HINGHAM MIDDLE SCHOOL

Mathematics Department Curriculum Summaries

Mathematics Department
Overview

<u>**Guiding Principles**</u>

Mathematics instruction in the Hingham Public Schools is guided by the following principles.

1. Logical Structure. Mathematics has a logical structure which forms the basis for communication and explanation in mathematics. Students must reason abstractly and quantitatively. Students learn to construct viable arguments and critique the reasoning of others. They must learn to look for patterns and express regularity in repeated reasoning through algorithms. Students look for and make use of structure.

2. Multiple Representations. Students should learn and apply mathematical skills, strategies, and concepts in authentic problem solving situations and communicate these applications numerically, verbally, graphically, and analytically. We use mathematics to model real world situations and attend to precision.

3. Active Learning. Students learn mathematics by doing mathematics. Students need to make sense of problems and persevere in solving them. They use appropriate tools strategically.

4. Vertical Articulation. Our program is designed to promote a consistent continuum of skills and concepts from one course to the next.

5. Alignment with standards. Our program is aligned with the state curriculum frameworks and, as appropriate, with expectations for the Scholastic Aptitude Tests (SATs) and Advanced Placement Tests.

GRADE 6 MATHEMATICS

<u>DESCRIPTIVE OVERVIEW</u>

The sixth grade math curriculum is designed to provide students with the necessary skills to reason and communicate mathematically. The course is intended for all sixth grade students and is fully aligned with the 2000 Massachusetts Mathematics Curriculum Frameworks. During this course fundamental concepts are reviewed and new mathematical topics are introduced. There is attention to mental computation and divergent thinking skills, as well as the reinforcement of paper and pencil skills.

<u>GOALS AND OBJECTIVES</u>

1. Estimation, exponents, and order of operations.
2. Use of variables and expressions, solving one-step equations.
3. Operations with decimals.
4. Divisibility tests, greatest common factor, equivalent fractions, mixed numbers and improper fractions.
5. Operations with fractions.
6. Organizing, displaying, and interpreting data.
7. Proportional relationships and percents.
8. Geometric relationships: lines, angles, and polygons.
9. Perimeter and circumference.
10. Area, surface area, and volume.
11. Operations with integers.
12. Counting, sample spaces, and probability

<u>INSTRUCTIONAL MODEL</u>

Varied instructional techniques are implemented to increase opportunities for academic success. Students work on daily class work and homework, as well as practice tests, contest exams, and end of year projects. Students are encouraged to express their ideas in carefully written sentences and are given homework that requires this type of written work

Instruction is differentiated in several ways.
*   Each topic is presented, when appropriate, concretely, symbolically, numerically, pictorially, and verbally.
*   Topics are presented in several modes: direct teacher instruction, students working individually, students working in pairs, and small groups of students.
*   All students participate in Math Enrichment once in each four day cycle. Different activities take place in Math Enrichment based on student readiness.
*   Technology is used to improve student learning. Some teachers have interactive white boards. All students have access to on-line resources including interactive websites, individual lesson tutorials, and videos.
*   Modified assignments, cooperative learning, use of individual writing slates, and playing review games all are used in response to different student learning styles.

<u>TEXT</u>

Holt Mathematics, Course 1, Bennett et al, (2007)

<u>ASSESSMENT</u>

Students are expected to do the assigned homework daily. Assessment of students' understanding is done with quizzes, tests, and projects. All students participate in contest exams but the results are never used to lower grades. Teachers will develop classroom specific grading procedures and students will be advised of these expectations at the beginning of the year. There is a policy where students who do poorly on a test may take a make up exam after receiving extra help, making test corrections, and having the test signed by a parent.

