Regular & Honors Algebra I

It is the fundamental philosophy of the Temple Christian School Math Department that the observable complexity and order demonstrated in nature is the result of God's creative power and design rather than "cosmic happenstance."   It would indeed seem to us that Galileo Galilei was correct when he said that mathematics is the language "with which God has written the universe." In light of this, the department's desire is to teach mathematics with a spiritual emphasis in accordance with the Apostle Paul's assertion in Romans 1 that God's eternal power and divine nature are clearly seen in nature.

In light of the department philosophy and given the size of our school, we have instituted a college preparatory curriculum that has two tiers in concert with a Christian world-view. It is designed so that students may aggressively pursue mathematics, or may simply prepare for the entry-level college algebra curriculum. As a result, the TCS Math Department hopes that critical thinking and exploration will run throughout our curriculum and coursework, increasing in emphasis as students rise higher in the degree of difficulty of the work attempted.

Course Description

This course is designed for the students that have completed our Pre-Algebra course. It encompasses the TEKS set forth by the Texas Education Association and focuses on linear functions and relations, and offers an introduction to exponential and quadratic functions. It is designed to foster both individual conceptual growth and use of simple technology in exploring the library of functions and enhancing conceptual grasp.

The regular and honors-level Algebra I courses are essentially the same; however, the honors level is more fast-paced and rigorous, and is aimed at the more mathematically capable and ambitious college-prep students. It is designed to prepare these students for the follow-on Geometry and Algebra II courses.   The honors course is administered in such a way as to require the student to undertake more homework and effort, both in and outside class to appropriately take advantage of the curriculum.

Scope & Sequence for Fall 2017

Expressions, Equations, and Functions: Students will review basics such as the use of variables and order of operations. Topics reviewed/introduced will include evaluating expressions, proper use of order of operations, and writing algebraic expressions.
TEKS §111.39 (c), 1A-G (Reference Chapter 1 and auxiliary material, planned time is 12 days)

Real Numbers: Students will study properties of Real Numbers with emphasis on their uses and place in number sets. Students will be able to perform four function operations (add/subtract/multiply/divide) using real numbers and will utilize the distributive property. Students will also review the nature of square roots in arithmetic.
TEKS §111.39 (c), 1A-G, 11A (Reference Chapter 2 and auxiliary material, planned time is 16 days)

Linear Equations: Students will study the nature of linear equations and learn to learn to solve them using acceptable techniques. As an extension of this students will study ratio, proportion, and properties of cross-products, and will manipulate equations to rewrite in a desired form. As an application of this, students will review the use of the concept of percentage.

TEKS §111.39 (c), 1A-G, 5A (Reference Chapter 3, planned time is 12 days)

Graphing Linear Equations and Functions: Students will review the coordinate plane, explore the nature of scatter plots, and learn to graph linear equations and functions without using a graphing calculator. Direct variation will be briefly explored as a special case of graphing linear functions.
TEKS §111.39 (c), 1A-G,3A-H (Reference Chapter 4, planned time is 15 days)

Writing Linear Equations: Students will learn to write linear equations in slope intercept form, point slope form and standard form given either the graph or information about the line. Students should be able to algebraically calculate slope, x-intercepts and y-intercepts. Students will apply their knowledge of linear equations to draw a best fitting line, write the related equation and make predictions using linear models.
TEKS §111.39 (c), 1A-G, 2A-H (Reference Chapter 5, planned time is 14 days)

Linear Inequalities: Students will study linear inequalities and demonstrate an ability to solve and graph them. Attention will be given to one-step, multi-step, compound and absolute value inequalities. Students will graph one variable and two variable inequalities without the aid of a calculator and explore stem and leaf plots, mean, median and mode.
TEKS §111.39 (c), 1A-G, 2H, 3D, 5B (Reference Chapter 6, planned time is 10 days)

Scope & Sequence for Spring 2018

Systems of Equations and Inequalities: Students will learn to solve systems of linear equations by graphing, substitution and linear combination. Students should be able to identify systems with many solutions and no solution. Students will learn to solve systems of linear inequalities by graphing. Practical applications of both types of systems will be explored.
TEKS §111.39 (c), 1 A-G, 2A, 2I, 2F-H 3G-H, 5C (Reference Chapter 7, planned time is 14 days)

Exponents and Exponential Functions: Students will learn the rules governing multiplication of exponents, zero and negative exponents and division of exponents. The exponential function will be introduced and students will briefly explore scientific notation. Students will be introduced to exponential growth and decay, recognize growth and decay graphs, become familiar with simple formulae demonstrating exponential growth and decay, and make predictions based on related models.
TEKS §111.39 (c), 1 A-G, 9A-E, 11 B (Reference Chapter 8, planned time is 13 days)

