Hingham Public Schools
Mathematics Department
Overview

Guiding Principles

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.

All courses in the mathematics department address all HHS Expectations for Student Learning. Specific ways in which the expectations are addressed are listed in the curriculum guides for each course. Copies of these curriculum guides are available from the department director.

Most courses have a recommended prerequisite. Parents may override most teacher recommendations but we cannot guarantee that a spot in the course recommended by the teacher will then later be available. The prerequisites for Algebra II and Pre-Calculus are required ones. Students must achieve prerequisite grades for those courses.

Hingham High School
Curriculum Summary

Course 412: MCAS SKILLS & STRATEGIES (L4)

DESCRIPTIVE OVERVIEW

MCAS Skills & Strategies is a year course in the regular standard sequence. It is designed for students who, based on MCAS results in middle school, risk being unable to demonstrate proficiency on the Grade 10 MCAS. It does not prepare students for college mathematics and many students take a college preparatory mathematics course at the same time as they take this course. Students in this course are developing the ability to read purposefully because many problems require that students read carefully, pay attention to technical language, and read material that contains symbols and numbers. Students must write effectively as many classroom worksheets require explanations in complete sentences. Students have class work in which they are required to effectively communicate their learning. Students identify, analyze, and solve problems throughout the course.

GOALS AND OBJECTIVES

At the end of the course, successful students will be able to solve problems involving the following:

1. Lute value.
2. Distributive Property.
3. Exponents.
4. Order of Operations.
5. Substitution.
6. Monomials.
7. Statistics.
8. Square Roots.
9. Special Numbers (i.e. π, $\sqrt{2}$)
10. Percents.
11. Equations.
12. Conversions.
13. Geometry.
14. Graphing.

INSRUCTIONAL MODEL

This class has a very low teacher/student ratio. Most instruction is given individually or in small groups. Introduction of new material is provided by either teacher leading the discussion followed by students working alone or with a partner on similar problems. Each class usually begins with a sample problem that is from a former MCAS exam. Throughout the week the students will receive a similar problem each day that has different numbers. The goal of this exercise is to have the students' complete multi-step problems and also answer questions with complete sentences.

TEXT

All of the material for this course is teacher prepared; much of it is directly based on MCAS problems.

ASSESSMENT

Most of the assessment that is done through this course is through worksheets. If the student has completed the worksheet with nearly 100% accuracy, then they receive credit for having done the worksheet. Students are also assessed with quizzes and tests. Students who come to class every day and work in the classroom generally receive at least a C. Students are also given prompts on quizzes and tests if they request them. The goal of this course is not to challenge the students, but to help the students gain a better understanding of math and to pass the MCAS exam.

Hingham High School
Curriculum Summary

Course 415: ALGEBRA I (L3)

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 an introduction to the language and skills of algebra. A major goal of the course is that students learn to communicate appropriately using proper mathematic vocabulary. Students move from arithmetic to the more advanced topics of algebra such as co-ordinate geometry and linear and eventually quadratic equation solving. Many algebraic equations can be solved with multiple approaches. Students are specifically taught to read in order to recognize the information being presented to them, analyze that information, and then develop the best approach to finding a solution. Through word problems and projects that model real world situations, students are asked to read analytically and write answers that effectively demonstrate that they understand the question being asked.

GOALS AND OBJECTIVES

A student should be able to

1. Evaluate algebraic expressions using real numbers.
2. Use rates, ratios and proportions in a variety of problem solving situations.
3. Simplify algebraic expressions.
4. Solve a variety of linear equations and inequalities.
5. Formulate algebraic models to solve simple word problems.
6. Graph linear equations and inequalities using several different techniques.
7. Apply rules for combining exponentials and simplifying radicals.
8. Add, subtract, multiply and factor polynomials.
9. Solve quadratic equations by suitable means, including the quadratic formula and factoring.
10. Graph quadratic equations and find the x-intercepts (if any), the axis of symmetry and the vertex of parabolas by analytic methods.

INSTRUCTIONAL MODEL

Instructional strategies place a strong emphasis on teacher demonstration and explanation. Other strategies include all or some of the following: in-class work, small and large co-operative problem solving groups, manipulatives, and projects. Homework is assigned on a daily basis. In general, calculators may be used but this is at the discretion of the individual teacher. MCAS type questions are interwoven in the curriculum. Traditional tests, quizzes, homework, and projects provide the basis for evaluation.

TEXT

Larson, Boswell, Kanold, and Stiff, *Algebra I*, (McDougal Littell, Evanston, IL) 2001

ASSESSMENT

Teachers will use tests, quizzes, work packets, projects, and homework in assessing learning and for assigning grades. Teachers will monitor understanding through class discussion and question-and-answer with students. Teachers are at liberty to use other techniques as they see fit. Students are informed about the relative weights and types of assessments at the beginning of the course. Graded work is kept in individual folders, which may be reviewed by students and shared with parents. Departmental midyear and final exams are given to all students and graded in a standardized way. Each counts as 10% of the overall course grade.

