

MATHEMATICS**Natural and Applied Sciences Division**

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<http://www.cabrillo.edu/programs>**Program Description: Information for Mathematics Majors**

The major in mathematics provides a broad foundation of problem solving and logical reasoning skills. The mathematics major learns to use patterns and relationships to analyze mathematical situations and solve a wide variety of problems. Career opportunities include teacher, researcher, and statistician. Graduates work in private industry, government and many areas of technological research and computer-related fields.

Model Program for Mathematics

The following Model Program fulfills requirements for the A.S./A.A. Degree in Mathematics at Cabrillo College. Specific lower division major preparation at four-year public institutions in California can be found at www.assist.org. Please see a counselor for advisement for transfer to any four-year institution.

A.S. Degree: Mathematics**A.S. General Education** **21 Units****Core Courses (18 units)**

MATH 5A	Analytic Geometry and Calculus I	5
MATH 5B	Analytic Geometry and Calculus II	5
MATH 5C	Analytic Geometry and Calculus III	5
MATH 7	Introduction to Differential Equations	3

Other Courses (15 units)

PHYS 4A	Physics for Scientists and Engineers	5
PHYS 4B	**Physics for Scientists and Engineers	5
PHYS 4C	*Physics for Scientists and Engineers	5

Approved Electives (6 units)**Total Units** **60****spring only; **fall only***General Information About Meeting Prerequisites**

A minimum grade of “C” is required in the prerequisite course. It is strongly recommended that prerequisite course work not be more than two years old. Verification of prerequisites will be required. Prerequisites for courses in this department are computer enforced. Students should be sure their records have been entered into the Cabrillo computer system before attempting to enroll. Course prerequisites may be met in the following ways:

- Successful completion of the prerequisite course as listed in the *Catalog* or *Schedule of Classes*
- Successful completion of appropriate coursework at another college or university
- An appropriate placement score, AP score, or EAP or ELM test result.
- For certain courses, equivalent professional experience. If you believe you have completed the listed prerequisites or corequisites for a course as listed in the *Catalog* or *Schedule of Classes*, make an appointment to see a counselor.

Associate in Science in Mathematics for Transfer

The major in mathematics provides a broad foundation of problem solving and logical reasoning skills. The mathematics major learns to use patterns and relationships to analyze mathematical situations and solve a wide variety of problems.

A mathematics major may transfer to a four-year institution to complete a Bachelor's Degree in Mathematics, Physics, Computer Science or Engineering.. Career opportunities include teacher, researcher, and statistician. Graduates work in private industry, government and many areas of technological research and computer-related fields.

Cabrillo offers options for degrees in Mathematics. The first option listed below is the Associate in Science in Mathematics for Transfer (A.S.-T.), which is intended for students who plan to complete a bachelor's degree in Mathematics or related STEM field at a CSU campus. Students completing these degrees are guaranteed admission to the CSU system, but not to a particular campus or major. This degree may not be the best option for students intending to transfer to a particular CSU campus or to a university or college that is not part of the CSU system. See a Counselor. “Requirements for the AA-T and AS-T are on page 46”.

The second option fulfills requirements for an A.S. Degree in Mathematics at Cabrillo College. Specific lower-division major preparation at four-year public institutions in California can be found at www.assist.org. Please see a counselor for advisement for transfer to any four-year institution.

CSU/IGETC General Education Requirements Units 37 - 39

Core

15 Units

MATH 5A	Analytic Geometry and Calculus I	5
MATH 5B	Analytic Geometry and Calculus II	5
MATH 5C	Analytic Geometry and Calculus III	5
Group A		
(3 units)		
MATH 6	Introduction to Linear Algebra	3
or		
MATH 7	Introduction to Differential Equations	3
Group B		
(3-5 units)		
MATH 6	Introduction to Linear Algebra	3
MATH 7	Introduction to Differential Equations	3
MATH 12	Elementary Statistics	5
or		
MATH 12H	Honors Elementary Statistics	5
MATH 23	Discrete Mathematics	4
PHYS 4A	Physics for Scientists and Engineers I	5
CS 11	Introduction to Programming Concepts and Methodology, C++	4
CS 12J	Introduction to Programming Concepts and Methodology, Java	4
CS 19	C++ Programming	4
CS 20J	Java Programming	4
CS 21	Introduction to Data Structures and Algorithms	4

Note: All major courses (except Computer Science courses) are also general education courses.

