AVATAR College Preparatory Mathematics Framework
Education Service Center Region 13

Course Description:

This course addresses a variety of mathematical topics needed to prepare students success in college-level mathematics. In addition, the course supports students in developing skills and strategies needed to succeed in college. Successful completion of this course, as defined by the memorandum of understanding (MOU) with the partnering institution(s), grants the student an exemption to TSI requirements for mathematics at the partnering institution(s). Throughout the entire course, the Texas College and Career Readiness Standards (TCCRS) for Mathematics sections Communication & Representation and Connections should be stressed. Alignment to the TCCRS for Mathematics and Cross-Disciplinary standards are noted in parentheses below.

Course Goal:

The goal of this course is to develop students' quantitative and algebraic reasoning abilities, thus preparing them for college success in the algebra intensive courses College Algebra MATH 1314, or Finite Mathematics MATH 1324. Students will also achieve mastery of concepts that will help prepare students for a Quantitative Literacy Course MATH 1332 or Elementary Statistics MATH 1342.

Austin Community College (ACC) Master Syllabi: http://www.austincc.edu/syllabus/master-syllabi.php
Our primary goal is to prepare students for MATH 1314 College Algebra & MATH 1342 Elementary Statistics. Course objectives for these courses can be found on the master syllabi at the link above. Prerequisite skill knowledge for for MATH 1332 and MATH 1324 is fairly consistent with that for MATH 1314 and Math 1342.

Target Students:

This course is appropriate for 12th grade students whose performance on measures outlined in TEC §28.014 indicates that the student is not ready to perform entry-level college coursework in Mathematics. This course is designed to advance college and career readiness.

Recommended Prerequisites:

Satisfactory completion of Algebra I and the Algebra I EOC exam, Geometry, and a third credit of mathematics from the courses listed in TAC §74.12(b)(1)(2). *Senate Bill 149 has revised the state's assessment graduation requirements for students enrolled in the 11th or 12th grade for the 2014-2015, 2015-2016, or 2016-2017 school years. A student who has failed the EOC assessment graduation requirements for no more than two courses may receive a Texas high school diploma if the student has qualified to graduate by means of an individual graduation committee (IGC).*

The Texas Success Initiative and TSI Assessment:

TSI Assessment is the Texas Higher Education Coordinating Board-approved assessment instrument designated for use by institutions of higher education for assessing a student's readiness to enroll in an entry-level freshman course. The TSI Assessment is the statewide standard for college readiness in Texas. Achieving the passing standard in mathematics on the TSI Assessment standard allows a student to enroll in entry-level freshman mathematics coursework at any public college/university in Texas for a period of five years from the date of testing. Students may be considered exempt from TSI in mathematics by achieving a score of 19 on the ACT mathematics test or a score of 500 on SAT mathematics test. ***All students who have not satisfied TSI requirements in mathematics on TSIA, ACT, or SAT by the end of this course are strongly*** *encouraged to take the TSI Assessment.*

Benefits of Successfully Completing the HB 5 College Preparatory Course:
In addition to meeting college readiness requirements on the TSI Assessment, students may earn a one-year exemption to TSI by successfully completing this course. "Successful completion" is achieved by earning a grade of 75% on the Austin Community College examination for the course. To earn this exemption, students must also earn a 70% for the final course grade. Meeting both requirements for successful completion will grant the student an exemption to TSI requirements in mathematics for a period of one year after graduation. This one-year exemption is only guaranteed to apply at Austin Community College. Students who do not meet both requirements will not earn an exemption to TSI. Students who earn the one-year exemption by successfully completing the requirements of this course are still strongly encouraged to take the TSI assessment.

Definition of Successful Completion of the HB College Preparatory Course for Austin Community College:
For the purpose of earning a one-year exemption to TSI mathematics requirements at Austin Community College, students are considered to have successfully completed this course by:
(1) earning a 70% or higher for the final course grade; AND
(2) earning a grade of 75% or higher on the Austin Community College final examination for the course.

