

## Mathematics

The Springfield High School Mathematics department offers programs that will provide students with mathematics courses appropriate to their future goals. From Algebra I to Advanced Placement (AP) Calculus, the mathematics curriculum has offerings to meet each student's specific needs. All courses are designed to prepare students to use mathematics effectively in today's world. The critical skills of problem-solving, logical reasoning and decision-making are incorporated and developed in all courses. Recognizing the importance of technology in today's world, the department emphasizes the use of technology in all courses to enable students to develop superior skills in this area.

Secondary Mathematics      Course 402      1.0 Credit MA      Grades: ALL      Recommendation

Secondary Mathematics is a self-contained special education math course that covers topics and concepts spanning 6th, 7th, 8th & Pre-algebra. Students are placed based on their levels from annual diagnostic testing. The purpose of the course is to deepen and extend student knowledge of basic math skills to build a powerful set of mathematical tools for solving problems. The goal is to apply fundamental mathematical and algebraic tools to a variety of real-world situations and use them to draw and support conclusions.

Integrated Mathematics 1      Course 413      1.0 Credit MA      Grade: 9,10,11      Recommendation

Integrated Mathematics emphasizes the development of a deep understanding of mathematical skills to solve real-world math related problems. It presents a focus on visual learning and modeling through meaningful student-centered tasks and activities, and follows an explore, understand, apply, practice, and assess model.

Students in Integrated Mathematics 1 will explore three common topics in mathematics at a fundamental level and see how the three disciplines are related and dependent on one another. Relevant topics examined include algebraic concepts of linear equations, exponent, inequalities, foundations of geometry and statistics.

### Prerequisite Course:

- Successful completion of Math 8, Pre-Algebra or equivalent
- Pre-Algebra

Integrated Mathematics 2      Course 423      1.0 Credit MA      Grade: 9,10,11      Recommendation

Integrated Mathematics emphasizes the development of a deep understanding of mathematical skills to solve real-world math related problems. It presents a focus on visual learning and modeling through meaningful student-centered tasks and activities, and follows an explore, understand, apply, practice, and assess model.

Students in Integrated Mathematics 2 will expand on the fundamental knowledge and skill on IM 1, or similar course work, to extend their understanding of and capacity to apply mathematical concepts and skills to real-world scenarios. Relevant topics examined include exponents and roots, polynomials and factoring, quadratics, functions, triangles, coordinate geometry, circles, probability and 2- and 3- dimensional modeling.

### Prerequisite Course:

- Successful completion of Integrated Mathematics 1 or equivalent

Hn Integrated Mathematics 2      Course 424      1.0 Credit MA      Grades: 9,10,11      Recommendation

Integrated Mathematics emphasizes the development of a deep understanding of mathematical skills to solve real-world math related problems. It presents a focus on visual learning and modeling through meaningful student-centered tasks and activities, and follows an explore, understand, apply, practice, and assess model.

\*\*\* The honors course will move at a faster pace through individual topics so that students can go deeper with analysis and application of various concepts. Students in **Honors Integrated Mathematics** will likely matriculate to Differential Calculus and/or Advanced Placement Calculus courses.

Integrated Mathematics 2 will expand on the fundamental knowledge and skill on IM 1, or similar course work, to extend student understanding of and capacity to apply mathematical concepts and skills to real-world scenarios. Relevant topics examined include exponents and roots, polynomials and factoring, quadratics, functions, triangles, coordinate geometry, circles, probability and 2- and 3- dimensional modeling.

Prerequisite Course:

- Successful completion of Integrated Mathematics 1 or equivalent

Integrated Mathematics 3	Course 433	1.0 Credit MA	Grade: 9,10,11	Recommendation
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Integrated Mathematics emphasizes the development of a deep understanding of mathematical skills to solve real-world math related problems. It presents a focus on visual learning and modeling through meaningful student-centered tasks and activities, and follows an explore, understand, apply, practice, and assess model.

Integrated Mathematics 3 will expand on the fundamental knowledge and skill on IM 2, or similar course work, to extend student understanding of and capacity to apply mathematical concepts and skills to real-world scenarios. Relevant topics examined include linear functions and systems, polynomial and rational functions, exponential and logarithmic functions, trigonometric functions and identities, coordinate geometry, circles, and data analysis and statistics.