Total Units **60**

Mathematics Courses

MATH 2

Precalculus Algebra

4 units; 4 hours Lecture

Prerequisite: MATH 152 or equivalent skills.

Recommended Preparation: Eligibility for ENGL 100 and READ 100.

Presents functions and their properties including polynomial, rational, exponential and logarithmic functions and their graphs, inverses and applications. May not be taken pass/no pass.

Transfer Credit: Transfers to CSU, UC, with limits: Math 2 and 4 combined-maximum credit: 1 course.

MATH 3

Precalculus Trigonometry

3 units; 3 hours Lecture

Prerequisite: MATH 152 or equivalent skills.

Recommended Preparation: MATH 153 or high school geometry or equivalent skills; Eligibility for ENGL 100 and READ 100.

Presents right and oblique triangle trigonometry with applications including vectors, graphing, identities, trigonometric equations, and trigonometric and inverse trigonometric functions. May not be taken pass/no pass.

Transfer Credit: Transfers to CSU.

MATH 4

Precalculus Algebra and Trigonometry

5 units; 5 hours Lecture

Prerequisite: MATH 152 or equivalent skills.

Recommended Preparation: MATH 153 or high school geometry or equivalent skills; Eligibility for ENGL 100 and READ 100.

Covers topics in MATH 2 and MATH 3 and is designed for the motivated student able to fulfill the requirements of both courses in a single course. A study of functions and their properties including trigonometric, logarithmic, exponential, polynomial, rational functions and their graphs, inverses and applications. The relationship between the equation form of a function and its graph will be emphasized. May not be taken pass/no pass. May be offered in a Distance-Learning Format.

Transfer Credit: Transfers to CSU, UC, with limits: Math 2 and 4 combined-maximum credit: 1 course.

MATH 5A

Analytic Geometry and Calculus I

5 units; 5 hours Lecture

Prerequisite: MATH 4 or MATH 2 and MATH 3 or equivalent skills.

Recommended Preparation: Eligibility for ENGL 100 and READ 100.

Presents plane analytic geometry of lines and graphing, differential calculus of algebraic and transcendental functions of one variable with applications. Designed for majors in mathematics, engineering, and physical sciences. May not be taken pass/no pass.

Transfer Credit: Transfers to CSU, UC, with limits: MATH 5A & 18 combined-maximum credit-1 course

MATH 5B

Analytic Geometry and Calculus II

5 units; 5 hours Lecture

Prerequisite: MATH 5A or equivalent skills.

Recommended Preparation: Eligibility for ENGL 100 and READ 100.

Presents integral calculus of algebraic and transcendental functions of one variable with applications, techniques of integration, sequences and series. Designed for majors in mathematics, engineering, and physical sciences. May not be taken pass/no pass.

Transfer Credit: Transfers to CSU, UC.

MATH 5C**Analytic Geometry and Calculus III**

5 units; 5 hours Lecture

Prerequisite: MATH 5B or equivalent skills.

Recommended Preparation: Eligibility for ENGL 100 and READ 100.

Presents vectors and vector functions, multivariable calculus of algebraic and transcendental functions, line and surface integrals, vector field theory. Designed for majors in mathematics, engineering, and physical sciences. May not be taken pass/no pass.

Transfer Credit: Transfers to CSU, UC. **C-ID MATH 230**

MATH 6**Introduction to Linear Algebra**

3 units; 3 hours Lecture

Prerequisite: MATH 5C or equivalent skills.

Recommended Preparation: Eligibility for ENGL 100 and READ 100.

Introduces linear algebra, including vectors in n -dimensional R , matrices, row reductions, inverse matrices, determinants, vector spaces, basis, change of basis, linear independence, transformations, eigenvalues, eigenvectors, and the Gram-Schmidt process. Students enrolled in the Honors Transfer Program may count this course towards the "Honors Scholar" designation. Offered spring only. May not be taken pass/no pass.

Transfer Credit: Transfers to CSU, UC.

MATH 7**Introduction to Differential Equations**

3 units; 3 hours Lecture

Prerequisite: MATH 5C or equivalent skills.

Recommended Preparation: Eligibility for ENGL 100 and READ 100.

