also created. The following instructional resources were purchased to supplement Everyday Math and address critical areas of focus represented by the new frameworks. *Developing Number Concepts,* by Kathy Richardson for Grades K-2, *About Teaching Mathematics*, by Marilyn Burns for Grades 3 and 4, and *Beyond Pizzas and Pies, 10 Essential Strategies for Supporting Fraction Sense,* by Julie McNamara and Meghan Shaughnessy for Grades 3-5.

In 2011, Everyday Math developed a Common Core Third Edition Update. Updated lessons, all available online, were analyzed by the elementary math coordinator. Selected lessons were downloaded, posted on Edline, incorporated into Unit Planners and implemented by teachers. Teachers were given time to view samples of the updated student journals and share reflections of the updated lessons at May and June district wide professional development meetings. A page-by-page comparison chart was created to analyze the updated Everyday Math student journals.

The findings of this analysis were as follows:

- Subtle changes were made to third edition lessons (visual models and vocabulary terms added).
- Subtle changes were made to third edition journal pages (revision of math boxes and problems on a given page).
- If a lesson addresses a K-6 standard, this lesson remains part of the new edition. It has not been moved to the appropriate grade level as represented in the Common Core. (For example, landmark data is not addressed in the Common Core until Grade 6, but remains at Grade 2 in the new edition.)
- Additional lessons, 5-10 per grade level were added to the updated edition to address the change to the new standards.

Math Science Integration

In the summer of 2012, the elementary science and math coordinators worked with a team of third grade teachers to integrate current math standards into the Weather Unit. Standards from the Measurement and Data domain that address graphing, linear measurement, elapsed time and volume were addressed in the science lessons. This integrated unit was introduced at grade level meetings and implemented the following school year.

During the 2012-2013 school year, the elementary science and math coordinator met on several occasions to research, discuss and reflect upon the integration of math and science at the elementary level. Discussions centered on the connections between practice standards for each discipline. Documents that connect the Next Generation Science Standards and Common Core State Content Standards for Mathematics were read and discussed. In addition, the coordinators analyzed the math standards by grade level and generated a list of natural connections to the current science units. The elementary math coordinator also collaborated with the elementary science coordinator to analyze the STEM Day activities for the integration of Grade 4 and 5 math standards.

Special Education and the Elementary Math Curriculum

Special educators service students with math goals, modify the Everyday Math lessons, assignments, homework and assessments to meet the needs of their students. Additional remedial materials are used to supplement the Everyday Program. Students with math goals receive in class and out of class support as needed. Special educators work closely with classroom teachers and have access to all aspects of the curriculum, including unit planners, supporting documents and professional development.

Less than 1% of the elementary students from the Sharon Public Schools receive substantially separate math support. Special educators providing this support, supplement Everyday Math with a program called, On Cloud Nine, a curriculum that focuses on visualizing and verbalizing the number system.

Supplementary Programs

The following supplementary programs have been offered to elementary students:

- 2007-2009 Project Success- 2 week summer session, district wide for Grades 1-3.
- 2007-2009 Academic Support Program-after school at Heights for Grades 3-5
- 2008 Academic Support Program-before school at East for Grades 4 and 5
- 2010-2011 Academic Support Program-before school at Cottage for Grades 3-5

2.1.2 Grades 6 through 8

Starting in the 2006-2007 school year, the use of Everyday Mathematics extended into the 6th grade. This continuation allowed students to complete the entire curriculum sequence. At each grade level in Everyday Mathematics, the curriculum provides students with multiple opportunities to learn concepts and practice skills. Across grade levels, concepts are reviewed and extended in varying instructional contexts. The distinguishing features of Everyday Mathematics are its focus on real-life problem solving, student communication of mathematical thinking, and appropriate use of technology. This curriculum also emphasizes balancing different types of instruction (including collaborative learning), using various methods for skills practice, and fostering parent involvement in student learning.

In 7th and 8th grades, the Sharon Middle School curriculum accommodates learning styles and pacing by offering two levels of math courses. Using the Prentice Hall Pre-Algebra and Algebra textbooks, courses were aligned to the then current standards. The accelerated courses incorporate some above grade level topics, and some of the grade level standards are looked at in more depth than in the standard level courses.

Special Education and the Middle School Math Curriculum

The middle school also currently offers a pullout section of mathematics at each grade level. A special education teacher teaches the 6th and 7th grade courses, while the 8th is currently being co-taught by the math specialist and a special education teacher. Access to grade level materials is available to each class and all efforts are made to expose students to all grade level material.

2.1.3 Grades 9 through 12

The secondary program uses a variety of texts (see section 2.2.3 and Appendix 7.1) and support materials that undergird a pre-college program culminating in either a course in calculus or statistics. The levels offered, starting in grade 7 expand to include an honors course sequence, and two levels of standard college preparatory mathematics. This allows students different access points to a vigorous core curriculum. Students have the ability to move up or down the levels based upon their preparedness, mathematical development and areas of interest. Teacher recommendations seek a balance point between comfort level and challenge for each student.

2.2 Inventory of Program Materials and Supplementary Resources

2.2.1 Kindergarten Through Grade 5

Core Instructional Program: Everyday Mathematics, Third Edition, McGraw Hill, 2008
Supplementary Resources

- Number and Operations
    - K-2 *Developing Number Concepts,* Kathy Richardson, Didax Publications
    - *About Teaching Mathematics,* Marilyn Burns, Math Solutions Publications
    - *Beyond Pizza and Pies*, *10 Essential Strategies for Supporting Fraction Sense*, Julie McNamara and Meghan Shaughnessy, Math Solutions Publications
- Problem Solving
    - Grades 1-5 *The Problem Solver,* Creative Publications
    - Grades 1-3 *Read It, Draw It Solve It,* Dale Seymour Publications
    - Grades K-5 *Exemplars,* Exemplars Publications

Supplementary Documents

- Unit Planners
- 2 Day Approach to Problem Solving
- Differentiated Versions of the Open Response Questions
- Math Workshop
- Math Stations
- Pacing Guidelines
- Academic Support: Guide to Instruction

2.2.2 Grades 6 through 8

Grade 6: Everyday Mathematics, Third Edition
Grade 7: Pre-Algebra, Prentice Hall, 2004
Grade 8: Algebra 1, Prentice Hall, 2004

2.2.3 Grades 9 through12

Course Name	Text Name	Publisher	Edition/Copyright
Concepts of Algebra 1	Algebra 1	McGraw Hill/Glencoe	2012
Algebra 1	Algebra 1	McGraw Hill/Glencoe	2012
Honors Algebra 1	Algebra & Trigonometry	Pearson	3rd/2003
Foundations of Geometry	Geometry Concepts and Applications	Glencoe McGraw Hill	1st/2008
*Concepts of Geometry (formerly Geometry w/Algebraic Applications	Geometry Concepts and Applications	Glencoe McGraw Hill	1st/2008
*Geometry	Geometry	Prentice Hall	1st/2004
*Honors Geometry	Geometry	Prentice Hall	1st/2004
Algebra 2 (all levels)	Algebra 2	Prentice Hall	1st/2004
Algebra & Trigonometry	Algebra & Trigonometry	Pearson	3rd/2008
Pre-Calculus (all levels	Pre-Calculus; Graphical, Numerical, Algebraic	Pearson	6th/2004
Advanced Math Reasoning	Materials created by SHS staff	n/a	n/a
Discrete Math	Discrete Mathematics Through Applications	Freeman	3rd/1994
Math Skills for Everyday Living	High School Financial Planning Program	National Endowment for Financial Education	n/a
Statistics	Elementary Statistics	Addison-Wesley	11th/2010
AP Statistics	The Practice of Statistics	Freeman	3rd/2007
Introduction to Calculus	Brief Calculus; An Applied Approach	Wiley	8th/2005
Calculus	Calculus; Graphical, Numerical, Algebraic	Prentice Hall	1st/2003
AP Calculus (both levels)	Calculus with Analytic Geometry	Holt McDougal	8th/2006
Intro to Computer Programming	Introduction to Programming with Greenfoot	Prentice Hall	1st/2010

Due to re-sequencing courses to align with the new Frameworks, Geometry courses (with the exception of Foundations of Geometry) are not being offered in 2012-2013. Textbook information in the table is based on previous years. Forthcoming, students in all levels of

Geometry will use the 2012 McGraw Hill/Glencoe Geometry text that was written in conjunction with the Algebra text adopted this year. Teachers using the newly purchased Algebra 1 text have used the extra resources and online components provided by McGraw Hill throughout the school year. The same resources are available for the new Geometry textbook. McGraw Hill also has provided us with online access for students.

2.3 Assessment

2.3.1 Kindergarten through Grade 5

Elementary teachers and math specialists use a variety of formative and summative assessments to check understanding, determine progress and drive instruction. Formative assessment occurs daily during math time and provides teachers with a means of checking in with students' thinking and/or level of understanding.

Students also complete written assessments and solve open response problems at the end of each Everyday Math unit. Teachers record the results of the assessments and analyze the progress of each objective addressed during the unit. Record sheets are shared with building principals, math specialists, and special educators.

Summative math assessments are conducted at various points throughout the school year and are common across each grade span, K-5. This summative data includes basic math fact assessments that measure student progress with meeting the grade specific basic fact benchmarks set for grades 1 – 5. The students are timed, unless a student has an IEP or a 504 Plan that requires untimed tests. This basic fact data is collected from all teachers across the district at the following points:

Grade 1	Addition Facts to 10, Subtraction Facts From 10 (January and June)
Grade 2	Addition Facts to 20, Subtraction Facts From 20 (September and June)
Grade 3	Addition Facts to 20, Subtraction Facts From 20 (September and June) Multiplication Facts through the 10s table (January and June)
Grade 4	Mixed Addition/Subtraction Facts from 20 (September and June) Multiplication Facts through 12s table (September and June) Division Facts through 12s table (September and June)
Grade 5	Mixed Addition/Subtraction Facts from 20 (September and June) Multiplication Facts through 12s table (September and June) Division Facts through 12s table (September and June)

Kindergarten students are assessed with a common instrument across the district. This assessment was developed in 2007, revised in September of 2010 to include a baseline assessment and modified in November of 2012 to better address the new Frameworks. The Kindergarten Assessment is aligned with the kindergarten report card standards and is used to assess individual progress in math. Kindergarten teachers work with math specialists and coordinators to assess each student individually at least three times a year. These assessments take approximately 20 minutes per student to administer.