Hingham High School
Curriculum Summary

Course 417: BASIC GEOMETRY (L4)

DESCRIPTIVE OVERVIEW

In this course the student will study basic geometric concepts without the use of formal proof. Emphasis is on the application of geometry using arithmetic and basic algebra. This course is taught at an intuitive level and will provide the student the opportunity to learn most of the geometric concepts which are required for further study in mathematics and for taking the SAT I. The student should have (at a minimum) prior basic skills in arithmetic, pre-algebra, and in the use of a calculator. Upon completion of this course a student normally takes mathematics survey (Level 4). A student who intends to take Algebra II must have a "C-" or better in Algebra I.

GOALS AND OBJECTIVES

The student who successfully completes this course will be able to

1. Apply symbols to lines, rays, segments, planes, and solids and understand collinear and coplanar relationships.
2. Understand parallel and perpendicular lines and planes, congruent segment, and angles.
3. Understand angular measure and apply it to polygons, parallel lines, circles.
4. Understand properties of specific triangles and quadrilaterals.
5. Recognize reason for triangle congruence.
6. Transform shapes by translation, reflection, and rotation.
7. Compute perimeter, circumference, and area using appropriate formulas.
8. Apply the Pythagorean theorem and special triangle theorems.
9. Understand the application of ratio and proportion to similar polygons and triangles.
10. Correctly use coordinate geometry formulas for distance, midpoint, and slope.
11. Use two-dimensional nets of 3D figures and compute volumes of simple 3D figures.

INSTRUCTIONAL MODEL

Instructional strategies include teacher explanation, student practice, and use of calculators. Emphasis on the use of worksheets in a cooperative setting provides the student with the opportunity to learn material. Mastery is accomplished through regular practice.

TEXT

Informal Geometry, Prentice Hall (1992)

ASSESSMENT

Tests, quizzes, and a great emphasis on completion of daily assignments provide the basis for the grade.

Hingham High School
Curriculum Summary

Course 419: GEOMETRY (L3)

DESCRIPTIVE OVERVIEW

Geometry (Level 3) is a year course in the regular college preparatory sequence. Students normally take the course after completing Algebra 1. The completion of Algebra 1 with a grade of "C-"or better is a recommended prerequisite. The course serves freshmen, sophomores, juniors, and seniors. Most colleges require students to take Geometry even if they do not expect to major in fields that require mathematics. Also, students normally take Algebra 2 after completing Geometry. Students in this course are developing the ability to read purposefully because many problems require that students read carefully, pay attention to technical language, and read material that contains symbols and numbers. Students must write effectively as many test and project questions require explanations in complete sentences. Students have projects in which they are required to effectively communicate their learning. Students identify, analyze, and solve problems throughout the course.

GOALS AND OBJECTIVES

At the end of the course, successful students will be able to solve problems involving

1. Points, lines, planes, segments, rays, parallel lines, and planes.
2. The coordinate plane.
3. Polygons and circles.
4. Transformations and symmetry.
5. Logic.
6. The Pythagorean Theorem and special right triangles.
7. Circumference, arc length, and areas of circles, sectors, and segments of circles.
8. Surface areas and volumes of prisms, cylinders, pyramids, cones, and spheres.
9. Parallel lines.
10. Proving triangles congruent.
11. Quadrilaterals.
12. Similar triangles.
13. Right triangle trigonometry.
14. Chords, secants, and tangents of circles.

INSRUCTIONAL MODEL

All teachers are consistent in content and concept coverage and use various instructional strategies. All teachers use both lecture/discussion and small group methods. Teachers also use cooperative learning techniques, distance learning, and assign projects which serve as both instructional and assessment tools. Homework is assigned daily and checked regularly by all teachers.

TEXT

Bass et al, *Geometry, Tools for a Changing World*, Prentice-Hall (1998)

ASSESSMENT

The teachers use tests, quizzes, projects, and homework in assessing learning and for assigning grades. Teachers also assess learning through conversations with individual students. Some teachers also assess learning through the observation of cooperative learning groups. These two techniques are not used, however, in assigning grades. Students are informed about the relative weights of the various forms of assessment at the beginning of the course. Graded work is kept in folders which may be reviewed by students or shared with parents upon request. Departmental midyear and final exams are given to all students and graded in a standardized way. Each counts as 10% of the course grade.

Hingham High School
Curriculum Summary

Course 421: GEOMETRY (L2)

DESCRIPTIVE OVERVIEW

Geometry, Level 2, is a rigorous course in Euclidean Geometry. Students will analyze characteristics and properties of two- and three dimensional geometric shapes and develop mathematical arguments in the form of deductive proofs about geometric relationships. This course develops students' ability to read purposefully as they apply definitions and theorems to specific situations. Reading purposefully is critical as students develop the ability to draw diagrams, state what is given and determine what is to be proven from a written description. Students' ability to write effectively in geometry is developed as they answer open response questions, explain a contradiction or write a comparison of geometric shapes. Students develop the ability to communicate effectively in class as they explain the logic behind a given proof. Throughout the course, students must identify and analyze the salient aspects of a proof or problem in order to apply pertinent theorems and definitions.