Presents an introductory course in Differential Equations: first order, second order, homogeneous, nonhomogeneous, variation of parameters, applications, simple linear systems with constant coefficients, Laplace transforms, and Euler's method. Students enrolled in the Honors Transfer Program may count this course towards the "Honors Scholar" designation. May not be taken pass/no pass.

Transfer Credit: Transfers to CSU, UC.

MATH 10**Survey of College Mathematics**

3 units; 3 hours Lecture

Prerequisite: MATH 152 or equivalent skills.

Recommended Preparation: Eligibility for ENGL 100 and READ 100.

Presents concepts and applications of various topics in mathematics that use intermediate algebra skills. Core topics are: set theory, logic, mathematical modeling, probability and statistics. Additional topics may include: mathematical systems, the mathematics of finance, ideas from geometry, or an introduction to calculus concepts.

Transfer Credit: Transfers to CSU, UC.

MATH 12**Elementary Statistics**

5 units; 5 hours Lecture

Prerequisite: MATH 152 or equivalent skills.

Recommended Preparation: Eligibility for ENGL 100 and READ 100.

Presents histograms, measures of central tendency and dispersion, probability, binomial and normal distributions, estimation and hypothesis testing, regression and correlation. Recommended for social science, environmental studies, and some liberal arts majors. Requires extensive use of a graphing calculator or desktop computer to complete required assignments. May be offered in a Distance-Learning Format.

Transfer Credit: Transfers to CSU, UC, with limits: MATH 12/12H combined with BUS 9-maximum credit-1 course.

MATH 12H**Honors Elementary Statistics**

5 units; 5 hours Lecture

Prerequisite: Honors Standing. MATH 152 or equivalent skills.

Recommended Preparation: ENGL 1A/1AH/1AMC/1AMCH; Eligibility for READ 100.

Presents histograms, measures of central tendency and dispersion, probability, binomial and normal distributions, estimation and hypothesis testing, regression and correlation. Recommended for social science, environmental studies, and some liberal arts majors. Requires extensive use of a graphing calculator or desktop computer to complete required assignments. May not be taken pass/no pass.

Transfer Credit: Transfers to CSU, UC, with limits: MATH 12/12H combined with BUS 9-maximum credit-1 course.

MATH 13**Finite Mathematics**

3 units; 3 hours Lecture

Prerequisite: MATH 152 or equivalent skills.

Recommended Preparation: Eligibility for ENGL 100 and READ 100.

Presents topics in set theory, linear programming, matrices, mathematics of finance, probability, with applications to business and the social sciences.

Transfer Credit: Transfers to CSU, UC.

MATH 15**Number Systems**

3 units; 3 hours Lecture, 1 hour Laboratory

Prerequisite: MATH 152 and MATH 153 or equivalent skills.

Recommended Preparation: Eligibility for ENGL 100 and READ 100.

Provides an understanding of the nature of arithmetic and the structure of mathematical systems as used by liberal arts students and prospective elementary teachers. Topics covered may include a study of sets, relations, systems of numeration, and the real number system. Offered spring only, in even years.

Transfer Credit: Transfers to CSU;UC: Does not meet the UC math admissions requirement.

MATH 18

Business Calculus

3 units; 3 hours Lecture

Prerequisite: MATH 152 or equivalent skills.

Recommended Preparation: Eligibility for ENGL 100 and READ 100.

Provides an intuitive introduction to differential and integral calculus for functions of one variable and an introduction to functions of several variables including partial differentiation and maxima/minima problems.

Transfer Credit: Transfers to CSU, UC, with limits: MATH 5A & 18 combined-maximum credit-1 course.

MATH 23

Discrete Mathematics

4 units; 3 hours Lecture, 3 hours Laboratory

Prerequisite: MATH 5A or equivalent skills.

Recommended Preparation: CS 19 or CS 20J or equivalent skills; Eligibility for ENGL 100 and READ 100.

Presents discrete mathematical systems including methods of proof that shape the foundations of computer science. Includes propositional logic, set and number theory, Boolean Algebra, deductive and inductive proof, functions and relations, combinatorics, discrete probability, graph theory and network models, and efficiency of algorithms. CS majors should enroll in CS 23 (identical to MATH 23). Offered spring only even years. May be offered in a Distance-Learning Format.

Transfer Credit: Transfers to CSU, UC.

