

Attached is an appendix from the Frameworks relevant to this course and referenced by number and strand in the course outline

Course Outline

A.1.N.2 Simplifying Algebraic Expressions
A.1.N.1 Evaluating Expressions Using Order of Operations
A.1.P.10 Solving Linear Equations
A.1.P.11 Solving Word Problems
A.1.P.7 Simplifying Monomials Using Laws of Exponents
10.P.3 Operations with Polynomial
10.P.2 Finding Slopes of Lines
A.1.P.6 Determining Equations of Lines
A.1.P.6 Graphing Linear Equations
A.1.P.3 Finding Domain and Range of Relations
A.1.P.1 Recognizing and Evaluating Functions
10.P.4 Factoring Polynomials
A.1.P.9 Solving Quadratic Equations with Factoring
A.1.P.9 Graphing vertical Parabolas
10.N.3 Simplifying Radicals
A.1.D2 Finding a Line of Best Fit for Data

Major Evaluation Strategies/Assessments

- Tests
- Homework
- Quizzes
- CORE Assignments
- Open Response Questions

Learning Standards for Algebra I

Note: The parentheses at the end of a learning standard contain the code number(s) for the corresponding standard(s) in the two-year grade spans.

Number Sense and Operations

[Understand numbers](#), ways of representing numbers, relationships among numbers, and number systems

[Understand meanings](#) of operations and how they relate to one another

[Compute fluently](#) and make reasonable estimates

Students engage in problem solving, communicating, reasoning, connecting, and representing as they:

- AI.N.1 Identify and use the properties of operations on real numbers, including the associative, commutative, and distributive properties; the existence of the identity and inverse elements for addition and multiplication; the existence of n^{th} roots of positive real numbers for any positive integer n ; the inverse relationship between taking the n^{th} root of and the n^{th} power of a positive real number; and the density of the set of rational numbers in the set of real numbers. (10.N.1)
- AI.N.2 Simplify numerical expressions, including those involving positive integer exponents or the absolute value, e.g., $3(2^4 - 1) = 45$, $4|3 - 5| + 6 = 14$; apply such simplifications in the solution of problems. (10.N.2)
- AI.N.3 Find the approximate value for solutions to problems involving square roots and cube roots without the use of a calculator, e.g., $\sqrt{3^2 - 1} \approx 2.8$. (10.N.3)
- AI.N.4 Use estimation to judge the reasonableness of results of computations and of solutions to problems involving real numbers. (10.N.4)

Patterns, Relations, and Algebra

[Understand patterns](#), relations, and functions

[Represent and analyze](#) mathematical situations and structures using algebraic symbols

[Use mathematical models](#) to represent and understand quantitative relationships

[Analyze change](#) in various contexts

Students engage in problem solving, communicating, reasoning, connecting, and representing as they:

- AI.P.1 Describe, complete, extend, analyze, generalize, and create a wide variety of patterns, including iterative, recursive (e.g., Fibonacci Numbers), linear, quadratic, and exponential functional relationships. (10.P.1)
- AI.P.2 Use properties of the real number system to judge the validity of equations and inequalities, to prove or disprove statements, and to justify every step in a sequential argument.
- AI.P.3 Demonstrate an understanding of relations and functions. Identify the domain, range, dependent, and independent variables of functions.
- AI.P.4 Translate between different representations of functions and relations: graphs, equations, point sets, and tabular.
- AI.P.5 Demonstrate an understanding of the relationship between various representations of a line. Determine a line's slope and x - and y -intercepts from its graph or from a linear equation that represents the line. Find a linear equation describing a line from a graph or a geometric description of the line, e.g., by using the "point-slope" or "slope y -intercept" formulas. Explain the significance of a positive, negative, zero, or undefined slope. (10.P.2)
- AI.P.6 Find linear equations that represent lines either perpendicular or parallel to a given line and through a point, e.g., by using the "point-slope" form of the equation. (10.G.8)
- AI.P.7 Add, subtract, and multiply polynomials. Divide polynomials by monomials. (10.P.3)

- AI.P.8 Demonstrate facility in symbolic manipulation of polynomial and rational expressions by rearranging and collecting terms, factoring (e.g., $a^2 - b^2 = (a + b)(a - b)$, $x^2 + 10x + 21 = (x + 3)(x + 7)$, $5x^4 + 10x^3 - 5x^2 = 5x^2(x^2 + 2x - 1)$), identifying and canceling common factors in rational expressions, and applying the properties of positive integer exponents. (10.P.4)
- AI.P.9 Find solutions to quadratic equations (with real roots) by factoring, completing the square, or using the quadratic formula. Demonstrate an understanding of the equivalence of the methods. (10.P.5)
- AI.P.10 Solve equations and inequalities including those involving absolute value of linear expressions (e.g., $|x - 2| > 5$) and apply to the solution of problems. (10.P.6)

Patterns, Relations, and Algebra (continued)

- AI.P.11 Solve everyday problems that can be modeled using linear, reciprocal, quadratic, or exponential functions. Apply appropriate tabular, graphical, or symbolic methods to the solution. Include compound interest, and direct and inverse variation problems. Use technology when appropriate. (10.P.7)
- AI.P.12 Solve everyday problems that can be modeled using systems of linear equations or inequalities. Apply algebraic and graphical methods to the solution. Use technology when appropriate. Include mixture, rate, and work problems. (10.P.8)

Data Analysis, Statistics, and Probability

- [Formulate questions](#) that can be addressed with data and collect, organize, and display relevant data to answer them
- [Select and use](#) appropriate statistical methods to analyze data
- [Develop and evaluate](#) inferences and predictions that are based on data
- [Understand and apply](#) basic concepts of probability

Students engage in problem solving, communicating, reasoning, connecting, and representing as they:

- AI.D.1 Select, create, and interpret an appropriate graphical representation (e.g., scatter plot, table, stem-and-leaf plots, circle graph, line graph, and line plot) for a set of data and use appropriate statistics (e.g., mean, median, range, and mode) to communicate information about the data. Use these notions to compare different sets of data. (10.D.1)
- AI.D.2 Approximate a line of best fit (trend line) given a set of data (e.g., scatter plot). Use technology when appropriate. (10.D.2)
- AI.D.3 Describe and explain how the relative sizes of a sample and the population affect the validity of predictions from a set of data. (10.D.3)

Learning Standards for Grades 9–10

Number Sense and Operations

[Understand numbers](#), ways of representing numbers, relationships among numbers, and number systems

[Understand meanings](#) of operations and how they relate to one another

[Compute fluently](#) and make reasonable estimates

Students engage in problem solving, communicating, reasoning, connecting, and representing as they:

- 10.N.1 Identify and use the properties of operations on real numbers, including the associative, commutative, and distributive properties; the existence of the identity and inverse elements for addition and multiplication; the existence of n^{th} roots of positive real numbers for any positive integer n ; and the inverse relationship between taking the n^{th} root of and the n^{th} power of a positive real number.
- 10.N.2 Simplify numerical expressions, including those involving positive integer exponents or the absolute value, e.g., $3(2^4 - 1) = 45$, $4|3 - 5| + 6 = 14$; apply such simplifications in the solution of problems.
- 10.N.3 Find the approximate value for solutions to problems involving square roots and cube roots without the use of a calculator, e.g., $\sqrt{3^2 - 1} \approx 2.8$.
- 10.N.4 Use estimation to judge the reasonableness of results of computations and of solutions to problems involving real numbers.