The Mid-Year and End of Year Assessments are cumulative assessments that are administered once a year to students in grades 1-5. The math coordinator and building math specialists developed these assessments in 2008. Modifications were made during the 2011-2012 school year to better address the 2011 Massachusetts Curriculum Frameworks. Test items were added or omitted to assess grade level standards from the new Frameworks. The Mid-Year Assessments cover content from Units 1-4 of Everyday Math and are administered in December to students in Grades 1-5. The End of Year Assessments covers content from Units 5-10 and are administered in June to students in Grades 1-5.

Building principals, math specialists, special educators and coordinators receive Midyear, End of Year data and fact data for all students in grades 1-5. This data allows teachers and specialists to identify those students who need more assistance with specific areas of mathematics, helps teachers understand which concepts may need more instructional focus throughout the year, and assists teachers in forming flexible guided math groups based on readiness levels with certain strands.

2.3.2 Grades 6 through 12

Grade 6 students are assessed by their individual teachers throughout the course of the year. Teachers work together to assure there are no major differences in the standards assessed. Assessments are based on expectations and pacing guides from the Everyday Math program.

Students in grade 7 and 8 are given multiple quizzes throughout each unit of instruction. Teachers use the results to determine future instruction, and to determine readiness for an end of unit assessment. Although each teacher creates their own quizzes and exams, collaboration during professional development time is available for them to share ideas and assessments. This process ensures that assessments are similar in question type and level of rigor. In addition, 8th grade students are given a departmental midyear exam. This exam, created by a former math coordinator and the then current teaching team, is reviewed yearly to ensure relevance. This assessment is also a tool to help determine placement recommendations for ninth grade. The results of this exam are factored into students' grade for the quarter as a normal test grade.

High school students participate in departmental mid-year and final exams. The current teams of teachers of the individual courses create these assessments. Question types vary from multiple choice, short answer, and long response answers where students have to explain a process of solving a more involved problem. In addition, teacher created quizzes and exams are given throughout each course. Teachers have collaborated on the course grading policies,

the weighting of homework and assessments, and the number of quizzes/tests given each unit to ensure equity among each course.

2.3.3 MCAS

The math curriculum for the Sharon Public Schools has prepared students for success on state assessments. Students at all levels perform significantly above the state average on these assessments (range of 12-30 percentage points above). When looking at data over time from 2009-2012, the following patterns emerged. The Sharon students performed best in the following areas: Data Analysis, Statistics, and Probability, Number Sense and Operations, and Patterns, Relations and Algebra, yet, had more difficulty in the areas of Geometry and Measurement. Sharon students perform well above the state average in all question types. (5-26 percentage points above) In 2012, the Sharon students scored an average of 13 points above the state average on the Open Response questions. (This average would be 15 points above if seventh grade data was omitted).

District Performance Level as Compared to State

	2009		**2010**		**2011**		**2012**	
	Proficient or Higher	State/ District Difference	Proficient or Higher	State/ District Difference	Proficient or Higher	State/ District Difference	Proficient or Higher	State/ District Difference
3	81%	+21	82%	+17	83%	+17	87%	+26
4	58%	+10	69%	+21	71%	+23	76%	+25
5	82%	+28	75%	+20	84%	+27	78%	+21
6	82%	+25	77%	+18	77%	+19	85%	+25
7	79%	+30	72%	+19	64%	+12	63%	+12
8	77%	+29	74%	+23	74%	+22	75%	+23
10	93%	+18	95%	+20	97%	+20	94%	+16

Analysis By Strand

% Correct as values Lowest Strand in given year		2009	2010	2011	2012
Grade 3	Data Analysis, Statistics, and Probability	88%	82%	90%	88%
	Geometry	78%	83%	77%	91%
	Measurement	82%	83%	86%	86%
	Number Sense and Operations	86%	81%	84%	89%
	Patterns, Relations, and Algebra	84%	88%	87%	87%
Grade 4	Data Analysis, Statistics, and Probability	74%	74%	90%	81%
	Geometry	76%	73%	84%	82%
	Measurement	69%	78%	66%	79%
	Number Sense and Operations	78%	81%	78%	80%
	Patterns, Relations, and Algebra	78%	82%	80%	76%
Grade 5	Data Analysis, Statistics, and Probability	83%	81%	83%	82%
	Geometry	71%	67%	80%	86%
	Measurement	79%	81%	82%	76%
	Number Sense and Operations	86%	83%	83%	81%
	Patterns, Relations, and Algebra	87%	80%	88%	84%
Grade 6	Data Analysis, Statistics, and Probability	80%	77%	79%	84%
	Geometry	79%	76%	78%	80%
	Measurement	79%	74%	74%	80%
	Number Sense and Operations	82%	80%	81%	81%
	Patterns, Relations, and Algebra	87%	84%	81%	84%

Grade 7	Data Analysis, Statistics, and Probability	86%	84%	78%	74%
	Geometry	80%	82%	79%	73%
	Measurement	77%	71%	72%	77%
	Number Sense and Operations	84%	76%	77%	66%
	Patterns, Relations, and Algebra	84%	79%	75%	79%
Grade 8	Data Analysis, Statistics, and Probability	75%	87%	81%	74%
	Geometry	72%	71%	74%	66%
	Measurement	83%	81%	79%	79%
	Number Sense and Operations	83%	77%	80%	74%
	Patterns, Relations, and Algebra	82%	80%	83%	81%
Grade 10	Data Analysis, Statistics, and Probability	82%	83%	84%	76%
	Geometry	71%	82%	70%	75%
	Measurement	78%	86%	87%	86%
	Number Sense and Operations	83%	82%	80%	85%
	Patterns, Relations, and Algebra	79%	82%	81%	79%

Analysis by Question Type

% Correct (state /district difference)		2009	2010	2011	2012
Grade 3	Open Response	76 (+13)	82 (+12)	85 (+11)	78 (+15)
	Short Answer	88 (+6)	76 (+9)	80 (+11)	85 (+16)
	Multiple Choice	87 (+9)	85 (+8)	86 (+10)	92 (+12)

Grade 4	Open Response	75 (+5)	70 (+9)	76 (+12)	76 (+11)
	Short Answer	71 (+11)	73 (+11)	80 (+10)	83 (+11)
	Multiple Choice	78 (+5)	83 (+9)	82 (+8)	81 (+11)
Grade 5	Open Response	81 (+14)	80 (+10)	81 (+15)	77 (+19)
	Short Answer	81 (+12)	77 (+14)	79 (+17)	79 (+14)
	Multiple Choice	84 (+13)	80 (+10)	85 (+12)	85 (+11)

Grade 6	Open Response	78 (+14)	73 (+9)	80 (+13)	80 (+16)
	Short Answer	73 (+10)	74 (+8)	72 (+10)	76 (+12)
	Multiple Choice	87 (+11)	84 (+11)	81 (+9)	84 (+10)
Grade 7	Open Response	78 (+16)	81 (+14)	73 (+8)	75 (+7)
	Short Answer	89 (+15)	81 (+11)	80 (+9)	76 (+9)
	Multiple Choice	85 (+13)	71 (+9)	77 (+7)	75 (+8)
Grade 8	Open Response	72 (+19)	71 (+16)	76 (+17)	71 (+13)
	Short Answer	82 (+13)	77 (+12)	83 (+15)	80 (+10)
	Multiple Choice	85 (+14)	85 (+11)	82 (+11)	78 (+11)

Grade 10	Open Response	79 (+17)	86 (+18)	77 (+18)	81 (+13)
	Short Answer	86 (+12)	87 (+17)	82 (+17)	86 (+16)
	Multiple Choice	78 (+17)	80 (+15)	83 (+15)	82 (+26)

Analysis by Gender

Gender that performed best and Percentage Point Difference

	2009	2010	2011	2012
Grade 3	Female +3%	Male +10%	Female +6%	Female +3%
Grade 4	Male +6%	Male +5%	Male +8%	Female +5%
Grade 5	Female +3%	Female +4%	Male +4%	Male +12%
Grade 6	Female +1%	Same	Female +4%	Female +2%
Grade 7	Female +7%	Male +3%	Female +2%	Male +5%
Grade 8	Female +4%	Female +1%	Male +4%	Female +2%
Grade 10	Male +1%	Male +2%	Male +1%	Female +2%

2.3.4 Advanced Placement (AP) Results

Seniors at Sharon High School have the opportunity to take three different AP courses as seniors: BC Calculus, AB Calculus and Statistics. Although students are not required to take the AP Exam as part of the course most opt to do so (see table).

AP Exam Grades are calculated using The Readers' scores on the free-response questions and are combined with the results of the computer-scored multiple-choice questions; the weighted raw scores are summed to give a composite score. The composite score is then converted to a grade on AP's 5-point scale:

AP GRADE QUALIFICATION

5 Extremely well qualified
4 Well qualified
3 Qualified
2 Possibly qualified
1 No recommendation

AP Exam grades of 5 are equivalent to A grades in the corresponding college course. AP Exam grades of 4 are equivalent to grades of A–, B+, and B in college. AP Exam grades of 3 are equivalent to grades of B–, C+, and C in college. Sharon High School students have consistently scored higher than the national average on the AP mathematics exams, as demonstrated in the table below.

Course	Year	% = 5	% = 4	% = 3	% ≥ 3	% = 2	% = 1	# of Tests Taken	# Enrolled in Course
Statistics	2007	5	32	58	95	5	0	19	25
Statistics	2008	19	35	31	85	15	0	26	43
Statistics	2009	6	56	38	100	0	0	16	20
Statistics	2010	29	48	14	90	10	0	21	25
Statistics	2011	48	33	14	95	5	0	21	28
Statistics	2012	25	55	15	95	0	5	20	21
Calculus AB	2007	69	23	3	94	0	6	35	33
Calculus AB	2008	95	5	0	100	0	0	22	23
Calculus AB	2009	80	15	5	100	0	0	20	20
Calculus AB	2010	95	5	0	100	0	0	21	23
Calculus AB	2011	78	17	4	100	0	0	23	23
Calculus AB	2012	75	14	7	96	0	4	28	30
Calculus BC	2007	100	0	0	100	0	0	15	15
Calculus BC	2008	73	27	0	100	0	0	15	16
Calculus BC	2009	53	33	7	93	7	0	15	15
Calculus BC	2010	64	21	14	100	0	0	14	14
Calculus BC	2011	71	14	14	100	0	0	21	22
Calculus BC	2012	84	11	5	100	0	0	19	18

2.4 Professional Development Supporting the Math Curriculum

2.4.1 Kindergarten Through Grade 5

2007-2010 Coordinators offered three after school study groups and provided full day release time to each teacher on formats for differentiated instruction in mathematics. Math specialists and coordinators attended the National Council of Teachers of Mathematics Regional Conference in Boston.