GOALS AND OBJECTIVES

At the end of the course the student will

1. Write two-column, indirect, and/or paragraph deductive reasoning proofs of theorems in geometric situations, such as theorems about congruent and similar figures, parallel or perpendicular lines, isosceles triangles, and circles.
2. Perform geometric constructions using a compass, straightedge and/or protractor and be able to make conjectures about methods of construction using logical justifications.
3. Recognize similarities and differences between special geometric polygons (sides, angles, diagonals), and analyze the relationship between the number of sides, the measure of the interior angles, and the measure of the exterior angles.
4. Use and apply rectangular coordinates to calculate midpoints of segments, slopes of lines, and distances between two points.
5. Recognize, solve problems and prove relationships in circles between central angles, inscribed angles, and their associated major and minor arcs, as well as the angles formed between tangents and secants. Recognize, solve problems and prove relationships between chords, radii, secant segments and tangent segments.
6. Use the Pythagorean Theorem, 30°-60-90 and 45-45-90 relationships to solve problems.
7. Use angle relationships in a triangle (angle sum property, exterior angle theorems) and angle-side inequalities to solve problems and prove relationships.
8. Calculate perimeter, circumference and area of plane figures. Calculate lateral area, surface area and volume of solid shapes. Relate changes in the measurement of one attribute of an object to changes in other attributes.
9. Apply trigonometric ratios to the solution of problems.
10. Draw the results and interpret transformations on figures in the coordinate plane (translations, rotations, scale factors).

INSTRUCTIONAL MODEL

Teachers of this course use lecture/discussion, small group work and some independent study. Homework is assigned daily and checked regularly. Tests, quizzes, homework, projects (including presentation) all may be used to determine grades.

TEXT

Phoads et al, *Geometry for Enjoyment & Challenge*, Holt McDougal (2000)

ASSESSMENT

Teachers use tests, quizzes, projects and homework in assessing learning and for assigning grades. Students are made aware of the various ways of various weights of the components of any grade. Graded work is kept in individual folders which may be reviewed by students and parents at any time. Departmental midyear and final exams are given to all students and graded in a standardized way. Each counts 10% of the course grade.

Hingham High School
Curriculum Summary

Course 423: ALGEBRA II (L3)

DESCRIPTIVE OVERVIEW

Algebra II (Level 3) is a year course in the regular college preparatory sequence. Students normally take the course after completing Geometry. The completion of Algebra I (normally two years prior to taking Algebra II) with a grade of "C-" or better is a required prerequisite. The course serves sophomores, juniors, and seniors. Most colleges require students to take Algebra II even if they do not expect to major in fields that require mathematics. In addition, students who plan to eventually take Calculus take Algebra II as a prerequisite for Pre-Calculus. A grade of "C" or better in Algebra II is required to take Pre-Calculus (Level 3). A grade of "B" or better is recommended. Less successful students who complete Algebra II should take Introduction to Statistics and Topics in Mathematics (Level 3) before going on to Pre-Calculus. Excellent students may also take A. P. Statistics at the same time as they take Pre-Calculus. Students in this course are developing the ability to read purposefully because many problems require that students read carefully, pay attention to technical language, and read material that contains symbols and numbers. Students must write effectively as many test and project questions require explanations in complete sentences. Students have projects (linear programming, exponential functions) in which they are required to effectively communicate their learning. Students identify, analyze, and solve problems throughout the course.

GOALS AND OBJECTIVES

At the end of the course successful students will

1. Exhibit problem-solving skills including the application of appropriate models.
2. Correctly sketch the graphs of basic functions (linear, quadratic, absolute value, exponential, logarithmic, square root, cube root, rational, and polynomial), and properly translate and reflect their graphs. (These reflect the state frameworks
3. Use graphing calculators correctly to sketch curves, provide tables to use in plotting points for paper and pencil graphing, approximate solutions of equations and systems of equations, and do statistical calculations.
4. Demonstrate content expertise relative to
    - solution of equations, inequalities, and systems of equations
    - evaluation of roots, powers, and logarithms
    - determination of equations of lines and other functions
    - operations with rational expressions
5. Correctly apply their content expertise to the solution of application problems
6. Correctly use concepts such as linear programming and curves of best fit.

INSTRUCTIONAL MODEL

All teachers are consistent in content and concept coverage and use various instructional strategies. All teachers use both lecture/discussion and small group methods. Several teachers also use cooperative learning techniques and distance learning and all teachers assign projects which serve as both instructional and assessment tools. Homework is assigned daily and checked regularly by all teachers. Graphing calculators are used throughout the course in classwork, homework, and on tests.

TEXT

Schultz et al, *Algebra 2,* Holt, Rinehart & Winston, (2001)

ASSESSMENT

All teachers use tests, quizzes, projects, and homework in assessing learning and for assigning grades. Teachers also assess learning through conversations with individual students. Some teachers also assess learning by observation of cooperative learning groups. These two techniques are not used, however, in assigning grades. Students are informed about the relative weights of the various forms of assessment at the beginning of the course. Graded work is kept in folders which may be reviewed by students or shared with parents at any time. Departmental midyear and final exams are given to all students and graded in a standardized way. Each counts as 10% of the course grade.