Patterns, Relations, and Algebra

[Understand patterns](#), relations, and functions

[Represent and analyze](#) mathematical situations and structures using algebraic symbols

[Use mathematical models](#) to represent and understand quantitative relationships

[Analyze change](#) in various contexts

Students engage in problem solving, communicating, reasoning, connecting, and representing as they:

- 10.P.1 Describe, complete, extend, analyze, generalize, and create a wide variety of patterns, including iterative, recursive (e.g., Fibonacci Numbers), linear, quadratic, and exponential functional relationships.
- 10.P.2 Demonstrate an understanding of the relationship between various representations of a line. Determine a line's slope and x- and y-intercepts from its graph or from a linear equation that represents the line. Find a linear equation describing a line from a graph or a geometric description of the line, e.g., by using the "point-slope" or "slope y-intercept" formulas. Explain the significance of a positive, negative, zero, or undefined slope.
- 10.P.3 Add, subtract, and multiply polynomials. Divide polynomials by monomials.
- 10.P.4 Demonstrate facility in symbolic manipulation of polynomial and rational expressions by rearranging and collecting terms; factoring (e.g., $a^2 - b^2 = (a + b)(a - b)$, $x^2 + 10x + 21 = (x + 3)(x + 7)$, $5x^4 + 10x^3 - 5x^2 = 5x^2(x^2 + 2x - 1)$); identifying and canceling common factors in rational expressions; and applying the properties of positive integer exponents.
- 10.P.5 Find solutions to quadratic equations (with real roots) by factoring, completing the square, or using the quadratic formula. Demonstrate an understanding of the equivalence of the methods.
- 10.P.6 Solve equations and inequalities including those involving absolute value of linear expressions (e.g., $|x - 2| > 5$) and apply to the solution of problems.
- 10.P.7 Solve everyday problems that can be modeled using linear, reciprocal, quadratic, or exponential functions. Apply appropriate tabular, graphical, or symbolic methods to the solution. Include compound interest, and direct and inverse variation problems. Use

technology when appropriate.

10.P.8 Solve everyday problems that can be modeled using systems of linear equations or inequalities. Apply algebraic and graphical methods to the solution. Use technology when appropriate. Include mixture, rate, and work problems.

Geometry

[Analyze characteristics](#) and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships
[Specify locations](#) and describe spatial relationships using coordinate geometry and other representational systems
[Apply transformations](#) and use symmetry to analyze mathematical situations
[Use visualization](#), spatial reasoning, and geometric modeling to solve problems

Students engage in problem solving, communicating, reasoning, connecting, and representing as they:

- 10.G.1 Identify figures using properties of sides, angles, and diagonals. Identify the figures' type(s) of symmetry.
- 10.G.2 Draw congruent and similar figures using a compass, straightedge, protractor, and other tools such as computer software. Make conjectures about methods of construction. Justify the conjectures by logical arguments.
- 10.G.3 Recognize and solve problems involving angles formed by transversals of coplanar lines. Identify and determine the measure of central and inscribed angles and their associated minor and major arcs. Recognize and solve problems associated with radii, chords, and arcs within or on the same circle.
- 10.G.4 Apply congruence and similarity correspondences (e.g., $\triangle ABC \cong \triangle XYZ$) and properties of the figures to find missing parts of geometric figures, and provide logical justification.
- 10.G.5 Solve simple triangle problems using the triangle angle sum property and/or the Pythagorean theorem.
- 10.G.6 Use the properties of special triangles (e.g., isosceles, equilateral, $30^\circ-60^\circ-90^\circ$, $45^\circ-45^\circ-90^\circ$) to solve problems.
- 10.G.7 Using rectangular coordinates, calculate midpoints of segments, slopes of lines and segments, and distances between two points, and apply the results to the solutions of problems.
- 10.G.8 Find linear equations that represent lines either perpendicular or parallel to a given line and through a point, e.g., by using the "point-slope" form of the equation.
- 10.G.9 Draw the results, and interpret transformations on figures in the coordinate plane, e.g., translations, reflections, rotations, scale factors, and the results of successive transformations. Apply transformations to the solutions of problems.
- 10.G.10 Demonstrate the ability to visualize solid objects and recognize their projections and cross sections.
- 10.G.11 Use vertex-edge graphs to model and solve problems.

Measurement

[Understand measurable attributes](#) of objects and the units, systems, and processes of measurement
[Apply appropriate techniques, tools, and formulas](#) to determine measurements

Students engage in problem solving, communicating, reasoning, connecting, and representing as they:

- 10.M.1 Calculate perimeter, circumference, and area of common geometric figures such as parallelograms, trapezoids, circles, and triangles.
- 10.M.2 Given the formula, find the lateral area, surface area, and volume of prisms, pyramids, spheres, cylinders, and cones, e.g., find the volume of a sphere with a specified surface area.
- 10.M.3 Relate changes in the measurement of one attribute of an object to changes in other

attributes, e.g., how changing the radius or height of a cylinder affects its surface area or volume.

10.M.4 Describe the effects of approximate error in measurement and rounding on measurements and on computed values from measurements.

Data Analysis, Statistics, and Probability

[Formulate questions](#) that can be addressed with data and collect, organize, and display relevant data to answer them

[Select and use](#) appropriate statistical methods to analyze data

[Develop and evaluate](#) inferences and predictions that are based on data

[Understand and apply](#) basic concepts of probability

- Students engage in problem solving, communicating, reasoning, connecting, and representing as they:*
- 10.D.1 Select, create, and interpret an appropriate graphical representation (e.g., scatter plot, table, stem-and-leaf plots, box-and-whisker plots, circle graph, line graph, and line plot) for a set of data and use appropriate statistics (e.g., mean, median, range, and mode) to communicate information about the data. Use these notions to compare different sets of data.
- 10.D.2 Approximate a line of best fit (trend line) given a set of data (e.g., scatter plot). Use technology when appropriate.
- 10.D.3 Describe and explain how the relative sizes of a sample and the population affect the validity of predictions from a set of data.

MELROSE PUBLIC SCHOOLS MATHEMATICS DEPARTMENT COURSE SYLLABUS

Course Description

Algebra II

C.P. 1, C.P. 2, & H

1 Credit

This course expands on the topics covered in Algebra 1. New topics include simplifying radicals, operations with radicals, operations with imaginary and complex numbers, new methods of solving quadratic equations, and the graphs of the conic sections. The use of functions is explored. The honors level will cover derivations of formulas.