Polynomials and Factoring: High degree polynomials will be introduced and students will learn to add, subtract and multiply polynomial expressions. Students will make a cursory study of quadratic factoring.
TEKS §111.39 (c), 1 A-G, 10 A-F (Reference Chapter 9, planned time is 12 days)

Quadratic Equations and Functions: Students will be introduced to quadratic functions and make a cursory study of the graphic appearance of a quadratic function, solving quadratic equations by taking square roots, and solving by way of the quadratic formula.
TEKS §111.39 (c), 1 A-G, 6 A-C, 7 A-C, 8A-B, 11A (Reference Chapter 10, planned time is 15 days)

Fundamental Arithmetic/Algebra of Radicals: Students will explore the arithmetic and simple operations of square root expressions and common applications in the Pythagorean Theorem and in the "distance formula."
TEKS §111.39 (c), 1 A-G* (No TEKS refer directly to this topic.) (Reference Chapter 11, planned time is 15 days)

Measures of Central Tendency: Students will make a cursory study of how to determine mean, median, mode, range, and (population) standard deviation.
TEKS §111.39 (c), 1 A-G* (No TEKS refer directly to this topic.) (Reference Sections Skills Review Handbook Page 918 and Chapter 13, planned time is 12 days)

Of note: 'planned time' as indicated for each chapter may be adjusted based on specific class learning pace, as well as school-related activities; there is sufficient flexibility in the scope/sequence to adjust for schedule impacts.

Methodology

There will be two major methods emphasized in our coursework; all students will be (1) encouraged to take advantage of the inherent strengths generated by mathematics done without a calculator and (2) will be taught to use modern technology as an exploratory tool to enhance the learning process. The course will be taught with an eye toward standardized college entrance testing.

Textbook

This document is linked to the Alg. I textbook in current use (Algebra I, Holt McDougal, Larson lead author, Student Edition ISBN 9780547315157) to complete a well-rounded high school mathematics study mandated by the state of Texas.

Evaluation

Assessment will include recall, understanding, and skill level for each class, and will occur in three primary ways. Students will undergo chapter assessments/tests (approximately every 3 weeks) and a semester cumulative assessment (Semester Exam). Students will also undertake assessments over the course of each chapter to include quizzes and homework assignments.   Not all homework will be used in the grading process, but enough will be used to confirm and validate a student's demonstrated progress. In addition, a bi-weekly participation grade will be awarded to each student. As the name implies, it is based on in-class work (answering questions, problem solving on the 'white board', and adherence to classroom policies/procedures). In assessing student work, mathematics department instructors will encourage student development of the ability to articulate what they know about the subject being studied in both written and oral form.

Texas Essential Knowledge & Skills

§111.39. Algebra I, Adopted 2012 (One Credit)

(a) General requirements. Students shall be awarded one credit for successful completion of this course. This course is recommended for students in Grade 8 or 9. Prerequisite: Mathematics, Grade 8 or its equivalent.

(b) Introduction.

(1) The desire to achieve educational excellence is the driving force behind the Texas essential knowledge and skills for mathematics, guided by the college and career readiness standards. By embedding statistics, probability, and finance, while focusing on fluency and solid understanding, Texas will lead the way in mathematics education and prepare all Texas students for the challenges they will face in the 21st century.

(2) The process standards describe ways in which students are expected to engage in the content. The placement of the process standards at the beginning of the knowledge and skills listed for each grade and course is intentional. The process standards weave the other knowledge and skills together so that students may be successful problem solvers and use mathematics efficiently and effectively in daily life. The process standards are integrated at every grade level and course. When possible, students will apply mathematics to problems arising in everyday life, society, and the workplace. Students will use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution. Students will select appropriate tools such as real objects, manipulatives, paper and pencil, and technology and techniques such as mental math, estimation, and number sense to solve problems. Students will effectively communicate mathematical ideas, reasoning, and their implications using multiple representations such as symbols, diagrams, graphs, and language. Students will use mathematical relationships to generate solutions and make connections and predictions. Students will analyze mathematical relationships to connect and communicate mathematical ideas. Students will display, explain, or justify mathematical ideas and arguments using precise mathematical language in written or oral communication.

