Bristol Public Schools

Office of Teaching & Learning

Department	Mathematics
Department Philosophy	*Students learn by doing math, solving problems in mathematical and real-world contexts, and constructing arguments using precise language.* The Bristol mathematics curricula embeds this *learn-by-doing* philosophy by focusing on high expectations for all students and providing students with opportunities that build conceptual understanding, computational and procedural fluency, and problem solving through the use of a variety of strategies, tools, and technologies. The mathematics curriculum is responsive to the individual needs of students, while providing a structure tied to the Common Core State Standards in Connecticut. The *learn-by-doing* philosophy develops mathematically literate and productive students who can effectively and efficiently apply mathematics in their lives to make informed decisions about the world around them by doing math. To be mathematically literate, one must understand major mathematics concepts, possess computational facility, and have the ability to apply these understandings to situations in daily life. Making connections between mathematics and other disciplines is key to the appropriate application of mathematics skills and concepts to solve problems. The ability to read, discuss, and write within the discipline of mathematics is an integral skill that supports mathematical understanding, reasoning and communication. The opportunity to think critically and creatively to solve problems is important to deepen mathematical knowledge and foster innovation. A rich hands-on mathematical experience is essential to provide the foundational knowledge and skills that prepare students to be mathematically literate, productive citizens.
Course	SAT Math
Course Description for Program of Studies	This course will provide students with a review of the mathematics used on college preparatory tests such as the SAT and ACT. The course will provide students with the opportunity to take practice tests as well as to assess and review areas of weakness in preparation for taking college placement tests. The course may not be used toward the mathematics requirement for graduation.
Grade Level	10-12
Pre-requisites	
Credit (if applicable)	0.25

Table of Contents

UNIT 1: Heart of Algebra

Heart of Algebra:
Analyzing and fluently solving equations and systems of equations; creating expressions, equations, and inequalities to represent relationships between quantities to solve problems; rearranging and interpreting formulas

College Board Standards
HA1: Create, solve, or interpret a linear expression or equation in one variable that represents a context. The expression or equation will have rational coefficients, and multiple steps may be required to simplify the expression, simplify the equation, or solve for the variable in the equation.
HA 2: Create, solve, or interpret linear inequalities in one variable that represent a context. The inequality will have rational coefficients, and multiple steps may be required to simplify or solve for the variable.
HA 3: Build a linear function that models a linear relationship between two quantities. The student will describe a linear relationship that models a context using either an equation in two variables or function notation. The equation or function will have rational coefficients, and multiple steps may be required to build and simplify the equation or function.
HA 5: Create, solve, and interpret systems of two linear equations in two variables. The student will analyze one or more constraints that exist between two variables by creating, solving, or analyzing a system of linear equations to represent a context. The equations will have rational coefficients, and multiple steps may be required to simplify or solve the system.
HA 6: Algebraically solve linear equations (or inequalities) in one variable. The equation (or inequality) will have rational coefficients and may require multiple steps to solve for the variable; the equation may yield no solution, one solution, or infinitely many solutions. The student may also be asked to determine the value of a constant or coefficient for an equation with no solution or infinitely many solutions.
HA 7: Algebraically solve systems of two linear equations in two variables. The equations will have rational coefficients, and the system may yield no solution, one solution, or infinitely many solutions. The student may also be asked to determine the value of a constant or coefficient of an equation in which the system has no solution, one solution, or infinitely many solutions.
HA 8: Interpret the variables and constants in expressions for linear functions within the context presented. The student will make connections between a context and the linear equation that models the context and will identify or describe the real-life meaning of a constant term, a variable, or a feature of the given equation.
HA 9: Understand connections between algebraic and graphical representations. The student will select a graph described by a given linear equation, select a linear equation that describes a given graph, determine the equation of a line given a verbal description of its graph, determine key features of the graph of a linear function from its equation, or determine how a graph may be affected by a change in its equation.