School Wide Learning Expectations

- Students will demonstrate the ability to use technology responsibly and effectively
- Students will demonstrate the ability to problem solve effectively

Course Specific Goals

Students will be able to:

- Utilize various methods to solve quadratic equations
- Simplify radical expressions
- Graph various functions, recognize why they are functions, and identify their domain and range
- Perform all operations with imaginary and complex numbers
- Solve word problems involving the utilization of quadratic equations

Essential Questions

- How are functions described and used in relationships between numbers?
- How is slope defined and used in writing the equations of lines?
- What methods are employed in solving systems of equations?
- What is the relationship between polynomial functions and their graphs?
- What methods are used to solve quadratic equations?

Instructional Strategies

- Demonstrations
- Brainstorming
- Problem Solving
- Group Work
- Calculator Exercises
- Discovery Method

Learning Standards from the Mass Frameworks

Attached is an appendix from the Frameworks relevant to this course and referenced by number and strand in the course outline

Course Outline

A.2.P.11 Solving Linear Equations
 A.2.P.11 Solving Linear Inequalities
 A.2.P.11 Absolute Value Functions
 A.2.P.10 Laws of Exponents
 10.P.3 Operations with Polynomials
 10.P.2 Slopes of Lines
 10.P.2 Graphing Lines
 10.P.2 Determining Equations of Lines
 10.P.2 Distance and Midpoint
 A.2.P.5 Relations and Functions
 A.2.P.5 Graphing Functions
 A.2.P.9 Solving Linear Systems
 A.2.P.9 Operations with Matrices
 10.P.4 Factoring Polynomials
 10.P.5 Solving Quadratic Equations
 10.P.5 Completing the Square
 A.2.P.4 Operations with Radicals
 A.2.N.1 Imaginary and Complex Numbers
 A.2.P.6 Conic Sections
 A.2.P.3 Binomial Expansion Using Pascal's Triangle
 A.2.G.1 Introduction to Trigonometric Ratios

Major Evaluation Strategies/Assessments

- Tests
- Homework

- Quizzes
- CORE Assignments
- Open Response Questions

Learning Standards for Algebra II

Note: The parentheses at the end of a learning standard contain the code number for the corresponding standard in the two-year grade spans.

Number Sense and Operations

[Understand numbers](#), ways of representing numbers, relationships among numbers, and number systems

[Understand meanings](#) of operations and how they relate to one another

[Compute fluently](#) and make reasonable estimates

Students engage in problem solving, communicating, reasoning, connecting, and representing as they:

- AII.N.1 Define complex numbers (e.g., $a + bi$) and operations on them, in particular, addition, subtraction, multiplication, and division. Relate the system of complex numbers to the systems of real and rational numbers. (12.N.1)
- AII.N.2 Simplify numerical expressions with powers and roots, including fractional and negative exponents. (12.N.2)

Patterns, Relations, and Algebra

[Understand patterns](#), relations, and functions

[Represent and analyze](#) mathematical situations and structures using algebraic symbols

[Use mathematical models](#) to represent and understand quantitative relationships

[Analyze change](#) in various contexts

Students engage in problem solving, communicating, reasoning, connecting, and representing as they:

- AII.P.1 Describe, complete, extend, analyze, generalize, and create a wide variety of patterns, including iterative and recursive patterns such as Pascal's Triangle. (12.P.1)
- AII.P.2 Identify arithmetic and geometric sequences and finite arithmetic and geometric series. Use the properties of such sequences and series to solve problems, including finding the formula for the general term and the sum, recursively and explicitly. (12.P.2)
- AII.P.3 Demonstrate an understanding of the binomial theorem and use it in the solution of problems. (12.P.3)
- AII.P.4 Demonstrate an understanding of the exponential and logarithmic functions.
- AII.P.5 Perform operations on functions, including composition. Find inverses of functions. (12.P.5)
- AII.P.6 Given algebraic, numeric and/or graphical representations recognize functions as polynomial, rational, logarithmic, or exponential. (12.P.6)
- AII.P.7 Find solutions to quadratic equations (with real coefficients and real or complex roots) and apply to the solutions of problems. (12.P.7)
- AII.P.8 Solve a variety of equations and inequalities using algebraic, graphical, and numerical methods, including the quadratic formula; use technology where appropriate. Include polynomial, exponential, and logarithmic functions; expressions involving the absolute values; and simple rational expressions. (12.P.8)
- AII.P.9 Use matrices to solve systems of linear equations. Apply to the solution of everyday problems. (12.P.9)

- AII.P.10 Use symbolic, numeric, and graphical methods to solve systems of equations and/or inequalities involving algebraic, exponential, and logarithmic expressions. Also use technology where appropriate. Describe the relationships among the methods. (12.P.10)
- AII.P.11 Solve everyday problems that can be modeled using polynomial, rational, exponential, logarithmic, and step functions, absolute values and square roots. Apply appropriate graphical, tabular, or symbolic methods to the solution. Include growth and decay; logistic growth; joint (e.g., $I = Prt$, $y = k(w_1 + w_2)$), and combined (F = $G(m_1m_2)/d^2$) variation. (12.P.11)
- AII.P.12 Identify maximum and minimum values of functions in simple situations. Apply to the solution of problems. (12.P.12)
- AII.P.13 Describe the translations and scale changes of a given function $f(x)$ resulting from substitutions for the various parameters a, b, c, and d in $y = af(b(x + c/b)) + d$. In particular, describe the effect of such changes on polynomial, rational, exponential, and logarithmic functions. (12.P.13)

Geometry

[Analyze characteristics](#) and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships
[Specify locations](#) and describe spatial relationships using coordinate geometry and other representational systems
[Apply transformations](#) and use symmetry to analyze mathematical situations
[Use visualization](#), spatial reasoning, and geometric modeling to solve problems

Students engage in problem solving, communicating, reasoning, connecting, and representing as they:

- AII.G.1 Define the sine, cosine, and tangent of an acute angle. Apply to the solution of problems. (12.G.1)
- AII.G.2 Derive and apply basic trigonometric identities (e.g., $\sin^2\theta + \cos^2\theta = 1$, $\tan^2\theta + 1 = \sec^2\theta$) and the laws of sines and cosines. (12.G.2)
- AII.G.3 Relate geometric and algebraic representations of lines, simple curves, and conic sections. (12.G.4)

Data Analysis, Statistics, and Probability

[Formulate questions](#) that can be addressed with data and collect, organize, and display relevant data to answer them
[Select and use](#) appropriate statistical methods to analyze data
[Develop and evaluate](#) inferences and predictions that are based on data
[Understand and apply](#) basic concepts of probability

Students engage in problem solving, communicating, reasoning, connecting, and representing as they:

- AII.D.1 Select an appropriate graphical representation for a set of data and use appropriate statistics (e.g., quartile or percentile distribution) to communicate information about the data. (12.D.2)
- AII.D.2 Use combinatorics (e.g., “fundamental counting principle,” permutations, and combinations) to solve problems, in particular, to compute probabilities of compound events. Use technology as appropriate. (12.D.6)

MELROSE PUBLIC SCHOOLS MATHEMATICS DEPARTMENT COURSE SYLLABUS

Course Title: Geometry

Course Description

Geometry C.P.1, C.P.2, H 1 Credit

This course explores the critical postulates governing angles, parallel lines, polygons, circles, congruency and similarity, areas of plane polygons and circles, as well as volumes and surface area of solids. Right triangles and their properties are emphasized.