(3) In Algebra I, students will build on the knowledge and skills for mathematics in Grades 6-8, which provide a foundation in linear relationships, number and operations, and proportionality. Students will study linear, quadratic, and exponential functions and their related transformations, equations, and associated solutions. Students will connect functions and their associated solutions in both mathematical and real-world situations. Students will use technology to collect and explore data and analyze statistical relationships. In addition, students will study polynomials of degree one and two, radical expressions, sequences, and laws of exponents. Students will generate and solve linear systems with two equations and two variables and will create new functions through transformations.

(4) Statements that contain the word "including" reference content that must be mastered, while those containing the phrase "such as" are intended as possible illustrative examples.

(c) Knowledge and skills.

(1) Mathematical process standards. The student uses mathematical processes to acquire and demonstrate mathematical understanding. The student is expected to:

(A) apply mathematics to problems arising in everyday life, society, and the workplace;

(B) use a problem-solving model that incorporates analyzing given information, formulating a plan or strategy, determining a solution, justifying the solution, and evaluating the problem-solving process and the reasonableness of the solution;

(C) select tools, including real objects, manipulatives, paper and pencil, and technology as appropriate, and techniques, including mental math, estimation, and number sense as appropriate, to solve problems;

(D) communicate mathematical ideas, reasoning, and their implications using multiple representations, including symbols, diagrams, graphs, and language as appropriate;

(E) create and use representations to organize, record, and communicate mathematical ideas;

(F) analyze mathematical relationships to connect and communicate mathematical ideas; and

(G) display, explain, and justify mathematical ideas and arguments using precise mathematical language in written or oral communication.

(2) Linear functions, equations, and inequalities. The student applies the mathematical process standards when using properties of linear functions to write and represent in multiple ways, with and without technology, linear equations, inequalities, and systems of equations. The student is expected to:

(A) determine the domain and range of a linear function in mathematical problems; determine reasonable domain and range values for real-world situations, both continuous and discrete; and represent domain and range using inequalities;

(B) write linear equations in two variables in various forms, including $y = mx + b$, $Ax + By = C$, and $y - y_1 = m(x - x_1)$, given one point and the slope and given two points;

(C) write linear equations in two variables given a table of values, a graph, and a verbal description;

(D) write and solve equations involving direct variation;

(E) write the equation of a line that contains a given point and is parallel to a given line;

(F) write the equation of a line that contains a given point and is perpendicular to a given line;

(G) write an equation of a line that is parallel or perpendicular to the X or Y axis and determine whether the slope of the line is zero or undefined;

(H) write linear inequalities in two variables given a table of values, a graph, and a verbal description; and

(I) write systems of two linear equations given a table of values, a graph, and a verbal description.

(3) Linear functions, equations, and inequalities. The student applies the mathematical process standards when using graphs of linear functions, key features, and related transformations to represent in multiple ways and solve, with and without technology, equations, inequalities, and systems of equations. The student is expected to:

(A) determine the slope of a line given a table of values, a graph, two points on the line, and an equation written in various forms, including $y = mx + b$, $Ax + By = C$, and $y - y_1 = m(x - x_1)$;

(B) calculate the rate of change of a linear function represented tabularly, graphically, or algebraically in context of mathematical and real-world problems;

(C) graph linear functions on the coordinate plane and identify key features, including x-intercept, y-intercept, zeros, and slope, in mathematical and real-world problems;

(D) graph the solution set of linear inequalities in two variables on the coordinate plane;

(E) determine the effects on the graph of the parent function $f(x) = x$ when $f(x)$ is replaced by $af(x)$, $f(x) + d$, $f(x - c)$, $f(bx)$ for specific values of a, b, c, and d;

(F) graph systems of two linear equations in two variables on the coordinate plane and determine the solutions if they exist;

(G) estimate graphically the solutions to systems of two linear equations with two variables in real-world problems; and

(H) graph the solution set of systems of two linear inequalities in two variables on the coordinate plane.

(4) Linear functions, equations, and inequalities. The student applies the mathematical process standards to formulate statistical relationships and evaluate their reasonableness based on real-world data. The student is expected to:

(A) calculate, using technology, the correlation coefficient between two quantitative variables and interpret this quantity as a measure of the strength of the linear association;

(B) compare and contrast association and causation in real-world problems; and

(C) write, with and without technology, linear functions that provide a reasonable fit to data to estimate solutions and make predictions for real-world problems.

(5) Linear functions, equations, and inequalities. The student applies the mathematical process standards to solve, with and without technology, linear equations and evaluate the reasonableness of their solutions. The student is expected to:

(A) solve linear equations in one variable, including those for which the application of the distributive property is necessary and for which variables are included on both sides;

(B) solve linear inequalities in one variable, including those for which the application of the distributive property is necessary and for which variables are included on both sides; and

(C) solve systems of two linear equations with two variables for mathematical and real-world problems.