UNIT 1: Heart of Algebra

College Board Standards	Learning Targets: I can	Summative Assessment Strategy	Lesson Progression and Connection to Math Practices	Common Learning Experiences and Assessments
See Heart of Algebra Grade Level Standards above	**Heart of Algebra:** ● I can define variables in the context of the problem. ● I can describe connections between algebraic and graphical representations. ● I can create linear expressions, equations, and inequalities. ● I can solve linear expressions, equations, and inequalities. ● I can represent a problem in function notation. ● I can create and solve a system of equations using graphing, substitution, or elimination. ● I can explain the solution to the system of equations in the context of the problem. ● I can interpret the word problem solution using the answer to the system of equations. ● I can create and solve a system of inequalities. ● I can explain the solution to the system of inequalities in the context of the problem. ● I can interpret the word problem solution using the answer to the system of inequalities.	x Selected Response x Constructed Response Performance Observation	**Lesson Progression and connections:** ● Students will take a practice SAT test ● Students will use ALEKS to work on topics that they struggle with, within this section of the SAT ● Students will use Khan Academy to work on topic specific problems, with SAT style wording. **Khan Academy topics:** **Heart of Algebra** 1. Solving linear equations and linear inequalities 2. Interpreting linear functions 3. linear equation word problems 4. Linear inequality word problems 5. Graphing linear equations 6. Linear function word problems 7. Systems of linear inequalities word problems 8. Solving systems of linear equations 9. Systems of linear equations word problems **ALEKS topics:** 1. Converting Between Fractions and Decimals 2. Evaluating Expressions 3. Properties of Operations 4. One-Step Linear Equations 5. Multi-Step LInear Equations 6. Absolute Value Equations 7. Writing Expressions and Equations	**Mandatory Lessons/Activities:** ● ALEKS (as a supplemental resource to work on topics that they struggle with) ● Khan Academy (as the main set of assignments/practice problems for the course)

			8. Applications of LInear Equations 9. Solving for a Variable and Dimensional Analysis 10. Writing and Graphing Inequalities 11. One-Step LInear Inequalities 12. Multi-Step Linear Inequalities 13. Applications (linear inequalities) 14. Compound Inequalities 15. Absolute Value Inequalities 16. Slope 17. Equations of Lines 18. Applications of Linear Equations with Two Variables 19. Graphs of Functions 20. Systems of LInear EQuations 21. Applications (Linear Systems) 22. Linear Inequalities with Two Variables 23. Systems of Linear Inequalities	
Pacing: 5 weeks			**Math Practices:** ● CCSS.MATH.PRACTICE.MP1 Make sense of problems and persevere in solving them. ● CCSS.MATH.PRACTICE.MP2 Reason abstractly and quantitatively. ● CCSS.MATH.PRACTICE.MP3 Construct viable arguments and critique the reasoning. ● CCSS.MATH.PRACTICE.MP4 Model with mathematics. ● CCSS.MATH.PRACTICE.MP5 Use appropriate tools strategically. ● CCSS.MATH.PRACTICE.MP6 Attend to precision. ● CCSS.MATH.PRACTICE.MP7 Look for and make use of structure. ● CCSS.MATH.PRACTICE.MP8 Look for and express regularity in repeated reasoning.	**Assessments:** ● SAT Practice Test-Heart of Algebra

UNIT 2: Problem Solving and Data Analysis

Problem Solving and Data Analysis:
Creating and analyzing relationships using ratios, proportions, percentages, and units; describing relationships shown graphically; summarizing qualitative and quantitative data