School Wide Learning Expectations

- Students will demonstrate the ability to use technology responsibly and effectively
- Students will demonstrate the ability to problem solve effectively

Course Specific Goals

Students will be able to:

- Recognize points, lines, line segments, rays, angles and triangles
- Determine when figures are congruent or similar by identifying corresponding parts of figures
- Effectively work with ratios, recognize and work with proportions, apply the product and ratio theorems, and calculate geometric means
- Identify characteristics of circles and effectively work with chords, arcs, tangents, special angles in the circle and the relationship between these parts
- Determine the area of plane figures, volume and surface area of solid figures

Essential Questions

- What characteristics and properties of two and three dimensional geometric shapes can be utilized to develop mathematical arguments about relationships?
- How can geometry be utilized to specify locations and to describe spatial relationships?
- How can symmetry, congruency, and similarity be employed to analyze mathematical situations?
- What appropriate techniques, tools, and formulas can be used to determine measurements?
- How can visualization, special reasoning, and geometric modeling be utilized to solve problems?

Instructional Strategies

- Presentations
- Demonstrations
- Examples
- Problem solving
- Brainstorming
- Group Work
- Effective use of Smart-Board
- Calculator Exercises
- Discovery Method

Learning Standards from Mass. Frameworks

Attached is an appendix from the Frameworks relevant to this course and referenced by number and strand in the course outline

Course Outline

G.G.2	Deductive Reasoning
G.G.1	Points, Lines, and Planes
G.G.1	Angles and Segments
G.G.11	The Coordinate Plane
G.G.1	Types of angles and parallel lines
G.G.8	Properties of Triangles
G.G.1	Properties of Polygons
G.G.1	Properties of Quadrilaterals
G.G.8	Congruent and similar Polygons
G.G.2	Circles and their properties
G.G.15	Reflections, Translations, Rotations, and Dilations
G.M.1	Area and perimeter of polygons
G.M.1	The Pythagorean Theorem and its converse
10.G.1	Special Right Triangles
G.G.5	Proving Triangles Congruent
10.G.2	Similarity of Triangles
G.M.2	Volume and Surface Area of Solids
A.II.G.I	Finding Trigonometric Values

Major Evaluation Strategies/Assessments

- Tests
- Homework
- Quizzes
- CORE Assignments
- Open Response Questions
- Rubric used for Open Response and CORE Assignment

Learning Standards for Geometry

Note: The parentheses at the end of a learning standard contain the code number for the corresponding standard in the two-year grade spans.

Geometry

[Analyze characteristics](#) and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships
[Specify locations](#) and describe spatial relationships using coordinate geometry and other representational systems
[Apply transformations](#) and use symmetry to analyze mathematical situations
[Use visualization](#), spatial reasoning, and geometric modeling to solve problems

Students engage in problem solving, communicating, reasoning, connecting, and representing as they:

- G.G.1 Recognize special types of polygons (e.g., isosceles triangles, parallelograms, and rhombuses). Apply properties of sides, diagonals, and angles in special polygons; identify their parts and special segments (e.g., altitudes, midsegments); determine interior angles for regular polygons. Draw and label sets of points such as line segments, rays, and circles. Detect symmetries of geometric figures.
- G.G.2 Write simple proofs of theorems in geometric situations, such as theorems about congruent and similar figures, parallel or perpendicular lines. Distinguish between postulates and theorems. Use inductive and deductive reasoning, as well as proof by contradiction. Given a conditional statement, write its inverse, converse, and contra positive.
- G.G.3 Apply formulas for a rectangular coordinate system to prove theorems.
- G.G.4 Draw congruent and similar figures using a compass, straightedge, protractor, or computer software. Make conjectures about methods of construction. Justify the conjectures by logical arguments. (10.G.2)
- G.G.5 Apply congruence and similarity correspondences (e.g., $\triangle ABC \cong \triangle XYZ$) and properties of the figures to find missing parts of geometric figures, and provide logical justification. (10.G.4)
- G.G.6 Apply properties of angles, parallel lines, arcs, radii, chords, tangents, and secants to solve problems.
- G.G.7 Solve simple triangle problems using the triangle angle sum property, and/or the Pythagorean theorem. (10.G.5)
- G.G.8 Use the properties of special triangles (e.g., isosceles, equilateral, $30^\circ\text{--}60^\circ\text{--}90^\circ$, $45^\circ\text{--}45^\circ\text{--}90^\circ$) to solve problems. (10.G.6)
- G.G.9 Define the sine, cosine, and tangent of an acute angle. Apply to the solution of problems.
- G.G.10 Apply the triangle inequality and other inequalities associated with triangles (e.g., the longest side is opposite the greatest angle) to prove theorems and solve problems.
- G.G.11 Demonstrate an understanding of the relationship between various representations of a line. Determine a line's slope and x- and y-intercepts from its graph or from a linear equation that represents the line. Find a linear equation describing a line from a graph or a geometric description of the line, e.g., by using the "point-slope" or "slope y-intercept" formulas. Explain the significance of a positive, negative, zero, or undefined slope. (10.P.2)
- G.G.12 Using rectangular coordinates, calculate midpoints of segments, slopes of lines and segments, and distances between two points, and apply the results to the solutions of problems. (10.G.7)
- G.G.13 Find linear equations that represent lines either perpendicular or parallel to a given line and

- through a point, e.g., by using the “point-slope” form of the equation. (10.G.8)
- G.G.14 Demonstrate an understanding of the relationship between geometric and algebraic representations of circles.
- G.G.15 Draw the results, and interpret transformations on figures in the coordinate plane, e.g., translations, reflections, rotations, scale factors, and the results of successive transformations. Apply transformations to the solution of problems. (10.G.9)
- G.G.16 Demonstrate the ability to visualize solid objects and recognize their projections and cross sections. (10.G.10)
- G.G.17 Use vertex-edge graphs to model and solve problems. (10.G.11)
- G.G.18 Use the notion of vectors to solve problems. Describe addition of vectors and multiplication of a vector by a scalar, both symbolically and pictorially. Use vector methods to obtain geometric results. (12.G.3)

Learning Standards for Measurement

[Understand measurable attributes](#) of objects and the units, systems, and processes of measurement

[Apply appropriate techniques, tools, and formulas](#) to determine measurements

Students engage in problem solving, communicating, reasoning, connecting, and representing as they:

- G.M.1 Calculate perimeter, circumference, and area of common geometric figures such as parallelograms, trapezoids, circles, and triangles. (10.M.1)
- G.M.2 Given the formula, find the lateral area, surface area, and volume of prisms, pyramids, spheres, cylinders, and cones, e.g., find the volume of a sphere with a specified surface area. (10.M.2)
- G.M.3 Relate changes in the measurement of one attribute of an object to changes in other attributes, e.g., how changing the radius or height of a cylinder affects its surface area or volume. (10.M.3)
- G.M.4 Describe the effects of approximate error in measurement and rounding on measurements and on computed values from measurements. (10.M.4)
- G.M.5 Use dimensional analysis for unit conversion and to confirm that expressions and equations make sense. (12.M.2)

**MELROSE PUBLIC SCHOOLS
MATHEMATICS DEPARTMENT
COURSE SYLLABUS**

Course Title: Math Analysis

Course Description

Math Analysis C.P. 1 1 Credit

This course strengthens the concepts covered in Algebra II. New topics include complex numbers, conic sections, rational exponents, logarithms, conic sections polynomial functions, rational functions, and some different methods to solve quadratic equations.