GRADE 7 MATH LEVEL 3

DESCRIPTIVE OVERVIEW
The 7th Grade Level 3 Mathematics course is a college preparatory course. In this course, students are expected to consolidate and extend their skills and understandings acquired in previous mathematics courses. Students will refine their work with equations, measurement, geometry, proportions, percents, number patterns and functions, probability, and graphing points on a coordinate plane. Students are encouraged to learn by careful reading as well as exploring, listening, and practicing skills in class. Problem solving and mathematical applications will be emphasized. Fractions and decimals are used in problems throughout the course but are not directly taught. It is assumed that students have already learned to operate with fractions and decimals and simply need to review these operations as they learn other material. At the completion of the course, students will either take Level 3 Algebra I or Level 3 Pre-Algebra in Grade 8.

GOALS AND OBJECTIVES
The goals and objectives of this course are fully aligned with the Massachusetts Curriculum Framework for Mathematics.
- *Algebraic Reasoning*: Numbers and Patterns, Exponents, Metric Measurements, Applying Exponents, Order of Operations, Properties, Variables and Algebraic Expressions, Simplifying Algebraic Expressions, Equations and Their Solutions, Addition and Subtractions Equations, Multiplication and Division Equations.
- *Integers and Rational Numbers*: Integers, Adding Integers, Subtracting Integers, Multiplying and Dividing Integers, Solving Equations Containing Integers, Equivalent Fractions and Decimals, Comparing and Ordering Rational Numbers
- *Applying Rational Numbers*: Estimate with Decimals, Solving Equations Containing Decimals, Estimate with Fractions, Solving Equations with Fractions
- *Patterns and Function*: The Coordinate Plane, Tables and Graphs, Interpreting Graphs, Functions Tables and Graphs, Find a Pattern, Graphing Linear Functions
- *Proportional Relationships*: Ratios, Rates, Identifying and Writing Proportions, Solving Proportions, Customary Measurements, Similar Figures and Proportions, Using Similar Figures, Scale Drawings and Scale Models
- *Percents*: Percents, Fractions Decimals and Percents, Estimate with Percents, Percent of a Number, Solving Percent Problems, Percent of Change, Simple Interest
- *Collecting, Displaying, and Analyzing Data*: Frequency Tables, Stem and Leaf Plots, and Line Plots, Mean, Median, Mode, Range, Bar Graphs, Histograms, Reading and Interpreting Circle Graphs, Line Graphs, Choosing an Appropriate Display, Scatter Plots, Misleading Graphs
- *Geometric Figures*: Building Blocks of Geometry, Classifying Angles, Angle Relationships, Properties of Circles, Classifying Polygons, Classifying Triangles, Classifying Quadrilaterals, Angles in Polygons, Congruent Figures, Translations Reflections and Rotations, Symmetry
- *Measurement of Two Dimensional Figures*: Perimeter and Circumference, Area of Parallelograms, Area of Triangles and Trapezoids, Area of Circles, Area of Irregular Figures, Squares and Square Roots, The Pythagorean Theorem
- *Measurement of Three Dimensional Figures*: Introduction of Three-Dimensional Figures, Volume of Prisms and Cylinders, Surface Area of Prisms and Cylinders
- *Probability*: Probability, Experimental Probability, Sample Spaces, Probability of Independent and Dependent Events, Combinations, Permutations

INSTRUCTIONAL MODEL
Students will be taught by teacher's lectures, examples, demonstrations, and by student exploration and research topics. Oral presentations, utilization of the textbook website, work with manipulatives, and written work will be done in class. Mathematical communication will be developed through explanation of mathematical procedures or algorithms, generalization of patterns, convincing support for answers and/or solutions, sharing of strategies or methods, and additional methods as deemed by the teacher. Students will work in small groups and individually. Calculators are permitted at the teacher's discretion for complex algorithms where the simple calculations have been mastered. Class and homework time will be used to develop concepts, practice skills, and solve problems. Development of computational skills will receive daily focus.

TEXT
Mathematics Course 2, Holt, Rinehart, and Winston, 2007.