Hingham High School
Curriculum Summary

Course 423C: ALGEBRA II WITH CONICS (L3)

DESCRIPTIVE OVERVIEW

Algebra II with Conics (Level 3) is a year course in the regular college preparatory sequence. Students normally take the course after completing Geometry. The completion of Algebra I (normally two years prior to taking Algebra II) with a grade of "C-" or better is a required prerequisite and completion of Algebra 1 with a "B" or better is strongly recommended. The course serves sophomores, juniors, and seniors. Most colleges require students to take Algebra 2 even if they do not expect to major in fields that require mathematics. In addition, students who plan to eventually take Calculus take Algebra II as a prerequisite for Pre-Calculus. A grade of "C" or better in Algebra II is required to take Pre-Calculus (Level 3). A grade of "B" or better is recommended. Less successful students who complete Algebra II should take Introduction to Statistics and Topics in Mathematics (Level 3) before going on to Pre-Calculus. Excellent students may also take A. P. Statistics at the same time as they take Pre-Calculus. Students in this course are developing the ability to read purposefully because many problems require that students read carefully, pay attention to technical language, and read material that contains symbols and numbers. Students must write effectively as many test and project questions require explanations in complete sentences. Students have projects (linear programming, exponential functions) in which they are required to effectively communicate their learning. Students identify, analyze, and solve problems throughout the course.

RATIONALE

This course covers all of the material of the regular Level 3 Algebra II course. In addition, students are introduced to the study of conic sections. The big difference between this course and the regular Level 3 Algebra II course, however, is not in the additional concepts covered but in the depth at which all concepts are studied. Students in this course are assumed to have a good background in Algebra 1 and consequently Algebra 1 topics are reviewed only briefly. This allows time in the course to study new topics in greater depth and to expect students to perform more complex symbol manipulations.

GOALS AND OBJECTIVES

At the end of the course successful students will

1. Exhibit problem-solving skills including the application of appropriate models.
2. Correctly sketch the graphs of basic functions (linear, quadratic, absolute value, exponential, logarithmic, square root, cube root, rational, and polynomial), and properly translate and reflect their graphs. (These reflect the state frameworks
3. Use graphing calculators correctly to sketch curves, provide tables to use in plotting points for paper and pencil graphing, approximate solutions of equations and systems of equations, and do statistical calculations.
4. Demonstrate content expertise relative to:
    - solution of equations, inequalities, and systems of equations
    - evaluation of roots, powers, and logarithms
    - determination of equations of lines and other functions
    - operations with rational expressions
5. Correctly apply their content expertise to the solution of application problems
6. Correctly use concepts such as linear programming and curves of best fit.

INSTRUCTIONAL MODEL

All teachers are consistent in content and concept coverage and use various instructional strategies. All teachers use both lecture/discussion and small group methods. Several teachers also use cooperative learning techniques and distance learning and all teachers assign projects which serve as both instructional and assessment tools. Homework is assigned daily and checked regularly by all teachers. Graphing calculators are used throughout the course in classwork, homework, and on tests.

TEXT

Larson et al, *Algebra 2*, Holt McDougal (2011)

ASSESSMENT

All teachers use tests, quizzes, projects, and homework in assessing learning and for assigning grades. Teachers also assess learning through conversations with individual students. Some teachers also assess learning by observation of cooperative learning groups. These two techniques are not used, however, in assigning grades. Students are informed about the relative weights of the various forms of assessment at the beginning of the course. Graded work is kept in folders which may be reviewed by students or shared with parents at any time. Departmental midyear and final exams are given to all students and graded in a standardized way. Each counts as 10% of the course grade.

Hingham High School
Curriculum Summary

Course 425: ALGEBRA II (L2)

DESCRIPTIVE OVERVIEW

Algebra II (L2) is a year course in the honors college preparatory sequence normally taken by sophomores. Students who do well in the course will take Level 2 Pre-Calculus in their junior year and Calculus as seniors. A grade of "B" or better is recommended for students who intend to take Pre-Calculus. Many students also take Level 3 Pre-Calculus junior year and, if they do well, take Level 2 Calculus as seniors. A grade of "C" or better in this course is required to take either Pre-Calculus course; less successful students must do something to remedy their deficits before taking Pre-Calculus.

GOALS AND OBJECTIVES

At the end of the course successful students will be able to

1. State the properties of real numbers and apply them in proofs.
2. Exhibit problem-solving skills including the application of appropriate models.
3. Correctly sketch the graphs of basic functions (linear, quadratic, absolute value, exponential, logarithmic, square root, cube root, and polynomial.)
4. Use graphing calculators correctly to sketch curves, provide tables to use in plotting points for paper and pencil graphing, approximate solutions of equations and systems of equations, solve matrix equations, and do statistical calculations.
5. Demonstrate content expertise relative to:
    - solution of equations, inequalities, and systems of linear equations.
    - evaluation of roots, powers, and logarithms
    - determination of equations of lines and other functions
    - operations with rational expressions
    - evaluation of functions and use of function notation
    - use of rational, irrational, and complex numbers in the performance of rational operations
    - derivation and application of the quadratic formula
    - solution of quadratic systems in two variables
    - sequences and series
    - transformations of functions and their related graphs
    - statistical analysis
    - counting and probability
6. Correctly apply their content expertise to the solution of application problems.
7. Correctly use the concepts of linear programming and curves of best fit.
8. Define, identify, and sketch graphs of conic sections and derive the equations of these graphs given information about the graphs.

INSTRUCTIONAL MODEL

All teachers in this course use both lecture/discussion and small group methods. Major projects are assigned each term which require students to go beyond the basic curriculum. Some also give students practice with open response MCAS problems. These projects serve as both instructional and assessment tools. Homework is assigned daily and checked regularly by all teachers. Graphing calculators are used throughout the course in class work, homework, and on tests.