(6) Quadratic functions and equations. The student applies the mathematical process standards when using properties of quadratic functions to write and represent in multiple ways, with and without technology, quadratic equations. The student is expected to:

(A) determine the domain and range of quadratic functions and represent the domain and range using inequalities;

(B) write equations of quadratic functions given the vertex and another point on the graph, write the equation in vertex form ($f(x) = a(x - h)^2 + k$), and rewrite the equation from vertex form to standard form ($f(x) = ax^2 + bx + c$); and

(C) write quadratic functions when given real solutions and graphs of their related equations.

(7) Quadratic functions and equations. The student applies the mathematical process standards when using graphs of quadratic functions and their related transformations to represent in multiple ways and determine, with and without technology, the solutions to equations. The student is expected to:

(A) graph quadratic functions on the coordinate plane and use the graph to identify key attributes, if possible, including x-intercept, y-intercept, zeros, maximum value, minimum values, vertex, and the equation of the axis of symmetry;

(B) describe the relationship between the linear factors of quadratic expressions and the zeros of their associated quadratic functions; and

(C) determine the effects on the graph of the parent function $f(x) = x^2$ when $f(x)$ is replaced by $af(x), f(x) + d, f(x - c), f(bx)$ for specific values of a, b, $c,$ and d.

(8) Quadratic functions and equations. The student applies the mathematical process standards to solve, with and without technology, quadratic equations and evaluate the reasonableness of their solutions. The student formulates statistical relationships and evaluates their reasonableness based on real-world data. The student is expected to:

(A) solve quadratic equations having real solutions by factoring, taking square roots, completing the square, and applying the quadratic formula; and

(B) write, using technology, quadratic functions that provide a reasonable fit to data to estimate solutions and make predictions for real-world problems.

(9) Exponential functions and equations. The student applies the mathematical process standards when using properties of exponential functions and their related transformations to write, graph, and represent in multiple ways exponential equations and evaluate, with and without technology, the reasonableness of their solutions. The student formulates statistical relationships and evaluates their reasonableness based on real-world data. The student is expected to:

(A) determine the domain and range of exponential functions of the form $f(x) = ab^x$ and represent the domain and range using inequalities;

(B) interpret the meaning of the values of *a* and *b* in exponential functions of the form $f(x) = ab^x$ in real-world problems;

(C) write exponential functions in the form $f(x) = ab^x$ (where *b* is a rational number) to describe problems arising from mathematical and real-world situations, including growth and decay;

(D) graph exponential functions that model growth and decay and identify key features, including *y*-intercept and asymptote, in mathematical and real-world problems; and

(E) write, using technology, exponential functions that provide a reasonable fit to data and make predictions for real-world problems.

(10) Number and algebraic methods. The student applies the mathematical process standards and algebraic methods to rewrite in equivalent forms and perform operations on polynomial expressions. The student is expected to:

(A) add and subtract polynomials of degree one and degree two;

(B) multiply polynomials of degree one and degree two;

(C) determine the quotient of a polynomial of degree one and polynomial of degree two when divided by a polynomial of degree one and polynomial of degree two when the degree of the divisor does not exceed the degree of the dividend;

(D) rewrite polynomial expressions of degree one and degree two in equivalent forms using the distributive property;

(E) factor, if possible, trinomials with real factors in the form $ax^2 + bx + c$, including perfect square trinomials of degree two; and

(F) decide if a binomial can be written as the difference of two squares and, if possible, use the structure of a difference of two squares to rewrite the binomial.

(11) Number and algebraic methods. The student applies the mathematical process standards and algebraic methods to rewrite algebraic expressions into equivalent forms. The student is expected to:

(A) simplify numerical radical expressions involving square roots; and

(B) simplify numeric and algebraic expressions using the laws of exponents, including integral and rational exponents.

(12) Number and algebraic methods. The student applies the mathematical process standards and algebraic methods to write, solve, analyze, and evaluate equations, relations, and functions. The student is expected to:

(A) decide whether relations represented verbally, tabularly, graphically, and symbolically define a function;

(B) evaluate functions, expressed in function notation, given one or more elements in their domains;

(C) identify terms of arithmetic and geometric sequences when the sequences are given in function form using recursive processes;

(D) write a formula for the nth term of arithmetic and geometric sequences, given the value of several of their terms; and

(E) solve mathematic and scientific formulas, and other literal equations, for a specified variable.

Source: The provisions of this §111.39 adopted to be effective September 10, 2012, 37 TexReg 7109.