ASSESSMENT
Student grades are based on homework, tests, quizzes, as well as midyear and final exams. At the teacher's discretion, students may also be graded on projects, extra credit assignments, and class participation. A cumulative folder of completed work, including all tests, quizzes, and anything else the teacher deems appropriate, will be kept by the teacher for each student. Teachers will develop classroom specific grading procedures and students will be advised of these expectations at the beginning of the year. Homework will be assigned and checked daily. Students are expected to have a notebook and binder for homework and supplementary materials.

Hingham Middle School
Curriculum Summary

LEVEL 2 PRE-ALGEBRA
(Advanced Grade 7)

DESCRIPTIVE OVERVIEW

This is a pre-algebra course involving the study of mathematical systems, geometry, measurement, graphing, solving simple equations, and the four fundamental operations with rational numbers. This course is the first of a sequence of courses designed to prepare students for advanced placement calculus in their senior year. The course is designed to develop the background the student needs to take a rigorous Algebra I course in grade 8.

GOALS AND OBJECTIVES

Students who complete this course successfully will be able to:
- solve problems involving two or more basic operations on rational numbers
- recognize and express mathematical patterns
- state and use basic geometric relations among plane and solid shapes
- measure using both the English and metric systems of measure
- graph on a number line and on a coordinate plane

INSTRUCTIONAL MODEL

Many strategies are used to meet the needs of students and to present the topics. Computational facility with whole numbers, fractions, and decimals is assumed at this level. Most new topics are introduced through teacher-presented lessons. Students are often required to read the texts and take notes. They must be able to correct their own work and to identify questions referring to the homework assignments. In order to cover all of the required material, little class time is spent on skills practice or homework correction. Teaching time is often used to address the more challenging (C level) problems.

Manipulatives are used to introduce topics such as integers and coordinate graphing. Calculators are used as an aid to solving equations, formulas, word problems, and scientific notation, but not to replace paper and pencil or mental calculation skills. The computer may be used to create spreadsheets as part of the statistics unit.

Students should be able to work in small groups and independently. Notebooks are required. They should contain class notes and homework assignments. Homework is assigned daily and long-range challenge packets are offered periodically. Each student's classroom folder contains tests, quizzes, and other samples of the student's work. All students will be required to complete other independent projects.

TEXT

Pre Algebra, an Accelerated Course, Dolciani, et al, Houghton Mifflin Co. (1996)

ASSESSMENT

Student grades are based on tests, quizzes, challenge packet completion, and independent projects. Each teacher will specify grading schemes and the percent breakdown at the beginning of the year. Challenge packets and projects allow for alternate methods of assessment. Students will also have the opportunity to compete in the CML, NEML, and the AJHSME contest activities.

LEVEL 3 PRE-ALGEBRA

DESCRIPTIVE OVERVIEW

This course is intended for students who have completed 7 US Mathematics, but who need a more extensive background in pre-algebra and geometry topics before attempting a formal course in algebra. The course will also solidify arithmetic concepts and procedures and provide some exploratory experiences in data analysis and probability. Students who complete this course successfully will typically follow an Algebra I, Geometry, Algebra II, Pre-Calculus sequence in high school.

GOALS AND OBJECTIVES

The general goals of this course are:

1. Students will be able to compute efficiently with decimals, fractions, percents, and rational numbers.

2. Students will be able to solve simple and complex linear equations.

3. Students will be able to recognize geometric relationships and properties and be able to use area, surface area, and volume formulas for simple shapes.

4. Students will be able to interpret simple statistical measures and apply fundamental concepts of probability.

5. Students will be able to recognize and apply a variety of problem solving strategies.

6. Students will be able to represent and analyze data using several kinds of graph forms.

INSTRUCTIONAL MODEL

Varied instructional techniques are used: lectures, small and large problem-solving groups, manipulatives, and independent projects. Oral presentations are supplemented with appropriate materials and overhead displays. Homework is given daily and MCAS practice activities will be provided. Complete and accurate sentences are required on problems needing a written explanation. Students are expected to keep notebooks. While calculators may be used at times, the use of paper and pencil computation and mental arithmetic skills will be reinforced.