TEXT

Brown, Richard, et al., *Algebra and Trigonometry – Structure and Method, Book 2.* McDougal Littell, 2004. Chapters 1-11 are covered completely, also sections of Chapter 15.

ASSESSMENT

All teachers use tests, quizzes, projects, and homework in assessing learning and for assigning grades. Some teachers also require structured notebooks and assign grades for these notebooks. Teachers also assess learning through conversations with individual students, but do not assign grades on this basis. Students are informed about the relative weights of the various forms of assessment at the beginning of the course. Graded work is kept in folders which may be reviewed by students or shared with parents at any time. Departmental midyear and final exams are given to all students and graded in a standardized way. Each counts as 10% of the course grade.

Hingham High School
Curriculum Summary

Course 430: PRECALCULUS (L3)

DESCRIPTIVE OVERVIEW

Precalculus (Level 3) is a year course in the regular college preparatory sequence. Students take this course after they have taken Algebra II and have received a C or better (a B or better is highly recommended). Some students choose to take Topics in place of this course if they performed poorly in Algebra II. This course serves juniors and seniors. This course focuses on advanced algebra topics during the first semester and trigonometry during the second semester. We plunge deeper into the algebra topics than we did in Algebra II so therefore the students learn to analyze and solve problems as well as to effectively communicate about the topics learned. They also fine tune their algebra skills from the heavy reinforcement of the first semester.

GOALS AND OBJECTIVES

At the end of the course successful students will be able to

1. Exhibit problem-solving skills including the application of appropriate models.
2. Correctly sketch the graphs of functions and relations (linear, quadratic, greatest integer, exponential, logarithmic, square root, rational, polynomial, conic sections, and trigonometric).
3. Use the graphing calculator correctly to sketch curves, find solutions and intersections (for systems).
4. Demonstrate content expertise relative to: Solving Algebraic, Exponential, Logarithmic and Trigonometric Equations.
5. Correctly apply their content expertise to the solution of application problems.
6. Correctly apply regression results and curve fitting to make predictions from data.

INSTRUCTIONAL MODEL

While consistent in content and concept coverage, the teachers of the course vary in the emphasis they place on different instructional strategies. All teachers use both lecture/discussion and small group methods. Several teachers also use cooperative learning techniques and all teachers assign projects which serve as both instructional and assessment tools. Homework is assigned daily and checked regularly by all teachers. Graphing calculators are used throughout the course in classwork, homework and on tests.

TEXT

The basic text is Sullivan's *Precalculus*, published by Prentice Hall. Teacher-prepared worksheets and activities are used in addition to the text.

ASSESSMENT

All teachers use tests, quizzes, projects and homework in assessing learning and for assigning grades. Teachers also assess learning through conversations with individual students. Some teachers assess learning by observing cooperative learning groups. These two techniques are not used, however, in assigning grades. Students are informed about the relative weights of various forms of assessment at the beginning of the course. Graded work is kept in folders which may be reviewed by students or shared with parents at any time. Departmental exams are given twice a year to all students and graded in a standardized way. Each counts as 10% of the course.

Hingham High School
Curriculum Summary

Course 431
INTRODUCTION TO STATISTICS AND TOPICS IN MATHEMATICS (L3)

DESCRIPTIVE OVERVIEW

This is a full year course which will provide an introduction into Statistics and a review of Algebra II. Students earning a B or better in an Algebra II cl*ass* can not take this course. During the first semester the class will be covering an Introduction of Statistic which is intended to give the student a better understanding of the collection, organization, analysis, and interpretation of numerical data. While learning to compute measures of center, measures of dispersion, and measures of position, the students will also be developing their ability to read purposefully because many problems require that students read carefully, pay attention to technical language, and read material that contains symbols and numbers. An introduction of probability distributions leads to applications of the binomial and normal distribution, which is intended to strength students' ability to communicate effectively through the construction of meaningful graphs and tables. The semester ends with linear regression and correlation. Applications to real life are stressed and use of a graphing calculator is required to do many of the statistical calculation. During the second semester the course will review basics concepts of algebra and some pre-trigonometry geometry. The second semester is paced so that a willing student will have ample time to revisit and understand those topics, develop better study habits, and build confidence. Students will be developing skills to read, write, and communicate effectively, throughout the year, as they transfer mathematical problems (given in projects, quizzes and tests) into symbols, numbers and solutions. Upon completion of this course the students will be better prepared to continue in a mathematics course such as Pre-Calculus.

RATIONALE

This course is intended for students who have found limited success in Algebra II. It introduces the students to Statistics and reviews Algebra II. This course is also intended to be a foundation for future work in college level statistics courses and to strengthen skills in algebra in preparation for precalculus.