School Wide Learning Expectations

- Students will demonstrate the ability to use technology responsibly and effectively
- Students will demonstrate the ability to problem solve effectively

Course Specific Goals

Students will be able to:

- Determine the relationship between polynomial functions, their graphs, and solutions
- Effectively solve quadratic equations utilizing various methods
- Effectively solve systems of equations and inequalities algebraically and geometrically
- Perform all operations with the set of complex numbers
- Effectively identify the key components of the conic sections and graph each conic

Essential Questions

- When does the need for imaginary numbers come into clear view in math?
- What essential components are necessary in order to graph polynomial functions?
- How is the process of completing the square utilized in deriving the quadratic formula?
- How do rational exponents connect to radicals?
- What are the key components of each of the 4 conic sections?

Instructional Strategies

- Presentations
- Demonstrations
- Examples
- Problem solving
- Brainstorming

- Group Work
- Effective use of Smart-Board
- Calculator Exercises
- Discovery Method

Learning Standards from Mass. Frameworks

Attached is an appendix from the Frameworks relevant to this course and referenced by number and strand in the course outline

Course Outline

12P8 Solving Linear Equations and Inequalities
 12P8 Graphing Lines and Determining Equations of Lines
 12N2 Laws of Exponents
 10P3 Operations with Polynomials
 12P11 Factoring Polynomials
 12P5 Composition of Functions
 12P11 Inverse Functions
 A1P8 The Conic Sections
 A1P10 Operations with Rational Expressions
 A1P10 Solving Equations with Rational Expressions
 12N1 Operations with Complex Numbers
 12P5 Graphing Polynomial Functions
 12P6 Graphing Rational Functions
 12P10 Simplifying Radicals
 12N2 Simplifying Expressions with Rational Exponents
 12P6 Simplifying Logarithmic Functions
 12P9 Linear Systems
 12P9 Binomial Expansion with Pascal's Triangle

Major Evaluation Strategies/Assessments

- Tests
- Homework
- Quizzes
- CORE Assignments
- Open Response Questions
- Rubric used for Open Response and CORE Assignment

Learning Standards for Grades 11–12

Number Sense and Operations

[Understand numbers](#), ways of representing numbers, relationships among numbers, and number systems

[Understand meanings](#) of operations and how they relate to one another

[Compute fluently](#) and make reasonable estimates

Students engage in problem solving, communicating, reasoning, connecting, and representing as they:

- 12.N.1 Define complex numbers (e.g., $a + bi$) and operations on them, in particular, addition, subtraction, multiplication, and division. Relate the system of complex numbers to the systems of real and rational numbers.
- 12.N.2 Simplify numerical expressions with powers and roots, including fractional and negative exponents.

Patterns, Relations, and Algebra

[Understand patterns](#), relations, and functions

[Represent and analyze](#) mathematical situations and structures using algebraic symbols

[Use mathematical models](#) to represent and understand quantitative relationships

[Analyze change](#) in various contexts

Students engage in problem solving, communicating, reasoning, connecting, and representing as they:

- 12.P.1 Describe, complete, extend, analyze, generalize, and create a wide variety of patterns, including iterative and recursive patterns such as Pascal's Triangle.
- 12.P.2 Identify arithmetic and geometric sequences and finite arithmetic and geometric series. Use the properties of such sequences and series to solve problems, including finding the general term and sum recursively and explicitly.
- 12.P.3 Demonstrate an understanding of the binomial theorem and use it in the solution of problems.
- 12.P.4 Demonstrate an understanding of the trigonometric, exponential, and logarithmic functions.
- 12.P.5 Perform operations on functions, including composition. Find inverses of functions.
- 12.P.6 Given algebraic, numeric and/or graphical representations recognize functions as polynomial, rational, logarithmic, exponential, or trigonometric.
- 12.P.7 Find solutions to quadratic equations (with real coefficients and real or complex roots) and apply to the solutions of problems.
- 12.P.8 Solve a variety of equations and inequalities using algebraic, graphical, and numerical methods, including the quadratic formula; use technology where appropriate. Include polynomial, exponential, logarithmic, and trigonometric functions; expressions involving absolute values; trigonometric relations; and simple rational expressions.
- 12.P.9 Use matrices to solve systems of linear equations. Apply to the solution of everyday problems.
- 12.P.10 Use symbolic, numeric, and graphical methods to solve systems of equations and/or inequalities involving algebraic, exponential, and logarithmic expressions. Also use technology where appropriate. Describe the relationships among the methods.
- 12.P.11 Solve everyday problems that can be modeled using polynomial, rational,

exponential, logarithmic, trigonometric, and step functions, absolute values, and square roots. Apply appropriate graphical, tabular, or symbolic methods to the solution. Include growth and decay; joint (e.g., $I = Prt$, $y = k(w_1 + w_2)$) and combined ($F = G(m_1m_2)/d^2$) variation, and periodic processes.

12.P.12 Relate the slope of a tangent line at a specific point on a curve to the instantaneous rate of change. Identify maximum and minimum values of functions in simple situations. Apply these concepts to the solution of problems.

12.P.13 Describe the translations and scale changes of a given function $f(x)$ resulting from substitutions for the various parameters a , b , c , and d in $y = af(b(x + c/b)) + d$. In particular, describe the effect of such changes on polynomial, rational, exponential, logarithmic, and trigonometric functions.

Geometry

[Analyze characteristics](#) and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships
[Specify locations](#) and describe spatial relationships using coordinate geometry and other representational systems
[Apply transformations](#) and use symmetry to analyze mathematical situations
[Use visualization](#), spatial reasoning, and geometric modeling to solve problems

Students engage in problem solving, communicating, reasoning, connecting, and representing as they:

- 12.G.1 Define the sine, cosine, and tangent of an acute angle. Apply to the solution of problems.
- 12.G.2 Derive and apply basic trigonometric identities (e.g., $\sin^2\theta + \cos^2\theta = 1$, $\tan^2\theta + 1 = \sec^2\theta$) and the laws of sines and cosines.
- 12.G.3 Use the notion of vectors to solve problems. Describe addition of vectors and multiplication of a vector by a scalar, both symbolically and geometrically. Use vector methods to obtain geometric results.
- 12.G.4 Relate geometric and algebraic representations of lines, simple curves, and conic sections.
- 12.G.5 Apply properties of angles, parallel lines, arcs, radii, chords, tangents, and secants to solve problems.