2010-2011 Coordinators offered a yearlong book study focused on RTI and Math based on the book Response To Intervention in Math by Paul J. Riccomini and Bradley S. Witzel. All elementary math specialists and special educators participated. The group analyzed current research around common models of implementation, universal screening, recommended instructional time in each tier, and effective content and pedagogical practices for interventions. Coordinators also offered workshops on using parallel tasks and open questions to differentiate instruction.

2011-2012 Coordinator and math specialists provided 12 hours of professional development on the 2011 MA Frameworks for Mathematics. The four early release days were devoted to this topic along with a full day release for every teacher grades K-5. Sessions addressed the following: Organization of the Standards, Transition Timeline, Alignment to Everyday Math Program, Progressions, and Implementation of the Standards for Mathematical Practice.

2012-2013 Secondary and Elementary Coordinators attended the New England Mathematics Leadership Conference at Lesley University. Elementary math specialists and coordinator attended the fall conference on RTI for the Massachusetts Elementary School Principals Association. The Elementary Coordinator offered the following three courses that address key shifts and critical areas of focus represented in the new frameworks:

Using Kathy Richardson to Develop Fluency with Basic Facts- A Book Study, Grades K-2
Number Talks- A Professional Learning Community for Addressing Computation, Grades 1-5
Professional Learning Community for the Teaching of Fractions, Grades 3-5

Math specialists and coordinators have attended the Massachusetts Math Association of Teacher Educators (MassMATE) annual conference for the past 5 years.

2.4.2 Grades 6 through 12

Utilizing time built into the teaching schedules, professional development offered to teachers varies from meeting to meeting. Recent focus at the middle school level has been around the new Frameworks, looking at planning documents and making adjustments where necessary to conform to the Common Core. Although not required of teachers, many of the staff members have taken advantage of courses offered through the district (RTI, Skillful Teacher, UBD). In addition, teachers who have attended workshops outside of the district often share materials and ideas with colleagues during professional development periods.

2.5 History of Programs Being Piloted or Recently Piloted

From 2010-2011 the Sharon Public Schools piloted the on-line Galileo Assessment System. An End of Year and Mid-Year Assessment was created and analyzed using Galileo and administered to all students in Grade 4. Given the yearly per student cost and lack of rigorous test items, it was determined that it did not meet the needs of the Elementary Math Curriculum in Sharon.

From 2011-2012 the Sharon Public Schools piloted the Esuite, an online technology platform created for use with Everyday Math by McGraw Hill. One teacher from each grade level, grades 2-5 piloted this platform. All buildings were represented. Given the concerns around the alignment of the Everyday Math program to the new standards and the added cost, subscriptions for the Esuite were not purchased.

In September of 2012, students and teachers in Grades K-8 began a pilot of iReady, an online Universal Screening tool. All students took an initial diagnostic mathematics test and plans are in place to re-administer the assessment at multiple times throughout the year to gauge student progress.

In September of 2012, students and teachers in Grades 1 and 2 began a pilot of the Everyday Math Common Core State Standards Edition student journals. Evaluation of this pilot will occur this spring.

2.6 Content Specialists Employed to support Math Programs

There are 3.5 Elementary math specialists employed in the Sharon Public Schools. One math specialist for Cottage Street School, one for East Elementary and one full time and one part time (.5) specialist at Heights Elementary. The Elementary Math specialists co-teach, model lessons, and work with small groups to meet the needs of individual learners. Math specialist schedules are based on the needs of the building each year. Thus, the math specialist schedule and service delivery varies from school to school, grade-to-grade and year-to-year.

Math specialists and building principals are working towards using iReady data to provide RTI targeted instruction through math intervention periods at all grade levels. These interventions, as outlined by RTI, require a "double dose" of math instruction for a minimum of three times per week, 30 minutes per day with a maximum of 6 students per group. Implementation of these interventions has been more successful in the primary grades given that instrumental music, choral ensemble and foreign language do not impact the daily schedule.

There is one math specialist at Sharon Middle School currently assigned to work with small groups of grade-alike students. In these small sections, the specialist individualizes instruction to meet each student's needs. In addition, the middle school specialist teaches the 8th Grade section of pullout Mathematics. This section is co-taught with a special education teacher.

3. 2011 Massachusetts Curriculum Frameworks for Mathematics

3.1 Massachusetts Curriculum Framework

The current Massachusetts Curriculum Frameworks were adopted in January of 2011. This new document builds on the Common Core State Standards for Mathematics and was developed with the purpose of ensuring that all students are college and career ready. The new frameworks represent many changes, particularly in Grades K-8. The following six key shifts are represented in the standards: Focus, Coherence, Depth, Application, Dual Intensity and Balance. After many years of concern regarding the "mile wide, inch deep" curriculum represented in math standards across the United States, efforts have been made to narrow the focus and deepen the conceptual understanding of fewer concepts at each grade level. Three to four Critical Areas of Focus have been identified for Pre K-8. (See Appendix 7.2)

> "This work represents the first significant attempt in our nation's history to systematically align common K-12 mathematics standards across the states, building on previous efforts to create a national vision for mathematics education, including the National Council of Teachers of Mathematics' standards documents (1989, 2000, 2009, 2011). The new *Common Core State Standards for Mathematics* (CCSSM) will stimulate significant and immediate revisions in state mathematics assessments and classroom curriculum materials." William S. Bush (chair), Mathematics Educator, University of Louisville, Kentucky, 2011

The frameworks include not only content standards, but also 8 Standards for Mathematical Practice, which are 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.

Domains are now as follows:

1. Counting and Cardinality- Grade K
2. Operations and Algebraic Thinking- Grades K-5
3. Number and Operations Base Ten- Grades K-5
4. Number and Operations-Fractions- Grades 3-5
5. The Number System- Grades 5-8
6. Ratios and Proportional Relationships- Grades 6-7
7. Expressions and Equations- Grades 6-8
8. Functions- Grade 8
9. Measurement and Data- Grades K-5
10. Geometry- Grades K-8
11. Statistics and Probability- Grades 6-8

High School Content Standards are now broken up into 6 Conceptual Categories.

1. Number and Quantity
2. Algebra
3. Functions
4. Modeling
5. Geometry
6. Statistics and Probability

These conceptual categories portray a coherent view of high school mathematics, and work done by students in one category often crosses a number of traditional high school courses.

3.2 Sharon Learning Standards

The Sharon Learning Standards for Mathematics were developed in 2007. Teachers worked in teams to develop standards that outline Enduring Understandings, Essential Questions, Key Knowledge and Skills for mathematics at each grade level. The standards are aligned to the strands and content represented in the standards from the National Council of Teachers of Mathematics and the 2000 MA Curriculum Frameworks for Mathematics.[1] Thus, the Sharon Learning Standards are not organized by the domains or grade level content represented in the 2011 MA Curriculum Frameworks.

UBD templates have been created for 90% of the units covered in courses for grades 7-12, however they have not been developed for the Everyday Math Units. The nature of Everyday Mathematics has made it difficult to create such templates. Often a unit encompasses several Enduring Understandings and addresses many domains, skills and concepts at a time.

[1]2000 Strands for K-5 were as follows: Number and Operations, Patterns and Relations, Geometry, Measurement, and Data, Statistics and Probability.

3.3 Alignment of Current Programs to Curriculum Frameworks

Committee members determined how well the core instructional materials (EveryDay Math K-6 and Prentice Hall 7-8) align to the new Frameworks, using the Common Core Curriculum Analysis Tool[2]. (See Appendix 7.3) Standards were evaluated by grade level using the following criteria:

Standard Adequately Addressed: Content was fully formed as described in the standards

Standard Somewhat Addressed: Few gaps in the content, as described in the standards, were found and these gaps may be easily filled, modifications and supplementation needed to address standard.

Standard Marginally Addressed: Gaps in the content, as described in the standards, were found and these gaps may not be easily filled, or content was not found. Significant supplementation and resources are needed to address standard.

The following is a summary of the analysis by grade level.

Grade K
10 of 24 standards (41%) are adequately addressed: These standards were largely represented in the Counting and Cardinality or Measurement and Data Domains
9 of 24 standards (38%) are somewhat addressed. Standards were represented in every domain.
5 of 24 standards (21%) are minimally addressed or were not found. These standards were represented in the Operations and Algebraic Thinking, Numbers and Operations Base Ten and Geometry domains.

Grade 1
9 of 25 standards (36%) are adequately addressed: These standards were represented in every domain with the exception of Geometry.
12 of 25 standards (48%) are somewhat addressed. Standards were represented in every domain with the exception of Measurement.
4 of 25 standards (16%) are minimally addressed or were not found. These standards were represented in the Operations and Algebraic Thinking and Measurement Data domains.

Grade 2
12 of 27 standards (44%) are adequately addressed: These standards were represented in every domain.
5 of 27 standards (19%) are somewhat addressed. Standards were represented in every domain with the exception of Measurement and Data and Operations and Algebraic Thinking.

[2] The Common Core Curriculum Analysis Tool was developed by Bill Bush in 2011 to help school districts look at curriculum and determine how well they reflect the Common Core standards.

10 of 27 standards (37%) are minimally addressed or were not found. These standards were represented in the Operations and Algebraic Thinking, Numbers and Operations Base Ten, Measurement Data and Geometry domains.

Grade 3

9 of 33 standards (28%) are adequately addressed: These standards were represented in the Operations and Algebraic Thinking and Number and Operations in Base Ten Domains.

9 of 33 standards (28%) are somewhat addressed. These standards were represented in all domains with the exception of the Numbers and Operations-Fractions Domain

15 of 33 standards (45%) are minimally addressed or were not found. These standards were represented in the Numbers and Operations Base Ten, Numbers and Operations-Fractions, Measurement Data and Geometry domains

Grade 4

8 of 34 standards (24%) are adequately addressed: These standards were represented in every domain with the exception of Number and Operations-Fractions.