Definition of Successful Completion of the HB 5 College Preparatory Course:
To earn high school credit for this course, students must:
(1) earn a 70% or higher for the final course grade;
Note: It is possible to meet the high school credit requirements and not earn the one-year exemption to TSI.

Student Learning Outcomes & Learning Objectives:
Upon successful completion of this course, students will be able to:

(1) **Mathematical process standards**. Use 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) **Numeric Reasoning**. Perform computations with real and complex numbers. (TCCRS - I.A.1-2, I.B.1, IV.B.1-2) The student is expected to:
(A) Demonstrate mastery of:
      i. computations using whole numbers, integers, and rational numbers;
      ii. order and elementary arithmetic operations;
      iii. simplifying complex fractions;
      iv. finding absolute value;
      v. computations using irrational and complex numbers; and

      I. rational denominators

(B) Convert between fractions, decimals, and percentages;

(C) Apply order of operations;

(D) Use scientific notation;

(E) Convert units within a measurement system; and

(F) Convert from one measurement system to another.

(3) **Algebraic Reasoning**. Simplify, factor, and perform basic operations on algebraic expressions, including polynomials, rational and radical expressions, complex fractions, and complex numbers. (TCCRS - II.A.1, II.B.1) The student is expected to:

(A) Perform elementary arithmetic operations on polynomial, radical or rational expressions, including those that require factoring;

(B) Simplify a complex fraction, including one with negative exponents;

(C) Simplify an expression with fractional or negative exponents; and

(D) Simplify a radical expression, including rationalizing a monomial or binomial denominator.

(4) **Algebraic Reasoning**. Solve linear, absolute value, rational, and radical equations, quadratic equations, linear inequalities, and systems of equations. (TCCRS - II.C.1-2) The student is expected to:

(A) Solve linear equations and linear inequalities;

(B) Solve a quadratic equation with real or non-real solutions using factoring, principal of square roots, completing the square, or the quadratic formula;

(C) Solve rational equations including one with a quadratic expression in the denominator, identifying extraneous solutions;

(D) Solve absolute value equations;

(E) Solve radical equations, identifying extraneous solutions; and

(F) Solve systems of equations by graphing, substitution or elimination.

(5) **Algebraic Reasoning & Functions**. Have knowledge of properties of functions in general, with detailed knowledge of linear and quadratic functions. (TCCRS - II.D.1-2, VII.A.1-2, VII.B.1-2, VII.C.1) The student is expected to:

(A) Use representations of functions from tables, graphs or formulas;

(B) Evaluate a function using function notation;

(C) Find the domain and range of a function;

(D) Perform basic operations with functions, including composition;

(E) Construct and analyze linear functions, including slope and intercepts;

(F) Construct and analyze quadratic functions; and

(G) Use functions that model real world situations.

(6) **Algebraic Reasoning**. Graph linear equations and inequalities, including systems of each, quadratic functions, and circles. (TCCRS - II.D.1-2)

The student is expected to:

(A) Use the concepts of slope and intercept to graph linear functions from multiple forms (slope-intercept, standard, and point-slope);

(B) Graph a linear inequality on the Cartesian plane;

(C) Graph a system of linear inequalities on the Cartesian plane;

(D) Graph a quadratic function from vertex or standard form;

(E) Graph a quadratic function, written in the form, using transformations;

(F) Graph a circle; and

(G) Graph a function, such as a simple absolute value or rational function, by completing a table and plotting points.

(7) **Geometric Reasoning**. Use forms and formulas, including quadratic formula, midpoint, distance, and equations of circles and lines. (TCCRS - III.C.1, III.C.3, IV.C.1-3) The student is expected to:
(A) Find the midpoint and the distance between two points, from formulas or on a graph;
(B) Complete a square to rewrite an equation for a circle in standard form and identify its center and radius;
(C) Change from one form for the equation of a line to another;
(D) Find perimeter and area of two-dimensional figures; and
(E) Find surface area and volume of three-dimensional figures.