Measurement

[Understand measurable attributes](#) of objects and the units, systems, and processes of measurement
[Apply appropriate techniques, tools, and formulas](#) to determine measurements

Students engage in problem solving, communicating, reasoning, connecting, and representing as they:

- 12.M.1 Describe the relationship between degree and radian measures, and use radian measure in the solution of problems, in particular, problems involving angular velocity and acceleration.
- 12.M.2 Use dimensional analysis for unit conversion and to confirm that expressions and equations make sense.

Data Analysis, Statistics, and Probability

[Formulate questions](#) that can be addressed with data and collect, organize, and display relevant data to answer them
[Select and use](#) appropriate statistical methods to analyze data
[Develop and evaluate](#) inferences and predictions that are based on data
[Understand and apply](#) basic concepts of probability

Students engage in problem solving, communicating, reasoning, connecting, and representing as they:

- 12.D.1 Design surveys and apply random sampling techniques to avoid bias in the data collection.
- 12.D.2 Select an appropriate graphical representation for a set of data and use appropriate statistics (e.g., quartile or percentile distribution) to communicate information about the data.
- 12.D.3 Apply regression results and curve fitting to make predictions from data.
- 12.D.4 Apply uniform, normal, and binomial distributions to the solutions of problems.

- 12.D.5 Describe a set of frequency distribution data by spread (i.e., variance and standard deviation), skewness, symmetry, number of modes, or other characteristics. Use these concepts in everyday applications.
- 12.D.6 Use combinatorics (e.g., “fundamental counting principle,” permutations, and combinations) to solve problems, in particular, to compute probabilities of compound events. Use technology as appropriate.
- 12.D.7 Compare the results of simulations (e.g., random number tables, random functions, and area models) with predicted probabilities.

**MELROSE PUBLIC SCHOOLS
MATHEMATICS DEPARTMENT
COURSE SYLLABUS**

Course Title: Pre-Calculus

Course Description

Pre-Calculus

C.P. 1

1 Credit

This course covers the conic sections, exponential and logarithmic functions, analytical geometry, imaginary and complex numbers, the trigonometric functions, using trigonometry to solve problems, and binomial expansion. The honors level introduces limits and derivatives.

School Wide Learning Expectations

- Students will demonstrate the ability to use technology responsibly and effectively
- Students will demonstrate the ability to problem solve effectively

Course Specific Goals

Students will be able to:

- Effectively graph functions and relate their graphical representations to their algebraic ones
- Graph polynomial functions by examining end behavior, intercepts, and multiplicities
- Graph exponential and logarithmic functions
- Determine measure of angles and sides of triangles by utilizing trigonometry
- Solve problems by using the law of sines and the law of cosines

Essential Questions

- How are trigonometric functions related to their geometric definitions?
- How are polynomial functions of all degrees solved over complex and real fields?
- How are geometric and algebraic representations of curves translated between each other and applied to solutions of problems?
- How do transformations affect graphs of all types and how can the results be predicted and interpreted?
- How do the trigonometric identities connect to the Pythagorean Theorem and how are they used to solve problems?

Instructional Strategies

- Presentations
- Demonstrations
- Examples
- Problem solving
- Brainstorming
- Group Work
- Effective use of Smart-Board
- Calculator Exercises
- Discovery Method

Learning Standards from Mass. Frameworks

Attached is an appendix from the Frameworks relevant to this course and referenced by number and strand in the course outline

Course Outline

AIIN2 Radicals and Rational Exponents
AIPP6 Functions and Properties
AIPP5 Twelve Basic Functions
AIPP4 Exponential and Logarithmic Functions
PCP8 Conic Sections
PCN1 Imaginary and Complex Numbers
PCP2 Polynomial Functions and Their Graphs
AIPP4 Rational Functions
PCN1 Complex Zeros and Fundamental Theorem of Algebra
PCM1 Relationship Between Degree Measure and Radian Measure
PCP5 Angles and Measures
PCP3 Trigonometric Functions
PCP6 Graphs of Trigonometric Functions
PCP3 Inverse Trigonometric Functions
PCP4 Using Trigonometric Functions to Solve Right Triangles
PCP4 Trigonometric Identities
PCG1 Law of Sines and Cosines
PCG2 Discrete Math Topics
PCG2 Vectors
PCP9 Introduction to Limits

Major Evaluation Strategies/Assessments

- Tests
- Homework
- Quizzes
- CORE Assignments
- Open Response Questions

- Rubric used for Open Response and CORE Assignment

Learning Standards for Precalculus

Note: The parentheses at the end of a learning standard contain the code number for the corresponding standard in the two-year grade spans.

Learning Standards for Number Sense and Operations

[Understand numbers](#), ways of representing numbers, relationships among numbers, and number systems

[Understand meanings](#) of operations and how they relate to one another

[Compute fluently](#) and make reasonable estimates

Students engage in problem solving, communicating, reasoning, connecting, and representing as they:

PC.N.1 Plot complex numbers using both rectangular and polar coordinates systems. Represent complex numbers using polar coordinates, i.e., $a + bi = r(\cos\theta + isin\theta)$. Apply DeMoivre's theorem to multiply, take roots, and raise complex numbers to a power.

Patterns, Relations, and Algebra

[Understand patterns](#), relations, and functions

[Represent and analyze](#) mathematical situations and structures using algebraic symbols

[Use mathematical models](#) to represent and understand quantitative relationships

[Analyze change](#) in various contexts

Students engage in problem solving, communicating, reasoning, connecting, and representing as they:

PC.P.1 Use mathematical induction to prove theorems and verify summation formulas, e.g.,

$$\text{verify } \sum_{k=1}^n k^2 = \frac{n(n+1)(2n+1)}{6}.$$

PC.P.2 Relate the number of roots of a polynomial to its degree. Solve quadratic equations with complex coefficients.

PC.P.3 Demonstrate an understanding of the trigonometric functions (sine, cosine, tangent, cosecant, secant, and cotangent). Relate the functions to their geometric definitions.

PC.P.4 Explain the identity $\sin^2\theta + \cos^2\theta = 1$. Relate the identity to the Pythagorean theorem.

PC.P.5 Demonstrate an understanding of the formulas for the sine and cosine of the sum or the difference of two angles. Relate the formulas to DeMoivre's theorem and use them to prove other trigonometric identities. Apply to the solution of problems.

PC.P.6 Understand, predict, and interpret the effects of the parameters a , ω , b , and c on the graph of $y = a\sin(\omega(x - b)) + c$; similarly for the cosine and tangent. Use to model periodic processes. (12.P.13)

PC.P.7 Translate between geometric, algebraic, and parametric representations of curves. Apply to the solution of problems.

PC.P.8 Identify and discuss features of conic sections: axes, foci, asymptotes, and tangents. Convert between different algebraic representations of conic sections.

PC.P.9 Relate the slope of a tangent line at a specific point on a curve to the instantaneous rate of change. Explain the significance of a horizontal tangent line. Apply these concepts to the solution of problems.