13 of 34 standards (41%) are somewhat addressed. Standards were represented in every domain with the exception of Number Operations-Fractions.

13 of 34 standards (38%) are minimally addressed or were not found. These standards were represented in the Operations and Algebraic Thinking and Numbers and Operations-Fractions and Measurement and Data domains.

Grade 5

8 of 35 standards (23%) are adequately addressed: These standards were represented only in the Operations and Algebraic Thinking and Numbers and Operations- Base Ten domains.

16 of 35 standards (46%) are somewhat addressed. Standards were represented in every domain with the exception of Operations and Algebraic Thinking domain.

11 of 35 standards (31%) are minimally addressed or were not found. These standards were represented in the Number and Operations- Fractions and Measurement and Data Domains.

Grade 6

11 of 45 standards (24%) are adequately addressed: These standards were evenly spread throughout the domains.

22 of 35 standards (49%) are somewhat addressed. Standards were represented in every domain with the exception of the Statistics & Probability domain

12 of 45 standards (27%) are minimally addressed or were not found. These standards with the greatest deficiencies were Geometry, Statistics & Probability and Expressions & Equations.

Grade 7

14 of 45 standards (31%) are adequately addressed: These standards were represented only in the Number System Ratios & Proportional Relationships domains.

9 of 45 standards (20%) are somewhat addressed. Standards were represented in every domain with the exception of the Number System domain.

22 of 45 standards (49%) are minimally addressed or were not found. These standards were mostly represented in the Geometry, Statistics & Probability.

Grade 8

11 of 33 standards (33%) are adequately addressed: These standards were represented only in the Number System Ratios & Proportional Relationships domains.

15 of 33 standards (45%) are somewhat addressed. Standards were represented in every domain with the exception of the Number System domain.

7 of 33 standards (21%) are minimally addressed or were not found. These standards were mostly represented in the Geometry, Statistics & Probability.

3.3.1 Kindergarten through Grade 8 Alignment

Standards Minimally Addressed or Not Found By Grade Level

Grade K

The following 5 of 24 standards (21%) are minimally addressed or were not found.

- Operations and Algebraic Thinking
  - K.OA.3 Decompose numbers less than or equal to 10 in pairs in more than one way
  - K.OA.4 For any number from 1 to 9, find the number that makes 10 when added to the given number
- Number and Operations Base 10
  - K.NBT.1 Decompose and compose numbers from 11-19 into tens and some further ones
- Geometry
  - K.G.4 Analyze and compare two- and three- dimensional shapes, in different sizes and orientations, using informal language to describe their similarities, differences and parts
  - K.G.6 Compose simple shapes to form larger shapes.

Grade 1

The following 4 of 25 standards (16%) are minimally addressed or were not found.

- Operations and Algebraic Thinking
  - 1.OA.2 Solve word problems that call for addition of three whole numbers whose sum is less than or equal to 20.
  - 1.OA.8 Determine the unknown whole number in an addition or subtraction equation relating three whole numbers.
- Measurement and Data
  - 1.MD.1 Order three objects by length: compare the lengths of two objects indirectly by using a third object
  - 1.MD.2 Express 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.

Grade 2

The following 10 of 27 standards (37%) are minimally addressed or were not found.

- Operations and Algebraic Thinking
  - 2.OA.3 Determine whether a group of objects (up to 20) has an odd or even number; write an equation to express an even number as a sum of two equal addends
- Number and Operations in Base Ten
  - 2.NBT.8 Mentally add 10 or 100 to a given number 100-900, and mentally subtract 10 or 100 from a given number 100-900
- Measurement and Data
  - 2.MD.2 Measure the length of an object twice, using length units of different lengths for the two measurements; describe how the two measurements relate to the size of the unit chosen.

    - 2.MD.3 Estimate lengths using units of inches, feet, centimeters, and meters
    - 2.MD.4 Measure to determine how much longer one object is than another, expressing the length difference in terms of a standard length unit.
    - 2.MD.5 Use addition and subtraction within 100 to solve word problems involving lengths that are given in the same units, e.g., by using drawings (such as drawings or rulers) and equations with a symbol for the unknown number to represent the problem.
    - 2.MD.6 Represent whole numbers as lengths from 0 on a number line diagram with equally spaced points corresponding to the numbers 0, 1, 2, … , and represent whole-number sums and differences within 100 on a number line diagram.
    - 2.MD.9 Generate measurement data by measuring lengths of several objects to the nearest whole unit, or by making repeated measurements of the same object. Show the measurements by making a line plot, where the horizontal scale is marked off in whole-number units.
- Geometry
    - 2.G.2 Partition a rectangle into rows and columns of same-size squares and count to find the total number of them.
    - 2.G.3 Partition circles and rectangles into two, three, or four equal shares, describe the shares using the words halves, thirds, half of, a third of, etc., and describe the whole as two halves, three thirds, four fourths. Recognize that equal shares of identical wholes need not have the same shape.

Grade 3

The following 16 of 34 standards (47%) are minimally addressed or were not found.

- Number and Operations in Base Ten
    - 3.NBT.3 Multiply one-digit whole numbers by multiples of 10 in the range 10-90 (e.g., 9 × 80, 5 × 60) using strategies based on place value and properties of operations.
- Number and Operations- Fractions
    - 3.NF.1 Understand a fraction 1/b as the quantity formed by 1 part when a whole is partitioned into b equal parts; understand a fraction a/b as the quantity formed by a parts of size 1/b.
    - 3.NF.2a Represent a fraction 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 1/b and that the endpoint of the part based at 0 locates the number 1/b on the number line.
    - 3.NF.2b Represent a fraction a/b on a number line diagram by marking off a lengths 1/b from 0. Recognize that the resulting interval has size a/b and that its endpoint locates the number a/b on the number line.
    - 3.NF.3a Understand two fractions as equivalent (equal) if they are the same size, or the same point on a number line.
    - 3.NF.3b Recognize and generate simple equivalent fractions (e.g., 1/2 = 2/4, 4/6 = 2/3). Explain why the fractions are equivalent, e.g., by using a visual fraction model.
    - 3.NF.3c Express whole numbers as fractions, and recognize fractions that are equivalent to whole numbers. Examples: Express 3 in the form 3 = 3/1; recognize that 6/1 = 6; locate 4/4 and 1 at the same point of a number line diagram.
    - 3.NF.3d Compare two fractions with the same numerator or the same denominator, by reasoning about their size. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of

comparisons with the symbols >, =, or <, and justify the conclusions, e.g., by using a visual fraction model.

Measurement and Data

- 3.MD.1 Tell and write time to the nearest minute and measure time intervals in minutes. Solve word problems involving addition and subtraction of time intervals in minutes, e.g., by representing the problem on a number line diagram.
- 3.MD.2 Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l). Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem. 3.MD.3
- 3.MD.7a Find the area of a rectangle with whole number side lengths by tiling it, and show that the area is the same as would be found by multiplying the side lengths.
- 3.MD.7b Multiply side lengths to find areas of rectangles with whole-number side lengths in the context of solving real world and mathematical problems, and represent whole-number products as rectangular areas in mathematical reasoning.
- 3.MD.7c Use tiling to show in a concrete case that the area of a rectangle with whole-number side lengths a and b + c is the sum of a × b and a × c. Use area models to represent the distributive property in mathematical reasoning.
- 3.MD.7d Recognize area as additive. Find areas of rectilinear figures by decomposing them into non-overlapping rectangles and adding the areas of the non-overlapping parts, applying this technique to solve real world problems

- Geometry
  - 3.G.1 Understand that shapes in different categories (e.g., rhombuses, rectangles, and others) may share attributes (e.g., having four sides), and that the shared attributes can define a larger category (e.g., quadrilaterals). Recognize rhombuses, rectangles, and squares as examples of quadrilaterals, and draw examples of quadrilaterals that do not belong to any of these subcategories

Grade 4

The following 13 of 34 standards (38%) are minimally addressed or were not found.

- Operations and Algebraic Thinking
  - 4.OA.4 Find all factor pairs for a whole number in the range 1-100. Recognize that a whole number is a multiple of each of its factors. Determine whether a given whole number in the range 1-100 is a multiple of a given one-digit number. Determine whether a given whole number in the range 1-100 is prime or composite.
- Number and Operations-Fractions
  - 4.NF.1 Explain why a fraction a/b is equivalent to a fraction (n × a)/(n × b) by using visual fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size. Use this principle to recognize and generate equivalent fractions.
  - 4.NF.2 Compare two fractions with different numerators and different denominators, e.g., by creating common denominators or numerators, or by comparing to a benchmark fraction such as 1/2. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with symbols >, =, or <, and justify the conclusions, e.g., by using a visual fraction model

    - 4.NF.3a-d Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers.
    - 4.NF.4a-c Apply and extend previous understandings of multiplication to multiply a fraction by a whole number.
    - 4.NF.5 Express a fraction with denominator 10 as an equivalent fraction with denominator 100, and use this technique to add two fractions with respective denominators 10 and 100. For example, express 3/10 as 30/100 and add 3/10 + 4/100 = 34/100.
- Measurement and Data
    - 4.MD.4 Make a line plot to display a data set of measurements in fractions of a unit (1/2, 1/4, 1/8). Solve problems involving addition and subtraction of fractions by using information presented in line plots. *For example, from a line plot find and interpret the difference in length between the longest and shortest specimens in an insect collection.*
    - 4.MD.7 Recognize angle measure as additive. When an angle is decomposed into non-overlapping parts, the angle measure of the whole is the sum of the angle measures of the parts. Solve addition and subtraction problems to find unknown angles on a diagram in real world and mathematical problems, e.g., by using an equation with a symbol for the unknown angle measure.

Grade 5

The following 11 of 35 standards (31%) are minimally addressed or were not found.