MATH 152

Intermediate Algebra

5 units; 5 hours Lecture

Prerequisite: MATH 154 or equivalent skills.

Recommended Preparation: Eligibility for ENGL 100 and READ 100.

Continues development of algebra skills acquired in elementary algebra, which include the system of real numbers, polynomials, algebraic equations (linear, systems of linear, quadratic, and applications). The characteristics and properties of linear and quadratic functions are studied in detail, with an introduction to negative exponents, systems of linear equations in three variables, complex rational expressions, complex numbers, inverse, exponential and logarithmic functions, conic sections, and non-linear systems. Problem-solving skills are developed to encourage students to use their basic knowledge of algebra to explore problems. May not be taken pass/no pass. May be offered in a Distance-Learning Format.

MATH 152A

Intermediate Algebra - First Half

4 units; 4 hours Lecture, 4 hours Laboratory

Prerequisite: MATH 154 or equivalent skills.

Recommended Preparation: Eligibility for ENGL 100 and READ 100.

Presents the first half of Intermediate Algebra and is designed for a wide variety of students, including those who have been unsuccessful in MATH 152, are math anxious, or desire a slower paced, year-long version of MATH 152. When followed by MATH 152B, satisfies Cabrillo's math graduation requirement for Associate of Arts and Associate of Science Degree. Covers linear equations, functions and graphs, systems of linear equations and inequalities, compound inequalities, factoring, polynomial equations, rational expressions and rational equations. Offered fall only. May not be taken pass/no pass.

MATH 152B

Intermediate Algebra - Second Half

4 units; 4 hours Lecture, 4 hours Laboratory

Prerequisite: MATH 152A.

Recommended Preparation: Eligibility for ENGL 100 and READ 100.

Presents the second half of Intermediate Algebra and is intended only for students who have successfully completed MATH 152A. When taken after MATH 152A, satisfies Cabrillo's math graduation requirement for Associate of Arts and Associate of Science Degree. Covers radical, exponential, and logarithmic expressions and equations, composition and inverse of functions, graphs, and applications. Offered spring only. May not be taken pass/no pass.

MATH 153

Geometry

3 units; 3 hours Lecture

Prerequisite: MATH 154 or equivalent skills.

Recommended Preparation: Eligibility for ENGL 100 and READ 100.

Introduces the vocabulary and principles of Euclidean geometry, developing critical thinking skills using inductive and deductive reasoning while exploring the concepts of congruence and similarity, the properties of angles, lines, polygons, circles, and solids.

MATH 154

Elementary Algebra

5 units; 5 hours Lecture

Prerequisite: MATH 254B or MATH 254CM or MATH 254SI or equivalent skills.

Recommended Preparation: Eligibility for ENGL 100 and READ 100.

Presents a systematic development of numbers, polynomials and polynomial fractions, along with applications to the solution of linear equations, graphing of and solutions for systems of linear equations, quadratic equations and an introduction to exponents and radicals. Contains topics typical of first-year high school algebra, but taught at a college level. May not be taken pass/no pass. May be offered in a Distance-Learning Format.

MATH 154A

Elementary Algebra - First Half

4 units; 4 hours Lecture, 4 hours Laboratory

Prerequisite: MATH 254B or MATH 254CM or MATH 254SI or equivalent skills.

Recommended Preparation: Eligibility for ENGL 100 and READ 100.

Presents the first half of Elementary algebra and is designed for a wide variety of students, including those who have been unsuccessful in MATH 154, are math anxious, or desire a slower paced, year-long version of MATH 154; and along with MATH 154B is equivalent to MATH 154. Provides a systemic development of numbers, solving first degree equations and inequalities, graphing two variable linear equations, and two variable systems of equations. Offered fall only. May not be taken pass/no pass.

MATH 154B**Elementary Algebra-Second Half**

4 units; 4 hours Lecture, 4 hours Laboratory

Prerequisite: MATH 154A.

Recommended Preparation: Eligibility for ENGL 100 and READ 100.

Presents the second half of Elementary Algebra and is intended only for students who have successfully completed MATH 154A. Provides a systematic development of polynomials, polynomial fractions, applications to the solution of quadratic equations, and an introduction to exponents and radicals. Offered spring only. May not be taken pass/no pass.

MATH 158BF**Algebra Review- Basic Factoring**

0.5 unit; 1.5 hours Laboratory

Corequisite: MATH 154 or higher level math course.