Geometry

[Analyze characteristics](#) and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships
[Specify locations](#) and describe spatial relationships using coordinate geometry and other representational systems
[Apply transformations](#) and use symmetry to analyze mathematical situations
[Use visualization](#), spatial reasoning, and geometric modeling to solve problems

Students engage in problem solving, communicating, reasoning, connecting, and representing as they:

- PC.G.1 Demonstrate an understanding of the laws of sines and cosines. Use the laws to solve for the unknown sides or angles in triangles. Determine the area of a triangle given the length of two adjacent sides and the measure of the included angle. (12.G.2)
- PC.G.2 Use the notion of vectors to solve problems. Describe addition of vectors, multiplication of a vector by a scalar, and the dot product of two vectors, both symbolically and geometrically. Use vector methods to obtain geometric results. (12.G.3)
- PC.G.3 Apply properties of angles, parallel lines, arcs, radii, chords, tangents, and secants to solve problems. (12.G.5)

Measurement

[Understand measurable attributes](#) of objects and the units, systems, and processes of measurement
[Apply appropriate techniques, tools, and formulas](#) to determine measurements

Students engage in problem solving, communicating, reasoning, connecting, and representing as they:

- PC.M.1 Describe the relationship between degree and radian measures, and use radian measure in the solution of problems, in particular problems involving angular velocity and acceleration. (12.M.1)
- PC.M.2 Use dimensional analysis for unit conversion and to confirm that expressions and equations make sense. (12.M.2)

Data Analysis, Statistics, and Probability

[Formulate questions](#) that can be addressed with data and collect, organize, and display relevant data to answer them
[Select and use](#) appropriate statistical methods to analyze data
[Develop and evaluate](#) inferences and predictions that are based on data
[Understand and apply](#) basic concepts of probability

Students engage in problem solving, communicating, reasoning, connecting, and representing as they:

- PC.D.1 Design surveys and apply random sampling techniques to avoid bias in the data collection. (12.D.1)
- PC.D.2 Apply regression results and curve fitting to make predictions from data. (12.D.3)
- PC.D.3 Apply uniform, normal, and binomial distributions to the solutions of problems. (12.D.4)

- PC.D.4 Describe a set of frequency distribution data by spread (variance and standard deviation), skewness, symmetry, number of modes, or other characteristics. Use these concepts in everyday applications. (12.D.5)
- PC.D.5 Compare the results of simulations (e.g., random number tables, random functions, and area models) with predicted probabilities. (12.D.7)

- What is the related rate of change and how does one distinguish and how are related rates used in physical situations?
- What are some of the applications of calculus techniques to real world problems in engineering, physics, and other sciences?

Instructional Strategies

- Demonstrations
- Presentations
- Examples
- Problem Solving
- Group Work
- Effective Use of Smart-Board
- Calculator Exercises
- Discovery Method

Course Outline

Slope and Linear Equations
 Linear Transformations
 Solving Equations Graphically
 Inverse Functions
 Logarithmic and Exponential Functions
 Limits, Continuity and the Definition of the Derivative
 Graphical and Algebraic Approaches to Limits
 Derivatives and the Notion of Slope
 Differential Techniques
 Power, Sum, and Constant Rules
 Product and Quotient Rules
 Chain Rule and Implicit Derivatives
 Applications of Derivatives
 Extrema
 Related Rates
 Critical Points and Curve Sketching
 Integration
 The Fundamental Theorem of Calculus
 Approximating Area with Rectangles
 Definite and Indefinite Integrals
 Integrals by Substitution
 Integration by Parts
 Partial Fractions
 Applications of Definite Integrals
 Volumes and Solids of Revolution

Other Applications

Major Evaluation Strategies/Assessments

- Tests
- Homework
- Quizzes
- CORE Assignments
- Open Response Questions
- Rubric Used for Open Response questions and CORE Assignments

**MELROSE PUBLIC SCHOOLS
MATHEMATICS DEPARTMENT
COURSE SYLLABUS**

Course Title: Transition to College Algebra

Course Description

Transition to College Algebra CP 1 1 Credit

This course reviews difficult topics in previous algebra and geometry courses. Topics include trigonometry, complex numbers, advanced algebra and analytical geometry. Emphasis is placed on graphing techniques as well as the basic mathematical formulas. This course provides a solid foundation for students planning further study in the social sciences, education or other liberal arts disciplines.

School Wide Learning Expectations

- Students will demonstrate the ability to use technology responsibly and effectively
- Students will demonstrate the ability to problem solve effectively

Course Specific Goals

Students will be able to:

- Solve and graph linear and quadratic equations
- Solve linear systems and determine the points of intersection
- Determine the area and perimeter of simple and complex polygons
- Utilize trigonometry to solve both practical and theoretical problems
- Explore practical application problems involving the conic sections

Essential Questions

- How does the graph of vertical parabolas connect to quadratic equations?
- How is trigonometry used to solve missing angles and sides of right triangles?
- How do rational exponents connect to radicals?
- What number systems make up the complex number system?
- How is algebra utilized to solve word problems?

Instructional Strategies

- Demonstrations

- Presentations
- Examples
- Problem Solving
- Group Work
- Effective Use of Smart-Board
- Calculator Exercises
- Discovery Method

Learning Standards from Mass. Frameworks

Attached is an appendix from the Frameworks relevant to this course and referenced by number and strand in the course outline

Course Outline

12P8 Solving Linear Equations and Inequalities
 12P8 Laws of Exponents
 12P8 Operations with Polynomials
 12P8 Solving Polynomial Equations
 12P8 the Quadratic Formula
 12P8 Operations with Radicals
 12N2 Rational Exponents
 12P4 Logarithms
 12N1 Imaginary and Complex Numbers
 12P1 Binomial Expansion
 12P4 Functions
 12P6 Solving Exponential Functions
 12P10 Solving Linear Systems
 12P12 Determining Linear Equations and Graphing Lines
 12G1 Basic Trigonometric Functions
 12G2 Solving Right Triangles Using Trigonometry
 12M1 Converting Between radian Measure and Degree Measure
 12G4 The Conic Sections

Major Evaluation Strategies/Assessments

- Tests
- Homework
- Quizzes
- CORE Assignments
- Open Response Questions
- Rubric Used for Open Response questions and CORE Assignments

•

Learning Standards for Grades 11–12

Number Sense and Operations

[Understand numbers](#), ways of representing numbers, relationships among numbers, and number systems
[Understand meanings](#) of operations and how they relate to one another
[Compute fluently](#) and make reasonable estimates

Students engage in problem solving, communicating, reasoning, connecting, and representing as they:

- 12.N.3 Define complex numbers (e.g., $a + bi$) and operations on them, in particular, addition, subtraction, multiplication, and division. Relate the system of complex numbers to the systems of real and rational numbers.
- 12.N.4 Simplify numerical expressions with powers and roots, including fractional and negative exponents.