- Numbers and Operations- Fractions
    - 5.NF.5b Explaining why multiplying a given number by a fraction greater than 1 results in a product greater than the given number (recognizing multiplication by whole numbers greater than 1 as a familiar case); explaining why multiplying a given number by a fraction less than 1 results in a product smaller than the given number; and relating the principle of fraction equivalence a/b = (n×a) / (n×b) to the effect of multiplying a/b by 1.
    - 5.NF.6 Solve real world problems involving multiplication of fractions and mixed numbers, e.g., by using visual fraction models or equations to represent the problem.
    - 5.NF.7a Interpret division of a unit fraction by a non-zero whole number, and compute such quotients. For example, create a story context for (1/3) ÷ 4 and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that (1/3) ÷ 4 = 1/12 because (1/12) × 4 = 1/3.
    - 5.NF.7b Interpret division of a whole number by a unit fraction, and compute such quotients. For example, create a story context for 4 ÷ (1/5) and use a visual fraction model to show the quotient. Use the relationship between multiplication and division to explain that 4 ÷ (1/5) = 20 because 20 × (1/5) = 4.
    - 5.NF.7c Solve real-world problems involving division of unit fractions by non-zero whole numbers and division of whole numbers by unit fractions, e.g., by using visual fraction models and equations to represent the problem. For example, how much chocolate will each person get if 3 people share 1/2 lb. of chocolate equally? How many 1/3-cup servings are in 2 cups of raisins?
- Measurement and Data
    - 5.MD.3a A cube with side length 1 unit, called a “unit cube,” is said to have “one cubic unit” of volume, and can be used to measure volume.
    - 5.MD.3b A solid figure which can be packed without gaps or overlaps using n unit cubes is said to have a volume of n cubic units.

- 5.MD.4 Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft., and improvised units.
- 5.MD5a Find the volume of a right rectangular prism with whole-number side lengths by packing it with unit cubes, and show that the volume is the same as would be found by multiplying the edge lengths, equivalently by multiplying the height by the area of the base. Represent three-fold whole-number products as volumes, e.g., to represent the associative property of multiplication.
- 5.MD.5b Apply the formulas V =l x w x h and V = b x h for rectangular prisms to find volumes of right rectangular prisms with whole-number edge lengths in the context of solving real world and mathematical problems.
- 5.MD.5c Recognize volume as additive. Find volumes of solid figures composed of two non-overlapping right rectangular prisms by adding the volumes of the non-overlapping parts, applying this technique to solve real world problems.

Grade 6

The following 12 of 45 standards (27%) are minimally addressed or were not found.

- Geometry
  - 6.G.2 Find the volume of a right rectangular prism with fractional lengths by packing it with unit cubes of appropriate fraction lengths. and show that the volume is the same as would be found by multiplying the edge lengths of the prism.
  - 6.G.3 Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate. Apply these techniques in the context of solving real-world and mathematical problems.
  - 6.G.4 Represent three-dimensional figures using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures.
- Expressions and Equations
  - 6.EE2.b Identify parts of an expression using mathematical terms (sum, term, product, factor, quotient, coefficient); view one or more parts of an expression as a single entity
  - 6.EE.3 Apply the properties of operations to generate equivalent expressions
  - 6.EE.5 Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true.
  - 6.EE.8 Write an inequality of the form $x > c$ or $x < c$ to represent a constraint or condition in a real-world or mathematical problem. Recognize that inequalities of the form $x > c$ or $x < c$ have infinitely many solutions; represent solutions of such inequalities on number line diagrams.
- Statistics and Probability
  - 6.SP.1 Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers.
  - 6.SP.2 Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape.
  - 6.SP.4 Display numerical data in plots on a number line, including dot plots, histograms, and box-plots.
  - 6.SP.4 MA.4.a. Read and interpret circle graphs.
  - 6.SP.5 Summarize numerical data sets in relation to their context, such as by:
    a. Reporting the number of observations.

b. Describing the nature of the attribute under investigation, including how it was measured and its units of measurement.
c. Giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered.
d. Relating the choice of measures of center and variability to the shape of the data distribution and the context in which the data were gathered.

Grade 7

The following 22 of 45 standards (49%) are minimally addressed or were not found.

- Rations and Proportional Relationships
  - 7.RP.2a Decide whether two quantities are in a proportional relationship, e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin.
  - 7.RP.2b Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.
  - 7.RP.2c Represent proportional relationships by equations.
  - 7.RP.2d Explain what a point (x, y) on the graph of a proportional relationship means in terms of the situation, with special attention to the points (0, 0) and (1, r) where r is the unit rate.
- Expressions and Equations
  - 7.EE.2 Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related.
  - 7.EE.4 Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.
  - 7.EE.4b Solve word problems leading to inequalities of the form $px + q > r$ or $px + q < r$, where p, q, and r are specific rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem.
  - 7.EE.MA.4c. Extend analysis of patterns to include analyzing, extending, and determining an expression for simple arithmetic and geometric sequences (e.g., compounding, increasing area), using tables, graphs, words, and expressions.
- Geometry
  - 7.G.2 Draw (freehand, with ruler and protractor, and with technology) geometric shapes with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle.
  - 7.G.3 Describe the two-dimensional figures that result from slicing three-dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids.
- Statistics and Probability
  - 7.SP.1 Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences.
  - 7.SP.2 Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions.

- 7.SP.3 Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities, measuring the difference between the centers by expressing it as a multiple of a measure of variability. 7.SP.4. Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations.
- 7.SP.5 Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around ½ indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.
- 7.SP.6 Approximate the probability of a chance event by collecting data on the chance process that produces it and observing its long-run relative frequency, and predict the approximate relative frequency given the probability.
- 7.SP.7 Develop a probability model and use it to find probabilities of events. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy.
- 7.SP.7a Develop a uniform probability model by assigning equal probability to all outcomes, and use the model to determine probabilities of events.
- 7.SP.7b Develop a probability model (which may not be uniform) by observing frequencies in data generated from a chance process.
- 7.SP.8 Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation.
- 7.SP.8a Understand that, just as with simple events, the probability of a compound event is the fraction of outcomes in the sample space for which the compound event occurs.
- 7.SP.8b Represent sample spaces for compound events using methods such as organized lists, tables and tree diagrams. For an event described in everyday language (e.g., “rolling double sixes”), identify the outcomes in the sample space which compose the event.
- 7.SP.8c. Design and use a simulation to generate frequencies for compound events.

Grade 8

The following 7 of 33 standards (21%) are minimally addressed or were not found.

- Expressions and Equations
  - 8.EE.5 Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways.
  - 8.G.1 Verify experimentally the properties of rotations, reflections, and translations: lines are taken to lines and line segments to line segments of the same length; angles are taken to angles of the same measure; parallel lines are taken to parallel lines.
  - 8.G.2 Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them.
  - 8.G.3 Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.
  - 8.G.4 Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations,

and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them.

- Statistics and Probability
    - 8.SP.2 Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line.
    - 8.SP.4 Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables.

4. Surveys

4.1 Survey Methodology

Six surveys were created and disseminated:

- Parents and Guardians of Students K-5
- Parents of and Guardians of Students Grades 6-12
- Students Grades 2-5
- Students 6-12
- Staff Members K-5
- Staff Members 6-12

Data was collected using the 'Zoomerang' online survey software tool. Principals distributed parent surveys with weekly announcements using Alert Now. This Alert Now message was repeated twice over the course of one month. Surveys for staff members were shared through a link to Zoomerang as part of weekly updates in the month of May. Coordinators sent follow up emails. Student surveys were shared by email with technology specialists and classroom teachers with a link to the survey. Students completed surveys in building computer labs and/or on laptops in classrooms. (See appendix 7.4 for survey questions.)

4.2 Survey Summaries

4.2.1 Elementary (K-5/6) Teacher Survey

60 out of 85 staff members responded to the survey. The respondents were as follows:

- 20 K-2 Teachers (60%)
- 29 3-5 Teachers (80%)
- 3 Grade 6 teachers (50%)
- 3 math specialists (75%)
- 2 special educators (33%)
- 1 Instructional Assistant
- 2 administrators (33%)

Evaluation of Everyday Math

Teachers agree that Everyday Math provides clear guidelines and learning objectives (91% said always or sometimes), step-by-step instructions (93% said always or sometimes), and a master source of materials and resources (89% said always or sometimes). They also feel that the learning activities involve students in active learning and inquiry (77% said always or sometimes), and show students how to use basic arithmetic operations (74% said always or sometimes).

While teachers agree that the Everyday Math Unit Assessments provide information as to which skills assessed should be mastered in each unit (82% said always or sometimes) and assess procedural skills (77% said always or sometimes), they do not feel that there are pre-unit assessments available. (Only 30% said always or sometimes. 63% of Grade 5 teachers said rarely or never. All math specialists said rarely or never.)

Teachers indicated that Everyday Math was lacking in the areas of fact practice, problem solving and conceptual understanding. Only 51% agree that Everyday Math provides the in-depth investigations of major mathematical concepts (83% of Kindergarten teachers said rarely). 58% of teachers said materials for fact practice are rarely or never available, (80% of Grade 5 teachers and 100% of Grade 6 teachers said rarely). Only 38% of teachers agree that Everyday Math provides explicit instruction on strategies for problem solving. (80% of Grade 1 teachers said rarely. 90% of Grade 5 teachers said rarely or never.) Only 45% agree that Everyday Math assesses problem-solving skills.

The greatest area of concern expressed was the alignment of Everyday Math to the 2011 Massachusetts Frameworks for Mathematics. Only 21% of teachers agree or strongly agree that EDM is aligned to the new standards. 93% of teachers supplement the Everyday Math Program daily or weekly. (Most often at K- 83% said daily and Grade 2- 67% said daily).

Evaluation of Supplementary Materials

Benchmark Assessments

Teachers agree or strongly agree (range of 75-92%) that the K Baseline, Mid-Year, End of Year, Baseline Fact and June Fact assessments are efficient to administer and effective for measuring student growth. 75% of Kindergarten teachers, however, feel strongly that the K Midyear and End of Year Assessment is not efficient to administer and score.

Formative Assessment

Teachers use several methods for formative assessment. The following methods were used by more than 75% of the teachers: Periodic Fact Assessments, Analysis of Student Work, Teacher Observation, Classroom Discussions, Unit Assessments and One to One Conferring.

Supporting Documents

Teachers value the supporting documents and resources that have been developed to aid their instruction. Teachers feel strongly (94%) that the unit planners make their instruction more effective, that the Math Station binders make small group instruction manageable (81%), and the 2-Day Approach to Problem Solving provides students with the opportunity to apply problem-solving skills (76%).

Teachers in Grades 4 and 5 expressed concern with the problem solving supplements. 70% disagree with the following statement: "The Sharon Math Program as a whole (Everyday Math and supplementary resources such as Exemplars, Read It, Draw It, Solve It and Creative publications) provide adequate problem solving." Teachers of Grades K-3 were split on this issue.