College Board Standards
PS/DA 1: Use ratios, rates, proportional relationships, and scale drawings to solve single- and multistep problems. The student will use a proportional relationship between two variables to solve a multistep problem to determine a ratio or rate; calculate a ratio or rate and then solve a multistep problem; or take a given ratio or rate and solve a multistep problem.
PS/DA 2: Solve single- and multi-step problems involving percentages. The student will solve a multistep problem to determine a percentage; calculate a percentage and then solve a multistep problem; or take a given percentage and solve a multistep problem.
PS/DA 3: Solve single- and multi-step problems involving measurement quantities, units, and unit conversion. The student will solve a multistep problem to determine a unit rate; calculate a unit rate and then solve a multistep problem; solve a multistep problem to complete a unit conversion; solve a multistep problem to calculate density; or use the concept of density to solve a multistep problem.
PS/DA 4: Given a scatter plot, use linear, quadratic, or exponential models to describe how the variables are related. The student will, given a scatter plot, select the equation of a line or curve of best fit; interpret the line in the context of the situation; or use the line or curve of best fit to make a prediction.
PS/DA 5: Use the relationship between two variables to investigate key features of the graph. The student will make connections between the graphical representation of a relationship and properties of the graph by selecting the graph that represents the properties described, or using the graph to identify a value or set of values.
PS/DA 6: Compare linear growth with exponential growth. The student will infer the connection between two variables given a context in order to determine what type of model fits best.
PS/DA 7: Use two-way tables to summarize categorical data and relative frequencies, and calculate conditional probability. The student will summarize categorical data or use categorical data to calculate conditional frequencies, conditional probabilities, association of variables, or independence of events.
PS/DA 8: Make inferences about population parameters based on sample data. The student will estimate a population parameter given the results from a random sample of the population. The sample statistics may mention confidence intervals and measurement error that the student should understand and make use of, but need not calculate.
PS/DA 9: Use statistics to investigate measures of center of data and analyze shape, center, and spread. The student will calculate measures of center and/or spread for a given set of data or use given statistics to compare two separate sets of data. The measures of center that may be calculated include mean, median, and mode, and the measures of spread that may be calculated include range. When comparing two data sets, the student may investigate mean, median, mode, range, and/or standard deviation.
PS/DA 10: Evaluate reports to make inferences, justify conclusions, and determine appropriateness of data collection methods. The reports may consist of tables, graphs, or text summaries.

UNIT 2: Problem Solving and Data Analysis

CCSS Standards #	Learning Targets: I can	Summative Assessment Strategy	Lesson Progression and Connection to Math Practices	Common Learning Experiences and Assessments
See Problem Solving & Data Analysis Grade Level Standards above	**Problem Solving & Data Analysis:** ● I can create a scale drawing to represent a problem. ● I can calculate ratios, rates, and unit rates. ● I can calculate percentages. ● I can calculate unit conversions. ● I can solve problems using ratios, rates, unit rates, and proportional relationships. ● I can solve problems using percentages. ● I can select the correct line or curve of best fit for a problem. ● I can calculate the line of best fit. ● I can use linear, quadratic, or exponential models to describe a relationship in a scatter plot. ● I can interpret the line of best fit in the context of the problem. ● I can determine the correlation of the line of best fit. ● I can use the line of best fit to make a prediction. ● I can determine key features of a graph. ● I can identify a value or set of values from a graph. ● I can compare linear and exponential growth. ● I can calculate relative frequencies, conditional probabilities, and conditional frequencies from two-way tables. ● I can make inferences about	x Selected Response x Constructed Response Performance Observation	**Lesson Progression and connections:** ● Students will take a practice SAT test ● Students will use ALEKS to work on topics that they struggle with, within this section of the SAT ● Students will use Khan Academy to work on topic specific problems, with SAT style wording. **Khan Academy Topics:** **Problem Solving and Data Analysis** 1. Ratios, rates and proportions 2. Percents 3. Units 4. Table data 5. Scatterplots 6. Key features of graphs 7. Linear and exponential growth 8. Data inferences 9. Center, spread and shape of distributions 10. Data collection and conclusions **ALEKS topics:** 1. Ratios and Unit Rates 2. Percents, Decimals, and Fractions 3. Units of Measurement 4. Proportions 5. More on Percents 6. Tables and Graphs of Lines 7. Scatter Plots and LInes of Best Fit 8. Collecting Data 9. Graphs of Data 10. Measures of Center and Spread	**Mandatory Lessons/Activities:** ● ALEKS (as a supplemental resource to work on topics that they struggle with) ● Khan Academy (as the main set of assignments/practice problems for the course)