Patterns, Relations, and Algebra

[Understand patterns](#), relations, and functions
[Represent and analyze](#) mathematical situations and structures using algebraic symbols
[Use mathematical models](#) to represent and understand quantitative relationships
[Analyze change](#) in various contexts

Students engage in problem solving, communicating, reasoning, connecting, and representing as they:

- 12.P.14 Describe, complete, extend, analyze, generalize, and create a wide variety of patterns, including iterative and recursive patterns such as Pascal's Triangle.
- 12.P.15 Identify arithmetic and geometric sequences and finite arithmetic and geometric series. Use the properties of such sequences and series to solve problems, including finding the general term and sum recursively and explicitly.
- 12.P.16 Demonstrate an understanding of the binomial theorem and use it in the solution of problems.
- 12.P.17 Demonstrate an understanding of the trigonometric, exponential, and logarithmic functions.
- 12.P.18 Perform operations on functions, including composition. Find inverses of functions.
- 12.P.19 Given algebraic, numeric and/or graphical representations recognize functions as polynomial, rational, logarithmic, exponential, or trigonometric.
- 12.P.20 Find solutions to quadratic equations (with real coefficients and real or complex roots) and apply to the solutions of problems.
- 12.P.21 Solve a variety of equations and inequalities using algebraic, graphical, and numerical methods, including the quadratic formula; use technology where appropriate. Include polynomial, exponential, logarithmic, and trigonometric functions; expressions involving absolute values; trigonometric relations; and simple rational expressions.
- 12.P.22 Use matrices to solve systems of linear equations. Apply to the solution of everyday problems.

- 12.P.23 Use symbolic, numeric, and graphical methods to solve systems of equations and/or inequalities involving algebraic, exponential, and logarithmic expressions. Also use technology where appropriate. Describe the relationships among the methods.
- 12.P.24 Solve everyday problems that can be modeled using polynomial, rational, exponential, logarithmic, trigonometric, and step functions, absolute values, and square roots. Apply appropriate graphical, tabular, or symbolic methods to the solution. Include growth and decay; joint (e.g., $I = Prt$, $y = k(w_1 + w_2)$) and combined ($F = G(m_1m_2)/d^2$) variation, and periodic processes.
- 12.P.25 Relate the slope of a tangent line at a specific point on a curve to the instantaneous rate of change. Identify maximum and minimum values of functions in simple situations. Apply these concepts to the solution of problems.
- 12.P.26 Describe the translations and scale changes of a given function $f(x)$ resulting from substitutions for the various parameters a , b , c , and d in $y = af(b(x + c/b)) + d$. In particular, describe the effect of such changes on polynomial, rational, exponential, logarithmic, and trigonometric functions.

Geometry

[Analyze characteristics](#) and properties of two- and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships
[Specify locations](#) and describe spatial relationships using coordinate geometry and other representational systems
[Apply transformations](#) and use symmetry to analyze mathematical situations
[Use visualization](#), spatial reasoning, and geometric modeling to solve problems

Students engage in problem solving, communicating, reasoning, connecting, and representing as they:

- 12.G.6 Define the sine, cosine, and tangent of an acute angle. Apply to the solution of problems.
- 12.G.7 Derive and apply basic trigonometric identities (e.g., $\sin^2\theta + \cos^2\theta = 1$, $\tan^2\theta + 1 = \sec^2\theta$) and the laws of sines and cosines.
- 12.G.8 Use the notion of vectors to solve problems. Describe addition of vectors and multiplication of a vector by a scalar, both symbolically and geometrically. Use vector methods to obtain geometric results.
- 12.G.9 Relate geometric and algebraic representations of lines, simple curves, and conic sections.
- 12.G.10 Apply properties of angles, parallel lines, arcs, radii, chords, tangents, and secants to solve problems.

Measurement

[Understand measurable attributes](#) of objects and the units, systems, and processes of measurement
[Apply appropriate techniques, tools, and formulas](#) to determine measurements

Students engage in problem solving, communicating, reasoning, connecting, and representing as they:

- 12.M.3 Describe the relationship between degree and radian measures, and use radian measure in the solution of problems, in particular, problems involving angular velocity and acceleration.
- 12.M.4 Use dimensional analysis for unit conversion and to confirm that expressions and equations make sense.

Data Analysis, Statistics, and Probability

[Formulate questions](#) that can be addressed with data and collect, organize, and display relevant data to answer them
[Select and use](#) appropriate statistical methods to analyze data
[Develop and evaluate](#) inferences and predictions that are based on data
[Understand and apply](#) basic concepts of probability

Students engage in problem solving, communicating, reasoning, connecting, and representing as they:

- 12.D.8 Design surveys and apply random sampling techniques to avoid bias in the data collection.
- 12.D.9 Select an appropriate graphical representation for a set of data and use appropriate statistics (e.g., quartile or

- percentile distribution) to communicate information about the data.
- 12.D.10 Apply regression results and curve fitting to make predictions from data.
- 12.D.11 Apply uniform, normal, and binomial distributions to the solutions of problems.
- 12.D.12 Describe a set of frequency distribution data by spread (i.e., variance and standard deviation), skewness, symmetry, number of modes, or other characteristics. Use these concepts in everyday applications.
- 12.D.13 Use combinatorics (e.g., “fundamental counting principle,” permutations, and combinations) to solve problems, in particular, to compute probabilities of compound events. Use technology as appropriate.
- 12.D.14 Compare the results of simulations (e.g., random number tables, random functions, and area models) with predicted probabilities.

**MELROSE PUBLIC SCHOOLS
MATHEMATICS DEPARTMENT
COURSE SYLLABUS**

Course Title: Consumer Math

Course Description

Consumer Math

CP2

1 Credit

This course prepares students to apply computing skills to solve everyday personal finances. Units covered include banking, checking accounts, credit cards, budgeting, job related finances, taxes, housing installment buying, household bills, insurance, financing a car, investing, and retirement.

School Wide Learning Expectations

- Students will demonstrate the ability to use technology responsibly and effectively
- Students will demonstrate the ability to problem solve effectively

Course Specific Goals

Students will be able to:

- Compute interest for all types of loans and read bank statements
- Create a working budget while maintaining this budget for an event
- Budget and calculate costs for food, housing, clothing, and home care
- Determine how the stock market can be utilized for investment purposes
- Determine individual income taxes by filling out necessary forms

Essential Questions

- What forms are necessary in order to file income taxes?
- How are monthly payments on a mortgage determined?
- How can credit cards affect a person's financial situation?
- What typical expenses make up a household budget?
- What type of investment opportunities are available for individuals?

Instructional Strategies

- Demonstrations
- Presentations
- Examples
- Problem Solving
- Group Work
- Effective Use of Smart-Board
- Calculator Exercises
- Discovery Method

Course Outline

Budgeting
 Personal Finance
 Banking
 Checking
 Buying a Car
 Obtaining a Mortgage
 Renting
 Types of Taxes
 Filing Income Taxes
 Job Benefits
 Preparing for Retirement
 Job Related Budgets
 Investing
 Insurance
 Everyday Math in Shopping

Major Evaluation Strategies/Assessments

- Tests
- Homework
- Quizzes
- CORE Assignments
- Open Response Questions

- Rubric Used for Open Response questions and CORE Assignments