GOALS AND OBJECTIVES

Upon completion of this course students will be able to

1. Define and understand statistical terminology
2. Collect and organize numerical data
3. Analyze the shape and distribution of data
4. Compute measure of central tendency, dispersion, and position
5. Understand rules of probability and applications of probability distributions
6. Know the difference between discrete and continuous variables
7. Apply the normal distribution to probability, percentiles, and to critical raw scores
8. Understand linear regression and correlation
9. Apply linear equations and their graphs
10. Understand linear equations and application of slope
11. Write linear equations and apply absolute value graphs
12. Solve linear systems algebraically and graphically
13. Graph quadratic equations and solve them algebraically and graphically.
14. Know imaginary number exist
15. Apply various aspects of functions such as domain, range, roots, and understand inverse functions, recursive functions, and transformation of functions
16. Understand the relationship between powers, roots, and radicals
17. Relate exponential and logarithmic form and apply to natural logarithms
18. Use a graphing calculator to analyze function graphs and function values

INSTRUCTIONAL MODEL

The strategies for instruction in this course are varied to fit the best practice for the topic. Strategies include the following: teacher demonstration and explanation, in-class work, projects with partners, and problem solving groups both large and small. Graphing calculators are required and are used extensively but not exclusively throughout the course.

TEXTS

Triola, *Elementary Statistics,* (Pearson/Addison Wesley 2006)
Larson, Kanold, Stiff, *Algebra II,* (D.C. Heath and Company 1993)

ASSESSMENT

Teachers will use tests, quizzes, work packets, projects, and homework in assessing learning and for assigning grades. Teachers are at liberty to use other and varied techniques as they see fit. Students are informed about the relative weights and types of assessments at the beginning of the course. An extensive outline of the second semester calculus portion of the course constitutes a major portion of that quarter's grade. Graded work is kept in individual folders. These may be reviewed by students and shared with parents. Departmental midyear exams, and final exams for those eligible, are given to all students and graded in a standardized way. Each counts as 10% of the overall course grade.

Hingham High School
Curriculum Summary

Course 435: ANALYSIS II (L3)

DESCRIPTIVE OVERVIEW

This is a full year course which will provide a review of Pre-Calculus and an introduction into Calculus. For the first semester students will be improving their Pre-Calculus skill by identifying, analyzing and solving all different types of problems. There is also a quick survey of topics in statistics: central tendency, spread, grouped data, normal distributions, confidence intervals and regression. The second semester of the course is given over to a quick review of logarithms and parametric equations and an introduction to limits and elementary differential calculus. Students will be developing skills to read, write, and communicate effectively, throughout the year, as they transfer mathematical problems (given in projects, quizzes and tests) into symbols, numbers and solutions.

RATIONALE

This course is intended for students who wish to continue in mathematics but who do not wish to take calculus in high school. This course is also intended to be a foundation for future work in college level mathematics courses and to strengthen and maintain current skills.

GOALS AND OBJECTIVES

Upon completion of this course students will be able to

1. Apply linear and higher order equation and their graphs
2. Analyze polynomials (find roots, sketch graphs, and optimize)
3. Use matrices to solve applied problems
4. Analyze the shape and distribution of data
5. Compute measures of central tendency
6. Calculate probability based on a normal distribution
7. Analyze, simplify and solve trigonometric equation
8. Informally explain the meaning of a limit and compute limits
9. Find derivatives of algebraic and transcendental functions
10. Apply derivatives to a variety of applications
11. Use a graphing calculator to analyze function graphs and function values

INSTRUCTIONAL MODEL

The strategies for instruction in this course are, generally the traditional ones: teacher demonstration and explanation. Other strategies include the following: in-class work, projects with partners, and problem solving groups both large and small. Graphing calculators are required and are used extensively but not exclusively throughout the course.

TEXTS

(1st. Semester) Brown and Robbins, *Advanced Mathematics: A Precalculus Course*, (Houghton Mifflin) 1994.
(2nd Semester) Finney, Demana, Waits, and Kennedy, *Calculus*, (Addison Wesley Longman, Inc.) 1999.

ASSESSMENT

Teachers will use tests, quizzes, work packets, projects, and homework in assessing learning and for assigning grades. Teachers are at liberty to use other and varied techniques as they see fit. Students are informed about the relative weights and types of assessments at the beginning of the course. An extensive outline of the second semester calculus portion of the course constitutes a major portion of that quarter's grade. Graded work is kept in individual folders. These may be reviewed by students and shared with parents. Departmental midyear exams, and final exams for those eligible, are given to all students and graded in a standardized way. Each counts as 10% of the overall course grade.

Hingham High School
Curriculum Summary

Course 439: PRECALCULUS (LEVEL 2)

DESCRIPTIVE OVERVIEW

This is a year course in the advanced college preparatory sequence. One of the goals for this course is to help build an intuitive foundation for calculus. Students in this course are regularly exposed to exploration activities, writing to learn exercises, and exercises designed to extend ideas. The explorations are opportunities for students to discover mathematics on their own. The writing to learn exercises gives students practice at communicating about math. They must write effectively about their conclusions. They are also called on to explain their conclusions in class presentations. Students have many small group projects as well as one major project a term. The term projects are assigned after consultations with the other major academic departments. Students identify, analyze, and solve problems throughout the course.