(8) **Problem Solving & Reasoning**. Solve application problems using linear and quadratic models, direct and inverse variation, geometry, measurement, and 2x2 systems of linear equations (TCCRS - I.C.1, II.D.1-2, III.A.2-3, VII.C.1-2, VIII.A.1-5, VIII.C.1-3, IX, X) The student is expected to:
(A) Represent English descriptions of numerical relationships in algebraic form;
(B) Construct equations, solve, and interpret the result in the original context of the problem;
(C) Choose appropriate units for answers;
(D) Use given formulas, such as compound interest or a real world model to solve application problems;
(E) Use problems with scale drawings or similarity of figures to solve application problems;
(F) Use real world problems involving line plots, bar graphs, circle graphs and two-way tables; and
(G) Use problems involving ratios and proportions.

Additional Learning Outcomes to Support Statistics and Quantitative Reasoning. Upon successful completion of this course, students will be able to:

(9) **Probabilistic Reasoning**. Compute and interpret the probability of an event. (TCCRS - V.B.1-2) The student is expected to:
(A) Compute probabilities as percentages, fractions or decimals;
(B) Compute probabilities from sample spaces;
(C) Compute the probability of the complement of an event;
(D) Compute the probability of conditional and compound events;
(E) Compute probabilities from line plots, bar graphs, circle graphs and two-way tables; and
(F) Use real world application problems with probabilities.

(10) **Statistical Reasoning**. Compute and interpret measures of central tendency. (TCCRS - VI.B.2-3) The student is expected to:
(A) Compute the mean, median and mode for a set of data points
(B) Compare and contrast the value of the measures for a set of data points
(C) Given a measure of central tendency, find a missing data point
(D) Use real world application problems with measures of central tendency

(11) **Process Learning Outcomes Derived from the TCCRS Cross-Disciplinary Standards**. Students will:
(A) Engage in dialogue to seek feedback and use constructive criticism to improve their performance. (I.2.A)
(B) Construct and communicate logical arguments supported by evidence. (I.B.2, I.B.3)
(C) Analyze situations to identify problems and apply effective problem-solving strategies. (I.C.1, I.C.2)
(D) Self-monitor their learning needs, use study habits to manage academic tasks, seek assistance when needed, and persevere until task completion and mastery. (I.D.1, I.D.2, I.D.4)
(E) Find and evaluate information, properly attributing ideas and material to their original sources. (I.F.1, I.F.2)

(F) Demonstrate effective reading and note-taking strategies that enhance retention and comprehension. (II.A.1, II.A.2, II.A.4, II.A.6, II.A.7)

(G) Demonstrate written and oral communication that is appropriate to the context and that effectively conveys meaning and logic to a variety of audiences. (I.B.1, I.B.2, I.B.C, I.D.3, II.B.2)

(H) Research, evaluate, synthesize, and organize information effectively. (II.C.5)

(I) Plan investigations, collect and interpret data, and effectively communicate findings in a variety of formats. (II.D.2, II.D.3)

(J) Demonstrate a positive mindset toward learning and maintain motivation. (I.D.1, I.D.3, I.D.4)

YAG/Pacing Guide:

Unit 1: Numeric Reasoning: Real and complex numbers

Unit 2: Algebraic Reasoning: Polynomials, rational and radical expressions, complex fractions, and complex numbers.

Unit 3: Algebraic Reasoning: Linear, absolute value, rational, radical and quadratic equations, linear inequalities, and systems of equations.

Unit 4: Algebraic Reasoning & Functions: Properties of functions including linear and quadratic

Unit 5: Algebraic Reasoning: Linear equations and inequalities, Systems of equations/inequalities, quadratic functions, and circles.

Unit 6: Geometric Reasoning: Quadratic formula, midpoint, distance, and equations of circles and lines.

Unit 7: Problem Solving & Reasoning: Linear and quadratic models, direct and inverse variation, geometry, measurement, and 2x2 systems of linear equations

Unit 8: Probabilistic Reasoning: Probability of an event.