	population from sample data. ● I can use confidence intervals and measurement error to estimate population. ● I can calculate the measures of the center of a given data set. ● I can calculate measures of spread given a data set. ● I can determine the best measure of the center of data. ● I can analyze the shape, center, and spread of a given data set. ● I can evaluate tables, graphs, or text summaries of data. ● I can justify conclusions using reports. ● I can determine appropriate methods of data collection.		11. Comparing Data 12. Probability of Simple Events	
Pacing: 5 weeks			**Math Practices:** ● CCSS.MATH.PRACTICE.MP1 Make sense of problems and persevere in solving them. ● CCSS.MATH.PRACTICE.MP2 Reason abstractly and quantitatively. ● CCSS.MATH.PRACTICE.MP3 Construct viable arguments and critique the reasoning. ● CCSS.MATH.PRACTICE.MP4 Model with mathematics. ● CCSS.MATH.PRACTICE.MP5 Use appropriate tools strategically. ● CCSS.MATH.PRACTICE.MP6 Attend to precision. ● CCSS.MATH.PRACTICE.MP7 Look for and make use of structure. ● CCSS.MATH.PRACTICE.MP8 Look for and express regularity in repeated reasoning.	**Assessments:** ● SAT Practice Test-Problem Solving and data Analysis

UNIT 3: Passport to Advanced Math

Passport to Advanced Math:
Rewriting expressions using their structure; creating, analyzing, and fluently solving quadratic and higher-order equations; purposefully manipulating polynomials to solve problems

College Board Standards
PAM 1: Create a quadratic or exponential function or equation that models a context. The equation will have rational coefficients and may require multiple steps to simplify or solve the equation.
PAM 2: Determine the most suitable form of an expression or equation to reveal a particular trait, given a context.
PAM 3: Create equivalent expressions involving rational exponents and radicals, including simplifying or rewriting in other forms.
PAM 4: Create an equivalent form of an algebraic expression by using structure and fluency with operations.
PAM 5: Solve a quadratic equation having rational coefficients. The equation can be presented in a wide range of forms to reward attending to algebraic structure and can require manipulation in order to solve.
PAM 6: Add, subtract, and multiply polynomial expressions and simplify the result. The expressions will have rational coefficients.
PAM 7: Solve an equation in one variable that contains radicals or contains the variable in the denominator of a fraction. The equation will have rational coefficients, and the student may be required to identify when a resulting solution is extraneous.
PAM 8: Solve a system of one linear equation and one quadratic equation. The equations will have rational coefficients.
PAM 9: Rewrite simple rational expressions. Students will add, subtract, multiply, or divide two rational expressions or divide two polynomial expressions and simplify the result. The expressions will have rational coefficients.
PAM 10: Interpret parts of nonlinear expressions in terms of their context. Students will make connections between a context and the nonlinear equation that models the context to identify or describe the real-life meaning of a constant term, a variable, or a feature of the given equation.
PAM 11: Understand the relationship between zeros and factors of polynomials, and use that knowledge to sketch graphs. Students will use properties of factorable polynomials to solve conceptual problems relating to zeros, such as determining whether an expression is a factor of a polynomial based on other information provided.
PAM 12: Understand a nonlinear relationship between two variables by making connections between their algebraic and graphical representations. The student will select a graph corresponding to a given nonlinear equation; interpret graphs in the context of solving systems of equations; select a nonlinear equation corresponding to a given graph; determine the equation of a curve given a verbal description of a graph; determine key features of the graph of a linear function from its equation; or determine the impact on a graph of a change in the defining equation.

PAM 13: Use function notation, and interpret statements using function notation. The student will use function notation to solve conceptual problems related to transformations and compositions of functions.
PAM 14: Use structure to isolate or identify a quantity of interest in an expression or isolate a quantity of interest in an equation. The student will rearrange an equation or formula to isolate a single variable or a quantity of interest.