GOALS AND OBJECTIVES

The general goals of this course are as follows

1. Students will understand both the circular and trigonometric functions and their applications.
2. Students will be able to graph sine, cosine, tangent, cotangent, secant, cosecant graphs.
3. Student will also be required to graph the inverse trig function as well as the graphs of the composite trig functions.
4. Students will work with trig identities.
5. Students will apply the Law of Sines and the Law of Cosines and vectors.
6. Students will be able to work with polar coordinates including a variety of polar graphs and De Moivre's Theorem.
7. Students will work with a number of topics in algebra including permutations, combinations and probability, logarithmic and exponential functions, parametric equations, and polynomial functions.
8. Students will understand basic sequences and series, both finite and infinite.
9. Students will understand limits and the derivatives of polynomial functions.
10. Students will be able to read carefully and critically.
11. Students will be able to communicate effectively both orally and in writing.
12. Students will be able to analyze problems and plan a logical approach to solve the problem.

INSTRUCTIONAL MODEL

The instructional model is varied. Throughout the course each of the following are used: lecture, small group work, large group work, long-range projects, daily homework, and contest exams. Each topic is presented numerically, geometrically, symbolically, and verbally. Students are encouraged to express their ideas carefully, logically and in a mathematically meaningful way. Each student has his or her own graphing calculator and uses it extensively. Students may present their end of the year project in a variety of different ways, by video, by audio, by a written presentation, PowerPoint or a live presentation.

TEXT

Precalculus: Functions and Graphs (Fourth Edition) by Demana, Waits, Foley and Kennedy.

ASSESSMENT

Each student is assessed in a variety of ways. Homework is scheduled daily. Homework is checked on a regular basis. Test, quizzes, projects and class presentations are used frequently. Projects may be individual or group.

Hingham High School
Curriculum Summary

Course 441: CALCULUS – LEVEL 2

DESCRIPTIVE OVERVIEW

This is a yearlong course in calculus following the AB Syllabus published by the C.E.E.B. It is primarily concerned with an intuitive understanding of the concepts of calculus and experience with its methods and applications. Use of the word "intuitive" is not meant to suggest a reduction in rigor but a shift of emphasis from formal proof of theorems and concepts to their application in business, engineering, biology, and physics. This course is less encompassing than the level 1 calculus but covers much of the same material.

RATIONALE

This course is an alternative level 2 course for those students who have excelled in mathematics but do not desire the advanced placement program in mathematics.

GOALS AND OBJECTIVES

The student who successfully completes this course will be able to

1. define a limit and compute limits
2. find derivatives of algebraic and transcendental functions
3. apply derivatives to a wide variety of applications including related rates, max/min problems, and acceleration-velocity-distance problems
4. use a graphing calculator to analyze function graphs and function values
5. integrate basic functions and apply some methods of integration
6. apply the definite integral to a variety of problems

INSTRUCTIONAL MODEL

The instructional model is relatively traditional. Throughout the course the following are used: lecture, group work, daily homework, quizzes, tests, and various projects. The curriculum includes all the topics prescribed by the CEEB AB Calculus curriculum. Graphing calculators are required and are used extensively but not exclusively throughout the course

TEXT

Calculus, Finney, et al, Scott Foresman/Addison Wesley, 1999

ASSESSMENT

Each student is assessed in a variety of ways. Homework is given almost daily and quizzes at regular intervals and chapter tests make up the usual assessments. There are also semester outlines of the course and projects consisting of selections from past AP exams as well as other sources. Student folders are kept on each individual and may be used for review and shared at conferences with parents. Midyear and final exams are given and constitute 10% of the course grade.

Hingham High School
Curriculum Summary

Course 442: AP CALCULUS – AB

DESCRIPTIVE OVERVIEW

This is a yearlong course in calculus following the AB Syllabus published by the C.E.E.B. It is primarily concerned with a rigorous understanding of the concepts of calculus and experience with its methods and applications.

GOALS AND OBJECTIVES

The student who successfully completes this course will be able to

1. define a limit and compute limits
2. find derivatives of algebraic and transcendental functions
3. apply derivatives to a wide variety of applications including related rates, max/min problems, marginal cost and acceleration-velocity-distance problems
4. use a graphing calculator to analyze function graphs and function values
5. integrate basic functions and apply some methods of integration
6. apply the definite integral to a variety of problems

INSTRUCTIONAL MODEL

The instructional model is relatively traditional. Throughout the course the following are used: lecture, group work, daily homework, quizzes, tests, and various projects. The curriculum includes all the topics prescribed by the CEEB AB Calculus curriculum. The course is paced so that the necessary material is covered before the exam is given in May. Graphing calculators are required and are used extensively but not exclusively throughout the course

TEXT

Calculus, Finney, et al, Scott Foresman/Addison Wesley, 2007

ASSESSMENT

Each student is assessed in a variety of ways. Homework is given almost daily and quizzes at regular intervals and chapter tests make up the usual assessments. There are also semester outlines of the course and projects consisting of selections from past AP exams as well as other sources that are given throughout the year.

Student folders are kept on each individual and may be used for review and shared at conferences with parents. A midyear exam is given and students must take the Advanced Placement Calculus (AB) exam.

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Hingham High School
Curriculum Summary

Course 443: AP CALCULUS – BC

DESCRIPTIVE OVERVIEW

This is a college-level course following the Calculus BC outline as presented by The College Board. It corresponds to two semesters or three quarters of calculus at many colleges and universities. Sitting for the BC Advanced Placement Examination is a requirement of this course. This class meets an extra 2 periods in a seven-day cycle for lab periods. In these labs we discuss their work on written assignments comprised of old AP questions and on other occasions we work on explorations to enhance the work in the regular class.