Unit 9: Statistical Reasoning: Measures of central tendency.

*Includes all process standards

Pedagogical Overview

Various teaching styles can be applied to this course. It is recognized that instructors have a variety of experiences using different resources and techniques. Amongst these include collaborative learning, project based learning, problem based learning, and the incorporation of technology and adaptive resources. The following are examples of these techniques and select resources that could be used as an introduction to the types of instruction available.

Importance of Mindset in College Success

Establishing the correct mindset for success in this course and in future college courses is a key concept for academic success. Positive academic outcomes and success in school are associated with student academic mindsets. The term academic mindsets refers to student attitudes, beliefs, and dispositions about school and learning that are associated with positive academic outcomes and school success. Students who focus on their academic mindset can affect the quality, duration, and intensity with which they engage in behaviors that are critical to their success (e.g., attendance and studying). Therefore, this course should provide opportunities where students develop the mindset of being successful in this course and that succeeding in math is a path that is open to all students. This course should offer students the ability to learn math and to learn a new set of "learning how to learn" strategies that will go on to help them become a successful student in college. This idea of self-regulated learning (SRL) will help students fundamentally change the way they learn by learning how to use feedback, how to set up realistic goals when trying out strategies, and how to evaluate whether the strategies are really working. Successful students become so not through a quick one-step process that they go through once and then master. This course shall reinforce that any type of learning takes time and lots of practice of going through many cycles of planning, practice, and evaluation.

Recommended Textbook Materials:

This curriculum can be covered by the following two books. At the time of this writing, these are the current editions, but schools may need to find an appropriate mapping for later editions.

Creative use of alternative materials is encouraged. This is provided for the sake of clarity of course objectives, and as a resource to make course preparation easier for those who choose to use these standard materials. Sections covered are outlined below.

Intermediate Algebra 6/e by Elayn Martin-Gay; ISBN 0321785045, Pearson.

1.1 Tips for Success in Mathematics
1.2 Algebraic Expressions and Sets of Numbers
1.3 Operations on Real Numbers and Order of Operations
1.4 Properties of Real Numbers and Algebraic Expressions
2.1 Linear Equations in One Variable
2.2 An Introduction to Problem Solving
2.3 Formulas and Problem Solving
2.4 Linear Inequalities and Problem Solving
2.5 Compound Inequalities
2.6 Absolute Value Equations
3.1 Graphing Equations
3.2 Introduction to Functions
3.3 Graphing Linear Functions
3.4 The Slope of a Line
3.5 Equations of Lines
3.6 Shifting and Reflecting Graphs of Functions (Piecewise Functions optional)
3.7 Graphing Linear Inequalities
4.1 Solving Systems of Linear Equations in Two Variables
4.3 Systems of Linear Equations & Problem Solving
4.5 Systems of Linear Inequalities
5.1 Exponents and Scientific Notation
5.3 Polynomials and Polynomial Functions
5.4 Multiplying polynomials
5.5 The GCF and Factoring by Grouping
5.6 Factoring Trinomials

5.7 Factoring Special products
5.8 Solving Equations by Factoring and Problem Solving
6.1 Rational Functions and Multiplying and Dividing Rational Expressions
6.2 Adding and Subtracting Rational Expressions
6.3 Simplifying Complex Fractions
6.4 Dividing Polynomials: Long Division (not including Synthetic Division)
6.5 Solving Equations Containing Rational Expressions
6.6 Rational Equations and Problem Solving
6.7 Variation and Problem Solving
7.1 Radicals and Radical Functions
7.2 Rational Exponents
7.3 Simplifying Radical Expressions
7.4 Adding, Subtracting, and Multiplying Radical Expressions
7.5 Rationalizing Denominators (Numerators opt.)
7.6 Radical Equations and Problem Solving
7.7 Complex Numbers
8.1 Solving Quadratic Equations by Completing the Square
8.2 Solving Quadratic Equations by the Quadratic Formula
8.3 Solving Equations by Using Quadratic Methods
8.5 Quadratic Functions from their Graphs
9.1 The Algebra of Functions (Composite optional)
10.1 The Parabola and the Circle