Evaluation of Instructional Practices

Differentiated Instruction

Teachers use many formats for differentiating math instruction. Teachers pull small groups for remediation (83% said daily or weekly); pull small groups for enrichment (49% said weekly) implement math workshop weekly or daily (37%) and engage students in Math Stations weekly (43%) or monthly (43%). Math stations are used most often at Grade 1. (100% use weekly) Math Workshop is used most often at grades 2 and 4. Teachers pull remedial and enrichment groups most often at grades 2 and 5.

During math stations, the teacher divides the class into three to four groups, and provides three to four stations with differentiated tasks and learning experiences for each group and station. Students rotate through each station. Stations during a math class may include but are not limited to the following:

- Teacher Station-Teacher or math specialist introduces or reviews the concept or skill of the day
- Game Station-Generally independent or parent led, students engage in partner math card or online games
- Problem Solving Station-Parent, teacher or math specialist facilitates group problem solving, sharing of strategies or direct teaching of strategies
- Computation Station-Independent or parent led, students practice basic facts, multi-digit whole number computation, fractional or decimal computation, etc.

The content, process and product of each task or learning experience at each station are differentiated by readiness, learning profile or interest.

During math workshop, the teacher begins with a mini lesson, assigns a menu of differentiated learning experiences and tiered assignments and ends with reflection of the concepts and learning experiences of the day. Students have the choice of working with a partner, small group or independently on the menu of learning experiences and tasks. While students work on this menu, teachers pull small-guided groups to provide remediation or enrichment. Math workshop also allows time for teachers to engage in one to one conferences with students. The content, process and product of each task or learning experience from the small-guided groups, tiered assignments, and conferences are differentiated by readiness, learning profile or interest.

Math Specialist Support
Teachers and math specialists work together to meet the individual needs of their students. On a weekly basis 61% of teachers co-teach with math specialists, 43% send small groups with the math specialist for support within the math period, 37% send small groups with the math specialist for intervention outside of the math period and 22% observe/confer while math specialist models lesson.

When asked to rate math specialist services, 70% of teachers in Grades 1-5 agreed that in class math station support or pulling small groups of students during the math lesson to provide remediation or enrichment was most helpful. However, Kindergarten teachers did not agree with the teachers of grades 1-5. Only 30% said in class math station support or pulling small groups of students during the math lesson to provide remediation or enrichment was helpful. In contrast, 60% said providing interventions to students outside of the math lesson time was most helpful.

Instructional Techniques
The following instructional techniques are employed daily or weekly: Providing opportunities for students to share their thinking (96%), Modeling With Think Alouds (83%), Explicitly Teaching Problem Solving Strategies (73%). Most teachers said they share student work monthly (47%). However, this strategy is used more often Grade 3 (60% said weekly) and Grade 2 (56% said weekly).

Professional Development
Teachers responded that the following possible professional development offerings would be very helpful: Differentiated Instruction (65%), RTI in Math (62%), and Integration of Technology (59%). 91% of teachers report that they feel confident with the math content they teach. Only 23% of teachers felt that professional development that allowed for “Exploring their own understanding of math” would be helpful. 77% of teachers agree or strongly agree that they have a clear understanding of the new frameworks. Only 28% felt that professional development around “Unpacking/understanding the content standards that are new to the grade level” would be very helpful.

4.2.2 Grade 2 through Grade 5 Student Survey

77% of students from Grades 2-5 (764 out of 992) responded to the survey. 74% of the students feel math is just right, 18% feel it is too easy, 8% feel it is too hard.

At least 85% of the students find the following instructional techniques helpful most of the time or some of the time: Stating the Objective/ Using Essential Questions (93%), Turn and Talk (88%), Think Alouds (88%), and Use of Technology (88% of fifth grade students). Of all of these techniques, students said that stating the objective or Use of Essential Questions "Knowing what the lesson will be about before we start," was most helpful.

Students had many positive things to say about what they like best about math class. Only 3 students were not able to complete the statement "In math class I like to" with something they liked about math class. Reponses included the following:

> *Working with operations (multiplication, division, addition, subtraction, operations on fractions), problem solving, math challenges (Brain Teasers, logic problems, Continental Math League), practicing basic facts/completing timed tests, using technology- using the Promethean Board, online games, laptops, using tools (rulers, pattern blocks, slates, calculators), participating in Math Stations, small group work, partner work, playing games, taking tests, learning new things, exploring Area, Geometry, Fractions, Volume, Measurement, Graphing and working in the student journal*.

Students responded to the statement "In math class I do not like to…" in many ways. Over 50 students responded that they loved math class, or liked everything about math class, or said that there wasn't anything they didn't like about math class. The following topics were mentioned most often:

> *Subtracting, Dividing, working with Fractions/Decimals, solving Open Response questions, working in the math journal, explaining my thinking, listening and sitting for a long time, working in large groups/whole class, being timed in math, reviewing things I already know, working on math that is too hard*

4.2.3 Kindergarten through Grade 5 Parent Survey

Parents could respond for each elementary child in their family. Of the possible 1,406 survey responses for each elementary student enrolled in the Sharon Public Schools, only 117 were submitted. This equates to less than 8% of the parents of elementary students.

More than half the parents of students in Grades K, 2 and 3 said the current math curriculum is usually "just right". More than half of the Grade 1 parents said the program is usually "too easy". Parents of fourth and fifth graders were split between too easy and just right.

Parents offer assistance at home by helping with homework and practicing basic facts. About half of the parents access online games. Less than half report that they access website links or Family Math Letters.

57% of the parents surveyed agreed that they receive useful feedback regarding their child's progress in math. (Parents of students from grades 3 and 5 were higher with 65% and 69%). (Kindergarten parents were lower with 33%)

87% of the parents surveyed said they would attend parent math nights.

4.2.4 Grade 6 through 12 Teacher Survey

33 staff members responded to the survey. The respondents were as follows:

- 65% were classroom teachers (includes math specialist), all but one certified classroom teacher responded
- The remaining 35% (12 respondents) were other staff (Instructional Assistants or Special Education teachers).
- Of those responding 52% were employed at the middle school and 48% at the high school.

Instructional Practices:

The following instructional techniques are employed daily or weekly: Engage the class in whole group discussions (82%), Require students to explain their thinking/answers (97%), Allow students to work at their own pace (88%), Assign homework (85%), Introduce content through formal presentations (84.4%), Have students work in groups/partners (97%), review homework assignments before collecting (88%).

Curriculum:

Middle school teachers report they are dissatisfied with the current curriculum being accessible to all learners (53%), and its consideration for different learning styles (47%). Inquiry based investigations are lacking in the middle school materials, and teachers comments indicate they feel students would benefit from more hands on discovery. Teachers at both schools feel curriculum could be more relevant to day-to-day experiences (roughly 33% report dissatisfaction). Resources from the publisher are used more often at the high school level (47% daily use vs. 23% at the middle school). Supplemental resources are used equally at both (53% of teachers at both schools use them weekly).

The majority of respondents indicated they were familiar with the new Common Core Standards, the NCTM Standards, and the Sharon Learning Standards, that said teachers at both schools report reordering the sequence of materials to flow better with the new standards.

4.2.5 Grades 6 through 12 Parent Survey

Parents could respond for each secondary child in their family. Of the possible 1900 (approximately) survey responses for each secondary student enrolled in the Sharon Public Schools, only 174 were submitted. Parents could respond for each child enrolled in grades 6-12. Less than 9% of the parents eligible responded.

- 65% of parents agreed with the statement: When helping my child complete homework, I have referred to the textbook or Student Reference Book (SRB)
- 79% agreed with the statement: The assigned homework provides enough computational (skills) practice.

- 79% agreed with the statement: The assigned homework provides students an opportunity to think critically about the math concepts being covered.

That said, when looking at responses of just parents of sixth graders, 57% DISAGREED with the statement that they have found it helpful to refer to the (Everyday Mathematics) textbook. Several of the comments offered by parents were of the nature that they found it difficult to find what they were looking for, and there were little to no examples to help them help their child. Several stated that their usual practice was an Internet search on the homework topic assigned.

4.2.6 Grades 6 through 12 Student Survey

638 of the 2007 students from grades 6-12 responded to the survey, with the exception of grade 12, a minimum of 70 students from each grade participated. Of those who responded, 73% felt the math course they were currently enrolled in was just right (enough of a challenge but not overwhelming) for them, while 9% thought the course was to hard and 18% thought it was not challenging enough.

The following are thoughts to take away from the student survey results:

- 79% find it helpful to see an agenda to know what we will accomplish in class.
- 87% find it helpful to know what the lesson will be about before we start (daily objective).
- 75% I find it helpful to know how math can be applied in the real world.
- When it comes to providing a mix of teacher instruction and group work, 94% of the students find it helpful (as opposed to only lecture)
- Students comments indicate the key to keeping them interested and engaged in math class is a variety of activities: unit projects, think/pair/share, in class discovery activities, review games/puzzles, using internet resources, hands on materials (blocks, protractors, real-world data gathering)
- 96% of students responding indicated seeing multiple examples (done by the teacher) are helpful.
- Comments indicate students enjoy the challenge of math but they are unsure of how some concepts apply in the “real world”
- Students who commented that math was “too hard” also mentioned they always struggled, or could not find it useful outside of class, that it didn’t seem relevant to everyday, etc.

5. Investigations of Alternative Core Programs

5.1 Elementary

From the spring of 2012 to the winter of 2013, Curriculum specialists and sales representatives from McGraw Hill, Pearson and Houghton Mifflin were invited to present their newly revised Common Core elementary math programs to the members of the curriculum review team. At this time, these are the only publishing companies with programs that have Common Core Editions. Elementary members of the curriculum review committee were present for all presentations. Also in attendance were building principals, math specialists, a classroom teacher from each grade level and the technology director.