Recommended Preparation: Eligibility for ENGL 100 and READ 100.

This independent instruction module covers prerequisite skills for factoring followed by extensive drill on the five factoring techniques typically included in an elementary algebra course. This course may be taken pass/no pass only.

MATH 158GC**Introduction to the Graphing Calculator**

0.5 unit; 0.5 hour Lecture

Recommended Preparation: MATH 152; Eligibility for ENGL 100 and READ 100.

An introduction to the use of handheld graphing calculators in mathematics courses. Emphasis will be placed on the Texas Instruments TI-83 (and TI-83 Plus), TI-85, TI-86, and TI-89. Strongly recommended for students enrolled in a mathematics course where the use of a graphing calculator is required. May be taken for pass/no pass only.

MATH 158PF**Algebra Review-Polynomial Fractions**

0.5 unit; 1.5 hours Laboratory

Corequisite: MATH 154 or higher level math course.

Recommended Preparation: Eligibility for ENGL 100 and READ 100.

This independent instruction module covers addition and subtraction of polynomial fractions at the level of elementary algebra. A brief review of the least common multiple of two or more polynomials is included, and the ability to express an answer in lowest terms is emphasized. May be taken for pass/no pass only.

MATH 158SI**Using the Metric System**

0.5 unit; 1.5 hours Laboratory

Corequisite: MATH 154 or higher level math course.

Recommended Preparation: Eligibility for ENGL 100 and READ 100.

This independent instruction module introduces the units and uses of the metric system and its applications. May be taken for pass/no pass only.

MATH 158T**Preparation for Tutoring Mathematics**

1 unit; 3 hours Laboratory

Recommended Preparation: MATH 4 with a grade of "B" or better; Eligibility for ENGL 100 and READ 100.

Repeatability: May be taken a total of 2 times.

Provides tutoring techniques and hands-on training for math tutors and those interested in tutoring mathematics. Strategies for maximizing active learning are emphasized. Specifically designed for students enrolled in or recently completing MATH 12, 12H, 13, 15, 5A, 5B, or 5C.

MATH 190A-Z**Survey Topics in Mathematical Literacy**

1 - 5 units; 1 hour Lecture or 3 hours Laboratory

Recommended Preparation: Eligibility for ENGL 100 and READ 100.

Presents math topics with an emphasis on numeracy. The specific course content will be described in the *Schedule of Classes*.

MATH 195A-Z**Survey Topics in the Scientific Method**

2 units; 2 hours Lecture, 1 hour Laboratory

Recommended Preparation: Eligibility for ENGL 100 and READ 100.

Repeatability: May be taken a total of 4 times.

Introduces to the prospective math or science major some of the tools and skills that assist scientists in their work. Covers the general framework and philosophy of the scientific method, which forms the basis of the adoption and rejection of any theory in science.

MATH 254A**Essential Mathematics - First Half**

4 units; 4 hours Lecture

Presents the first half of Essential Mathematics and along with MATH 254B is equivalent to MATH 254CM. Covers arithmetic procedures involving whole numbers, fractions, and decimals integrated with proportions.

MATH 254B**Essential Mathematics - Second Half**

4 units; 4 hours Lecture

Prerequisite: MATH 254A.

Presents the second half of Essential Mathematics and is intended only for students who have successfully completed MATH 254A. Covers integers, percents, linear equations, measurements, geometry, and statistics.

MATH 254CM**Essential Mathematics-Computer Mediated**

2 units; 6 hours Laboratory

Presents topics in an accelerated format using computer software, assisted by the instructor, and covers whole numbers, fractions, decimals, percents, signed numbers, equations, statistics, proportions, and geometry. May be offered in a Distance-Learning Format.

MATH 254SI

Essential Mathematics with Supplemental Instruction

6 units; 6 hours Lecture

Recommended Preparation: Eligibility for READ 205 by Assessment.

Presents topics in an accelerated format and covers whole numbers, fractions, decimals, percents, signed numbers, equations, statistics, proportions, and geometry with a supplemental instruction component.

MATH 502

Supervised Tutoring

0 units; 5 hours Laboratory

Repeatability: May be repeated.

Provides supervised tutoring assistance in basic skills and transfer level mathematics courses, including mathematics applications found in science and other non-math courses.