TEXT

Holt Mathematics, Course 3, Holt McDougal, (2007)

ASSESSMENT

Student progress is measured by traditional tests and quizzes, completed homework, independent projects, class participation, and extra credit mini-projects. Individual teachers' grading standards are explained at the beginning of the year so percentage breakdowns are clear to students. Graded work is kept in folders for student and/or parent reference.

ALGEBRA I (L3) – MIDDLE SCHOOL

DESCRIPTIVE OVERVIEW

Algebra I is a course in elementary algebra in the classic three-year college preparatory sequence of Algebra I, Geometry and Algebra II. The emphasis is on understanding the language and developing the skills of algebra. Students quickly move from arithmetic skills to abstract reasoning and application.

GOALS and OBJECTIVES

The student who successfully completes this course will be able to:
1. Evaluate algebraic expressions using rational numbers.
2. Use ratios and proportion6s in a variety of problem solving situations.
3. Use the rules of algebra to simplify algebraic expressions.
4. Solve linear and absolute value equations.
5. Formulate and graph linear equations.
6. Solve systems of linear equations.
7. Solve and graph linear and non-linear inequalities.
8. Solve and graph quadratic equations.
9. Apply rules of exponents.
10. Add, subtract, multiply, and factor polynomials.
11. MCAS review topics, including geometry.

INSTRUCTIONAL MODEL

Instructional strategies place a strong emphasis on teacher lecture and explanation and student practice. Varied techniques include small and large problem-solving groups, use of manipulatives and projects. Mini-skill reviews are an integral part of the daily lesson. Homework is assigned daily. Traditional tests, quizzes, and homework as well as projects provide the basis for evaluation.

TEXT

Bellman, Bragg, et al., *Algebra: Tools for a Changing World*,
        (Prentice Hall, Needham, MA), 1988.

ASSESSMENT

Student grades are based on homework, tests, quizzes, as well as midyear and final exams. At the teacher's discretion, students may also be graded on projects, extra credit assignments, and class participation. Students participate in the Continental Mathematics League contests and correct responses will receive extra credit. A cumulative folder of completed work, including all tests, quizzes, and anything else the teacher deems appropriate, will be kept by the teacher for each student.

ALGEBRA 1 (L2)

DESCRIPTIVE OVERVIEW

Algebra I Level 2 is a first year intensive course in elementary algebra intended for students who have successfully completed Seventh Grade Advanced Math. The course is sequenced to lead to the quadratic formula by mid-year and concludes with the study of radicals, rational equations and inequalities. Word problems, a central theme throughout the course, involve variables that really vary, rather than standing for unknown constants. Successful completion of this course leads to further study in Geometry Level 2, Algebra II Level 2, Level 2 Pre-Calculus, and Calculus.

GOALS and OBJECTIVES

The general goals of this course are as follows:

- Expressions and equations
- Operations with negative numbers
- Distributing: Axioms and other properties
- Operations with polynomials and radicals
- Quadratic equations
- Expressions and equations containing two variables
- Linear functions, scattered data, and probability
- Properties of exponents
- Rational algebraic expressions
- Radical algebraic expressions
- Inequalities
- Functions

INSTRUCTIONAL MODEL

Varied instructional techniques are implemented to ensure opportunities for academic success. Throughout the year, each of the following are used: lecture, small group (2 students), large group (4 students), long-range projects, mini-projects, manipulatives, and contest exams. Topics are presented orally, in written form, concretely, symbolically, and/or abstractly when appropriate. Students are given daily homework that requires skill practice and/or problem solving. Students are encouraged to express their ideas in carefully-written sentences and are given opportunities to practice and share this type of written work.

TEXT

Foerster, Paul, *Algebra I Expressions, Equations, and Applications*, Addison Wesley Publishing Co., California, 1994

ASSESSMENT

Each student is assessed in a variety of ways. Students are expected to do the assigned homework daily. Assessment of students' understanding is accomplished in several ways including, but not limited to, frequent quizzes, unit tests, original projects, review assignments, and contest exams.