The following presentations occurred:

March 2012
Everyday Math, Common Core Edition, McGraw Hill
EnVision, Pearson

October 2012
MyMath, McGraw Hill

February 2013
Math Expressions, Houghton Mifflin

Feedback
Attendees of the presentations were given sample materials and provided verbal feedback as well as written feedback using the Textbook Selection Rubric form. (See Appendix 7.5)

Everyday Math Common Core Edition
Participants expressed the several concerns regarding the Common Core Edition of Everyday Math. The greatest concern was that Everyday Math has only omitted lessons that go beyond the Grade 6 standards. Thus, if a topic is addressed in Grade 2 of Everyday Math that is represented in Grade 6 of the Common Core Standards it remains in a lesson at Grade 2 because it is part of the K-6 Common Core State Standards. Additional concerns are that Everyday Math continues to address many concepts, early on, all at once. Teachers, math specialists, coordinators and administrators agree that too much content is addressed giving little time to develop deep understanding of concepts. Only subtle changes have been made to address standards. Participants were not eager to fully pilot this new edition at grades 3-5. There was some interest in piloting the student journals at grades 1 and 2.

EnVision
Teachers liked the layout of the program. The lesson design includes Common Core State Standards, Essential Questions, a digital visual learning bridge, inquiry based problem solving and options for differentiation. Explicit teaching of problem solving strategies and use of visual models are present. Attendees were also impressed by the team of authors, integration of technology and top rating from the US Department of Education's What Works Clearinghouse. The elementary math coordinator visited the Mansfield Public Schools, observed the

implementation of an EnVision lesson at grade 5, interviewed a teacher from grade 4, and met with the building principal. Participants were enthusiastic about the EnVision presentation and are eager to pilot EnVision.

MyMath
Concerns were expressed regarding the lack of problem solving, hands on experiences, and opportunities for students to think critically about the concepts addressed. The curriculum appeared to have a heavy emphasis on teacher directed lessons, procedural knowledge and traditional paper/pencil tasks. Participants were not interested in piloting the MyMath curriculum.

Math Expressions
Positive feedback included research behind the curriculum, endorsement by the National Science Foundation, background information for the teachers, alignment to new standards, DI and RTI instructional resources, online features, and emphasis on reasoning. Participants were eager to pilot Math Expressions.

5.2 Middle School

In June of 2012, a curriculum specialist and sales representative from Glencoe presented their newly developed middle school program, Courses 1, 2 & 3. At the time of the presentation, no local area schools were using the program but it would be available for use in the fall of 2013. All members of the middles school math department and both math coordinators attended the presentation.

Feedback from the presentation was mixed; teachers loved the organization of the program and the amount of materials that were available online for both the students and the teachers to use in whole group instruction. A major concern was the product was only available as a consumable. Students would receive workbooks that had some examples done to completion and then places to write directly in the book. During the fall of 2012, one sixth and one-seventh grade teacher used sets of the books with students and discovered that it was hard to manage collecting work this way. For example, if a teacher was to collect an assignment, students had to rip out a page of their "text" and then would not have that to look at for reference later. As a result of the initial feedback from both the teachers and students, the department was not interested in pursuing the program any further.

In the fall of 2012, another presentation was made to the middle school staff to introduce Holt/McDougal's Big Idea's Math program. This is not an entirely new curriculum, but the previous Big Ideas series was completely revamped to align to the new standards. Initial feedback from this presentation was positive, and materials have been ordered to pilot the program before the end of this school year. The advantages to Big Ideas were to do with the activity based lessons to introduce each concept, an excellent online platform to use with the technology we have available, and the option of an accelerated pathway so students have the opportunity to complete a Common Core Algebra 1 course at the 8th grade level.

The Big Ideas Math program addresses all of the Grade 6th, 7th, and 8th grade standards as outlined by the Common State Core Standards. The Regular Pathway provides 8th grade students with a study of Linear Equations and Functions, preparing them for a full Algebra 1

course in 9th grade. The Accelerated pathway has students use a Grade 7 textbook that combines all of the regular 7th and 8th grade standards as outlined by the Common Core State Standards. This course would be followed by using the Big Ideas Math Algebra 1 book that completes the compacted pathway for middle school students. Students are exposed to highly motivating and relevant problems that offer the depth and rigor needed to prepare them for Calculus and other college-level courses that will be studied during their senior year.

5.3 High School

Due to limited changes in the 2011 Massachusetts Curriculum Frameworks, major changes to the curriculum materials in grades 11 and 12 are not needed at this time. However, given that the materials for the freshman and sophomore courses were out of date (with regards to the new standards) the department began the process of reviewing new products from the major publishing companies. After previewing new curriculum materials during department meetings, and evaluating all available options with the textbook selection rubric (see Appendix 7.5), the consensus was to move forward with the 2012 McGraw Hill/Glencoe Algebra 1 textbooks. These textbooks were purchased for the 2012-2013 school year for freshmen level courses. The department has also decided to use the Geometry text in the Glencoe Series for sophomore level courses (starting in 2013).

6. Commendations and Recommendations of Program

6.1 Staff

Commendations:
Highly qualified teachers and 4.5 building math specialists are present in the Sharon Public Schools. Teachers and math specialists work together to meet the individual needs of their students. K-12 teachers report that they feel confident with the math content they teach and agree that they have a clear understanding of the new frameworks.

Recommendations:
Math interventions, as outlined by RTI, require a “double dose” of math instruction for a minimum of three times per week for 30 minutes per day with a maximum of 6 students per group. iReady data indicates the need for 3-4 math intervention groups per grade level in each school. There are 3.5 math specialists at the elementary level when compared to 8.5 reading specialists.

- Increase elementary math specialists or other certified support personnel to support the implementation of math intervention blocks in the K-5 schedule as outlined by RTI and the Sharon Public Schools Strategic Plan.

Elementary math specialist schedules are based on the needs of the building each year. Thus, the math specialist schedule and service delivery varies from school to school, grade-to-grade and year-to-year.

- Work with the elementary principals to clearly define the role of the elementary math specialist so that the service delivery among schools is more consistent across the district.

Teachers at the middle school are concerned with the lack of progress of students (in particular those in subgroups) scoring in the Needs Improvement or Warning category for multiple years in a row. Eligible students are often assigned to meet with the math specialist during the school week, making the specialist unavailable to work with classroom teachers during scheduled math classes. The amount of students seen each cycle (by the math specialist) is approximately 70 students.

- Look at the role of the math specialist at the middle school to see if there is a better way to service all students at the middle school (in classrooms more, working with all levels of students)
- Continue to gather data using iReady to monitor student progress and inform instruction in grades 6-8.

6.2 Curriculum

Commendations:
The math curriculum has prepared students for success on state assessments. Students at all levels perform significantly above the state average on these assessments. Over 73% of students Grades 2-12, report feeling their math classes meet them at "just the right" level.

Recommendations:
K-6 teachers do not agree that Everyday Math is aligned to the new standards. Analysis of the alignment of Everyday Math to the current state standards indicates that only an average of 25% of the standards are adequately addressed in grades 3-6. (40% in K-2). Only 51% agree that Everyday Math provides in-depth investigations of major mathematical concepts. Teachers also indicated that Everyday Math was lacking in the areas of fact practice, problem solving, conceptual understanding and pre-assessments.

- Continue to support teachers with the alignment of Everyday Math to the new standards through professional development, the use of supplementary resources and ongoing updates on Edline of alignment documents (Unit Planners) and web resources.
- Continue to investigate alternative core programs at the elementary level that are aligned to the mathematical content and practice standards represented in the 2011 Massachusetts Curriculum Frameworks for Mathematics, and provide the following: in-depth investigations of major mathematical concepts, active learning and inquiry, clear objectives, explicit teaching of problem solving strategies, fluency with basic facts and pre-unit assessments.

- Pilot at least two K-5 programs in the 2013-2014 school year. Plan to fund and adopt a new program for the 2014-2015 school year. Provide training and ongoing professional development for teachers as they implement the new core program.

In the new standards, the domains of The Number System, Rations and Proportional Relationships, Expressions & Equations, and functions are clustered in grade 6 through 8. Each grade level is presented in the same format and newly designed middle school curricula address this shift. These domains are not adequately addressed in the current core instructional materials.

- Evaluate the programs investigated by the staff at Sharon Middle School (pilot underway for the Big Ideas series) and decide what curriculum best serves the needs of Sharon students.

UBD templates have not been created for content covered in Grades K-6. The new sequence of Algebra followed by Geometry has made previous UBD documents out of date.

- Develop UBD templates for Kindergarten through Grade 8 for each domain of the 2011 Massachusetts Curriculum Frameworks for Mathematics.
- Update (in-progress) Algebra 1, Geometry and Algebra 2 UBDs at the high school to align with new Common Core Standards.

MCAS data indicates the Sharon students have more difficulty in the areas of Geometry and Measurement.

- Provide students with meaningful contexts for exploring content addressed in the Measurement and Geometry domains. Integrate standards from these domains into science curriculum.
- Allow time for math and science teachers and coordinators to collaborate and explore the natural connections between current math and science standards.

The Sharon Learning Standards for Math K-12 are not organized by the domains or grade level content represented in the 2011 MA Curriculum Frameworks.

- Engage in conversation with district administrators and curriculum coordinators regarding the status of the Sharon Learning Standards.

6.3 Instruction

Commendations:
Teachers use many formats for differentiating math instruction, provide opportunities for students to share their thinking, employ several techniques that support the development of

problem solving skills, and utilize frequent formative assessments to assess student understanding and steer the direction of math instruction.

Recommendations:
Elementary teachers indicated that they model with think alouds and share student work weekly or monthly. To address the standards for mathematical practice, particularly #2 Reason Abstractly and Quantitatively and #3 Construct Viable Arguments and Critique the reasoning of others, these techniques should be incorporated daily.

- Provide continued professional development around the implementation of the Standards for Mathematical Practice where teachers observe students engaged in these practices.

Teachers at the high school are concerned with the number of students who override recommendations of math teachers. The struggle that these students normally incur, and the teachers desires to meet the needs of these students inhibits the overall progress of the class. For example, for the 2012-2013 school year, 22 students overrode the recommendation made by their respective eighth grade teacher. Six of these students were rescheduled after the normal schedule change period. Of the 56 grades issued while students were in the non-recommended course, 9% of the grades were a B or above, 50% were in the B- to C- range and 41% were D+ or below.

- Continue to monitor students who override and re-evaluate the policy of letting parents have the final placement decisions.
- Modify the override letter that is sent to parents by the Guidance Department to include historical grade data.

6.4 Assessment

Commendations:
Elementary teachers use skill-based, assessments at the end of each unit, along with ongoing formative assessments to monitor student progress regarding specific content covered in each unit. Teachers in Grade 1-5 agree that the Everyday Math Unit Assessments and the Midyear and End of Year Assessments provide data for measuring student progress.