UNIT 3: Passport to Advanced Math

CCSS Standards #	Learning Targets: I can	Summative Assessment Strategy	Lesson Progression and Connection to Math Practices	Common Learning Experiences and Assessments
See Problem Solving & Data Analysis Grade Level Standards above	**Passport to Advanced Math:** ● I can create a quadratic equation. ● I can create an exponential equation. ● I can create equivalent expressions using rational exponents and radicals. ● I can simplify and rewrite expressions using rational exponents and radicals ● I can determine the best form of an expression or equation to use for a given context. ● I can solve quadratic equations. ● I can add, subtract, and multiply polynomial expressions into simplest forms. ● I can solve equations with radicals. ● I can solve equations with variables in the denominator. ● I can identify extraneous solutions. ● I can solve a system of one linear equation and one quadratic equation. ● I can add, subtract, multiply, or divide rational expressions into simplest forms. ● I can describe real-life meaning of a constant term, variable, or a feature of a given nonlinear equation in the context of the problem. ● I can describe the relationship	x Selected Response x Constructed Response Performance Observation	**Lesson Progression and connections:** ● Students will take a practice SAT test ● Students will use ALEKS to work on topics that they struggle with, within this section of the SAT ● Students will use Khan Academy to work on topic specific problems, with SAT style wording. **Khan Academy Topics:** **Passport to Advanced Math** 1.Solving quadratic equations 2.Interpreting nonlinear expressions 3.Quadratic and exponential word problems 4.Manipulating quadratic and exponential expressions 5.Radicals and rational exponents 6.Radical and rational equations 7.Operations with rational expressions 8.Operations with polynomials 9.Polynomial factors and graphs 10.Nonlinear equation graphs 11.Linear and quadratic systems 12.Structure in expressions 13.Isolating quantities 14.Function notation **ALEKS topics:** 1. Factors and Multiples 2. Exponents and Order of Operations 3. Introduction to Functions 4. Transformations 5. Product, Power, and Quotient Rules	**Mandatory Lessons/Activities:** ● ALEKS (as a supplemental resource to work on topics that they struggle with) ● Khan Academy (as the main set of assignments/practice problems. for the course)

	between zeros and factors of polynomials. ● I can sketch graphs of polynomials using zeros or factors of the polynomial. ● I can select the correct graph that corresponds with a given nonlinear equation. ● I can determine key features of a graph from its equation. ● I can interpret graphs in the context of solving systems of equations. ● I can use function notation to solve problems related to transformations and compositions of functions. ● I can rearrange an equation to isolate a single variable or quantity of interest.		6. Negative Exponents 7. Introduction to Radicals 8. Rational Exponents 9. Polynomial Addition and Subtraction 10. Polynomial Multiplication 11. Factoring Using the GCF 12. Factoring by Grouping 13. Factoring Quadratic Trinomials 14. Factoring Special Products 15. Polynomial Division 16. Solving Quadratic Equations by Factoring 17. Radical Functions 18. Operations with Radical Expressions 19. Division and Rationalization 20. Radical Equations and Applications 21. Simplifying Rational Expressions 22. Multiplication and Division (Rational Expressions) 23. Addition and Subtraction (Rational Expressions) 24. Rational Equations and Applications 25. Quadratic Functions 26. Square Root Property 27. Complex Numbers 28. Nonlinear Systems 29. Polynomial Functions 30. Function Operations (Composition) 31. Graphs of Exponential Functions 32. Applications (Exponential Functions)	
Pacing: 5 weeks			**Math Practices:** ● CCSS.MATH.PRACTICE.MP1 Make sense of problems and persevere in solving them. ● CCSS.MATH.PRACTICE.MP2 Reason abstractly and quantitatively. ● CCSS.MATH.PRACTICE.MP3 Construct viable arguments and critique the reasoning. ● CCSS.MATH.PRACTICE.MP4 Model with mathematics.	**Assessments:** ● SAT Practice Test-Passport to Advanced Math ● SAT practice Test-Combined topics

			• CCSS.MATH.PRACTICE.MP5 Use appropriate tools strategically. • CCSS.MATH.PRACTICE.MP6 Attend to precision. • CCSS.MATH.PRACTICE.MP7 Look for and make use of structure. • CCSS.MATH.PRACTICE.MP8 Look for and express regularity in repeated reasoning.	

ADDITIONAL CONSIDERATIONS			
COMMON MISCONCEPTIONS	**PRIOR KNOWLEDGE NEEDED TO MASTER STANDARDS FOR THIS UNIT**	**ADVANCED STANDARDS FOR STUDENTS WHO HAVE DEMONSTRATED PRIOR MASTERY**	**OPPORTUNITIES FOR STUDENT-DIRECTED LEARNING WITHIN THE UNIT**
	List standards in the unit and link to achieve the core coherence map for each standard		
RESOURCES			
SAT Lessons from College Board			