GOALS AND OBJECTIVES

The general goals of this course are as follows:

1. Students will understand and be able to give written descriptions of what the derivative of a function means graphically, numerically, symbolically, and verbally.
2. Students will be able to explain in practical terms the meaning of the derivative of a given model.
3. Students will understand the limiting process.
4. Students will understand the meaning of a definite integral.
5. Students will be able to use derivatives to determine rates of change, describe motion in the plane, and calculate limits.
6. Students will be able to use antiderivatives to determine areas, volumes, distances traveled, and calculate sums.
7. Students will be able to use differential equations to solve real world problems in which information regarding how quantities change is known.
8. Students will be able to determine the convergence or divergence of a series.
9. Students will be able to use a Taylor polynomial to approximate a differentiable function.
10. Students will be able to represent differentiable functions by a Taylor Series.
11. Students will be able to read carefully and critically.
12. Students will be able to communicate effectively both orally and in writing. In both cases students will demonstrate an ability to be complete in their expression without the inclusion of extraneous material.
13. Students will demonstrate an ability to analyze given information and decide how best to use this information and their mathematical knowledge to design and execute a solution plan.

INSTRUCTIONAL MODEL

The instructional model is varied. Throughout the course each of the following are used: lecture, small group work (2 students), large group work (3 or 4 students), long-range projects, daily homework, labs, and contest exams. Each topic is presented numerically, geometrically, symbolically, and verbally. Students are encouraged to express their ideas in carefully written sentences and are given homework that requires this type of written work. Each student has his or her own graphing calculator and uses it extensively. They use programs in their calculators to: perform numerical integration, find points of inflection, show Riemann sums, compute partial sums, use Euler's Method, draw a slopefield, draw a solution curve over a slopefield, among others.

TEXTS

Howard Anton. Calculus. Third edition / Brief edition. New York: John Wiley & Sons 1988.
Deborah Hughes-Hallett, Andrew M. Gleason, et al. *Calculus*, 5th ed. New York: John Wiley & Sons 2009.

ASSESSMENT

Each student is assessed in a variety of ways. Homework is scheduled daily. From the middle of October throughout the year the students are assigned 3 AP questions each week. These are graded as they would be at an AP reading. The students are encouraged to work cooperatively on in-class worksheets, graded AP problems, take-home exams.

Hingham High School
Curriculum Summary

Course 445: AP STATISTICS

DESCRIPTIVE OVERVIEW

This is a college-level course following the AP Statistics outline as presented by the College Board. It corresponds to a semester course of statistics at many colleges and universities. Sitting for the Statistics Advanced Placement Examination is a requirement of this course. Tests, AP Quizzes, and 2 major projects will follow the format of the AP exam (multiple choice / free response), so students will become familiar with the composition of the May exam, as well as how it will be graded.

GOALS AND OBJECTIVES

The general goals of this course are as follows

1. Students will be able to analyze data, making use of graphical and numerical techniques, to study patterns and departures from patterns.
2. Students will be able to examine data distributions, detecting important characteristics such as shape, location, variability, and unusual values.
3. Students will be able to observe data patterns in order to generate conjectures about relationships among variables, noting the difference between association and causation.
4. Students will be able to collect data according to a well-developed plan, choosing appropriate types of analysis, and make appropriate conclusions from their analysis.
5. Students will be fluent in the vocabulary and theory of sampling and experimentation.
6. Students will be able to use probability to accurately describe and calculate from different data distributions.
7. Students will be able to describe probability models using simulation techniques and long run interpretations.
8. Students will be able to select reasonable models to draw appropriate conclusions from data, including correct probability language.
9. Students will make correct inferences both in constructing confidence intervals and in decision making through hypothesis testing.
10. In all of the above, students will be able to read carefully and critically, and communicate effectively, both orally and in writing.

INSTRUCTIONAL MODEL

The instructional model is varied. Throughout the course each of the following are used: lecture, small group work (2 students), large group work (4 or 5 students), long range projects, daily homework, shorter (1 to 2 day) projects, and AP Quizzes. Each topic is presented numerically, graphically, symbolically, and verbally. Students are encouraged to express their ideas in carefully written sentences and are given assignments that require this type of written work. Each student has his/her own graphing calculator and uses it extensively. We use programs in students' calculators to: perform probability calculations, conduct simulations, compute confidence intervals, and do hypothesis testing, among other things.

TEXT

Daniel Yates, David Moore, Daren Starnes. *The Practice of Statistics*, 2nd edition. New York: W. H. Freeman and Company, 2003.

ASSESSMENT

Each student is assessed in a variety of ways. Homework is scheduled daily. Almost every unit from the textbook has an accompanying AP Quiz given on a day different than the unit test day. These are graded as they would be at an AP reading (holistic grading, ranging from 0 to 4). There are occasional surprise quizzes, usually based on homework that has been completed and gone over in class. All unit tests contain multiple choice questions and open response questions, similar to the actual AP test. A full AP exam is individually assigned to further ensure students are familiar with the format and content of the AP test and a graded mock AP exam is given in April. On most other assessments, such as homework, in-class worksheets, and practice AP problems, students are encouraged to work cooperatively.