The iReady data at Grades 2-5 indicates that more than 77% of our students are on or above level. This data matches results from other district wide measures. (MCAS/ Everyday Math unit assessments)

Recommendations:
According to the survey data, Kindergarten teachers feel strongly (range of 75-92%) that the K Midyear and End of Year Assessment is not efficient to administer and score. The iReady midyear data at Kindergarten and first grade indicates that more than 30% of the students are below level. (32% at Grade 1, 62% at Kindergarten.) This data is much lower than results from other district wide measures. (Everyday Math Unit Assessments, Baseline Fact Data, K Baseline Assessment, K Midyear Assessment)

- Review the effectiveness of the K-8 iReady Universal Screening Tool. Consider whether to continue its use or explore other Universal Screening tools.
- Share Kindergarten and Grade 1 iReady data with the RTI task force and consider the exploration of alternate assessments for measuring student progress at the K-1 level.

The initial iReady diagnostic data for grades 6-8 indicate that only 35% of grade 7 students are on or above grade level. This low performance is similar to what MCAS data has shown in the past.

- Continue to gather data using iReady and MCAS to monitor student progress and inform instruction
- Continue to explore the adoption of the Big Ideas program in 2013-2014.

6.5 Professional Development

Commendations:
K-8 teachers report that they feel confident with the math content they teach and agree that they have a clear understanding of the new standards.

Recommendations:
Elementary teachers indicated that they model with think alouds and share student work weekly or monthly. To address the standards for mathematical practice, particularly #2 Reason abstractly and quantitatively and #3 construct viable arguments and critique the reasoning of others, these techniques should be incorporated daily.

- Provide continued professional development for teachers K-8 around the implementation of the Standards for Mathematical Practice and key shifts represented in the new standards. Provide teachers with opportunities to observe students engaged in these practices.
- Offer K-8 teachers professional development in the following areas: Differentiated Instruction, RTI in Math, and Integration of Technology.

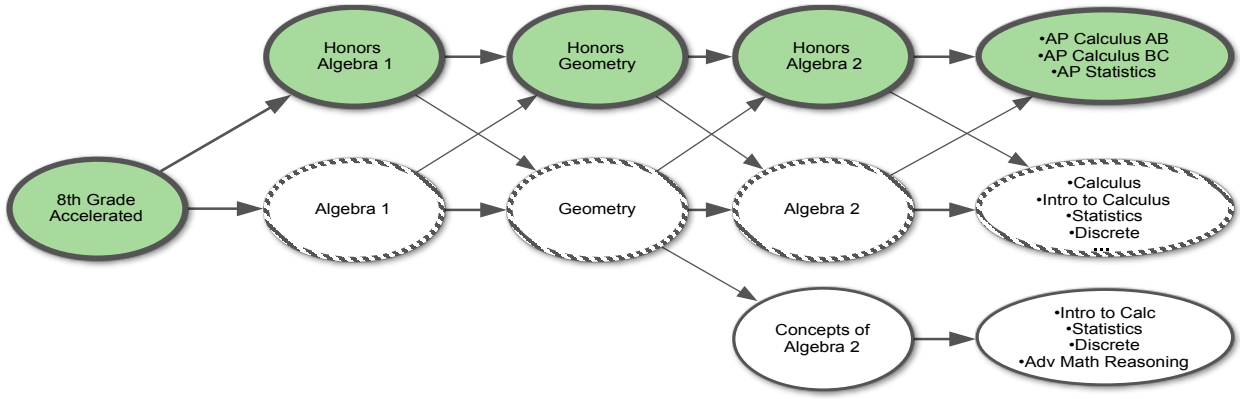
At the secondary level, teachers of math and science do not have common periods available to discuss curriculum across subject areas.

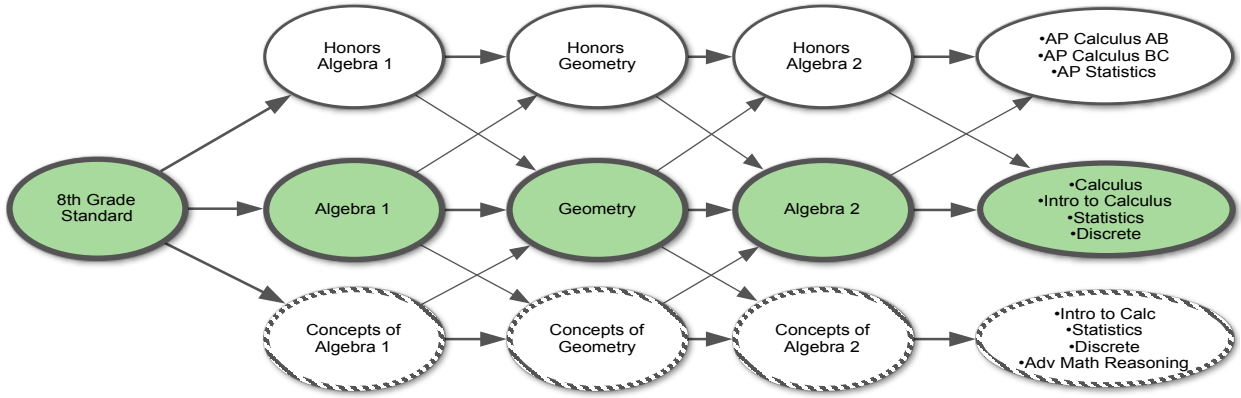
- Provide time for teachers of science and mathematics (at all levels) to collaborate and better align curriculums to reinforce math ideas in science class and vice versa.

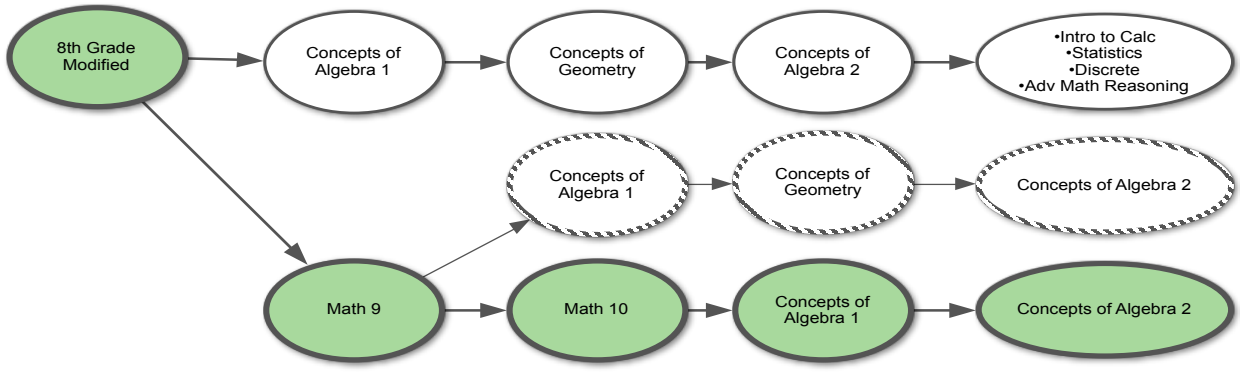
7. Appendix

7.1 Pathways at Sharon High School

The charts below show possible pathways of the Sharon High School Math program. The green pathway (shaded) is the most common given the course taken in 8th grade. The "dashed" pathway is a viable option as well. The arrows show logical transitions between each year.







7.2 Critical Areas of Focus Represented in the 2011 Frameworks

In preschool or pre-kindergarten, activity time should focus on two critical areas: (1) developing an understanding of whole numbers to 10, including concepts of one-to-one correspondence, counting, cardinality (the number of items in a set), and comparison; (2) recognizing two-dimensional shapes, describing spatial relationships, and sorting and classifying objects by one or more attributes. Relatively more learning time should be devoted to developing children's sense of number as quantity than to other mathematics topics.

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

In Grade 1, instructional time should focus on four critical areas: (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; and (4) reasoning about attributes of, and composing and decomposing geometric shapes.

In Grade 2, instructional time should focus on four critical areas: (1) extending understanding of base-ten notation; (2) building fluency with addition and subtraction; (3) using standard units of measure; and (4) describing and analyzing shapes.

In Grade 3, instructional time should focus on four critical areas: (1) developing understanding of multiplication and division and strategies for multiplication and division within 100; (2) developing understanding of fractions, especially unit fractions (fractions with numerator 1); (3) developing understanding of the structure of rectangular arrays and of area; and (4) describing and analyzing two-dimensional shapes.

In Grade 4, instructional time should focus on three critical areas: (1) developing understanding and fluency with multi-digit multiplication, and developing understanding of dividing to find quotients involving multi-digit dividends; (2) developing an understanding of fraction equivalence, addition and subtraction of fractions with like denominators, and multiplication of fractions by whole numbers; (3) understanding that geometric figures can be analyzed and classified based on their properties, such as having parallel sides, perpendicular sides, particular angle measures, and symmetry.

In Grade 5, instructional time should focus on three critical areas: (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 whole numbers 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 hundredths, and developing fluency with whole number and decimal operations; and (3) developing understanding of volume.

In Grade 6, instructional time should focus on four critical areas: (1) connecting ratio and rate to whole number multiplication and division and using concepts of ratio and rate to solve problems; (2) completing understanding of 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; and (4) developing understanding of statistical thinking.

In Grade 7, instructional time should focus on four critical areas: (1) developing understanding of and applying proportional relationships; (2) developing understanding of operations with rational numbers and working with expressions and linear equations; (3) solving problems involving scale drawings and informal geometric constructions, and working with two- and three-dimensional shapes to solve problems involving area, surface area, and volume; and (4) drawing inferences about populations based on samples.

In Grade 8, instructional time should focus on three critical areas: (1) formulating and reasoning about expressions and equations, including modeling an association in bivariate data with a linear equation, and solving linear equations and systems of linear equations; (2) grasping the concept of a function and using functions to describe quantitative relationships; (3) analyzing two- and three-dimensional space and figures using distance, angle, similarity, and congruence, and understanding and applying the Pythagorean Theorem.

7.3 Curriculum Analysis Tool

See attached document.

7.4 Survey Questions

See attached documents.

7.5 Textbook Selection Rubric

See attached document.

7.6 Works Consulted

Assisting Students Struggling with Mathematics: Response to Intervention (RTI) for Elementary and Middle Schools: IES National Center for Education and Evaluation and Regional Assistance, US Department of Education, April 2009.

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