Mathematics All Around, 5/e by Thomas Pirnot; ISBN 0321836995, Pearson.
Note: Chapter 1 can be replaced by some material from Crossing the River with Dogs (see below)

1.1 Problem Solving
1.2 Inductive and Deductive Reasoning
2.1 The Language of Sets
2.2 Comparing Sets
2.3 Set Operations
3.1 Statements, Connectives, and Quantifiers
3.2 Truth Tables (only as needed for other topics)
3.3 The Conditional (Biconditional optional)

12.1 Introduction to Counting Methods
12.2 The Fundamental Counting Principle
13.1 The Basics of Probability Theory
13.2 Complements and Unions of Events
13.3 Conditional Probability and Intersections of Events
14.1 Organizing and Visualizing Data
14.2 Measures of Central Tendency

Recommended Supplemental Material
Crossing the River with Dogs: Problem Solving for College Students, 2nd Edition by Ken Johnson, Ted Herr, & Judy Kysh; Paperback ISBN 9780470464731 or E-Text ISBN 9781118214770, Wiley.

Alternative Materials
The following materials are listed because they are designed with a specific teaching methodology. Many other materials may also be appropriate, even though they may not be listed here.
- Intermediate Algebra: Functions & Authentic Applications, 4/E by Jay Lehmann, ISBN 032162095X; Pearson.
  This textbook is dependent on graphing calculators and has a heavy emphasis on modeling.
- Intermediate Algebra with Applications and Visualization, 3/E by Gary K. Rockswold and Terry A. Krieger, ISBN 0321500032; Pearson.
  This textbook makes heavy use of multiple representation of functions (numeric, graphic, symbolic, verbal) in all topics.
- Intermediate Algebra, 3/E by Michael Sullivan and Katherine R. Struve, ISBN III0321880129; Pearson.
  This textbook is fairly traditional, but goes into more depth than most other textbooks, offering a variety of challenging problems in the exercise sets.
- Mathematics in Action: Algebraic, Graphical, and Trigonometric Problem Solving 4/e by The Consortium for Foundation Mathematics, ISBN 0321698614; Pearson.
  This textbook is activity-based, and lends itself well to group work in the classroom.

Recommended Technology Materials:
ACC College Readiness and the Texas Success Initiative Resource Website:
http://www.austincc.edu/collegeconnection/educators/tsi.php
Algebra II Revised (2012) Texas Essential Knowledge and Skills (TEKS):
http://ritter.tea.state.tx.us/rules/tac/chapter111/ch111c.html#111.40
Texas Education Agency (TEA) Algebra II Side-By-Side TEKS Comparison:
http://jukebox.esc13.net/PSgateway/Side-by-SideTEKS/docs/11_Algebra_II_Side_by_Side.pdf
TASA iTunes U College Preparatory Course: https://itunes.apple.com/us/course/hb-5-college-preparatory-mathematics/id875526876
SREB Math Ready: http://www.sreb.org/public/special/signin/MathReady.pdf
Khan Academy Algebra II Path: https://www.khanacademy.org/math/algebra2
Khan Academy Probability & Statistics Path: https://www.khanacademy.org/math/probability
Khan Academy New SAT (2016) Path: https://www.khanacademy.org/test-prep/new-sat
Assessment and LEarning in Knowledge Spaces (ALEKS): http://www.aleks.com/
EdReady College Mathematics Readiness Prep: http://www.edready.org
St. Petersburg College Free Get Ready for College Math Course: https://www.spcollege.edu/ready/

Resources that are available to support the Growth Mindset and Self-Regulated Learning:
Student Academic Mindsets: A Review of the Current Landscape
Mindset Works
PERTS
Carnegie's Alpha Lab Network
Developing Self-Regulated Learners
Self-Regulated Learning and Study Skills
Tomorrow's Professor
Learning and the Adolescent Mind
Encouraging Self-Regulated Learning in the Classroom