Prerequisite Course:

- Successful completion of Integrated Mathematics 1 or equivalent

Hn Integrated Mathematics 3	Course 434	1.0 Credit MA	Grades: 9,10,11	Recommendation
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Integrated Mathematics emphasizes the development of a deep understanding of mathematical skills to solve real-world math related problems. It presents a focus on visual learning and modeling through meaningful student-centered tasks and activities, and follows an explore, understand, apply, practice, and assess model.

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Integrated Mathematics 3 will expand on the fundamental knowledge and skill on IM 2, or similar course work, to extend student understanding of and capacity to apply mathematical concepts and skills to real-world scenarios. Relevant topics examined include linear functions and systems, polynomial and rational functions, exponential and logarithmic functions, trigonometric functions and identities, coordinate geometry, circles, and data analysis and statistics.

Hn Pre-Calculus<sup>CH</sup> Course 458 1.0 Credit MA or EL Grades: 10,11,12 Recommendation

**NOTE: Students entering Honors Pre-Calculus from CP Geometry and/or CP Algebra II will be required to meet with the Honors Pre-Calculus teacher and complete summer work before enrolling in the class.**

This course is recommended for mathematics students who have completed Honors Algebra II and Honors Geometry. In this course students will have daily experience with graphing calculator technology in the investigation of such topics as functions and models, trigonometric functions and their inverses, trigonometric identities, explicit and recursive formulas of sequences, Pascal's Triangle and the Binomial Theorem, ellipses and hyperbolas, and the logic of solving inequalities.

Due to the nature of this Honors course, in-depth discussions, proofs, and extension of certain topics and additional projects and/or assignments will be evident throughout the course. Upon successful completion of this course, students will be prepared to take AP Calculus.

Prerequisite Course:

- Algebra II 430 Hn or 431 CP [Grade 9 with completion of Geometry in Grade 8 at ETR]
- Geometry | Math Analysis 420 Hn or 421 CP at SHS

Recommended Academic Performance Levels for Teacher Recommendation:

- 84% or higher in Course 430 or Course 420
- 94% or higher in Course 431 or Course 421

Pre-Calculus /CP<sup>CH</sup> Course 459 1.0 Credit MA or EL Grades: 10,11,12 Recommendation

This course is recommended for those math students who have completed CP Algebra II and CP Geometry. In this course students will have daily experience with graphing calculator technology in the investigation of such topics as functions and models, trigonometric functions and their inverses, and trigonometric identities.

Prerequisite Course:

- Algebra II 430 Hn or 431 CP [Grade 9 with completion of Geometry in Grade 8 at ETR]
- Geometry | Math Analysis 420 Hn or 421 CP at SHS

Recommended Academic Performance Levels for Teacher Recommendation:

- 74% or higher in Course 421

Hn Differential Calculus<sup>CH</sup> Course 442 1.0 Credit MA or EL Grades: 11,12 HAC Access

This course is recommended for those students who have completed Honors Pre-Calc who seek exposure to calculus in a non-AP environment. In this course students will continue their daily experience with graphing calculator technology. Class time will be split between an initial deep review of Pre-Calculus topics and an introduction to Differential Calculus concepts. Pre-Calculus review topics will include polynomials, the Fundamental Theorem of Algebra, imaginary numbers, polar coordinates, unit circle trigonometry and trigonometric identities, and proofs with trigonometric identities. Calculus topics will include limits and continuity, derivatives, applications of derivatives, chain rule, and mean value theorem.

Prerequisite Course:

- Hn Pre-Calculus 458
- CP Pre-Calculus 459

Recommended Academic Performance Levels for Teacher Recommendation:

- 84% to 93% in Course 458
- 94% or higher in Course 459

Hn Probability and Statistics<sup>CH</sup> Course 445 1.0 Credit MA or EL Grades: 11,12 HAC Access

This course is designed to meet the mathematical and research needs of students who plan to enter such fields as economics, business, education, psychology, sociology, biology, and medicine, as well as science and mathematics. It is considered excellent preparation for usual college courses offered in these fields. The topics covered in the course include measurement scales, sampling techniques, study design, measures of center and dispersion, probability, estimation of confidence intervals, normal, binomial, geometric, and Poisson distributions, sampling distributions, hypothesis testing, linear regression, chi-square tests of independence and goodness of fit, one-way analysis of variance, and tests of homogeneity of variance.

Hn Probability and Statistics is an interest driven course or a possible 4<sup>th</sup> credit math option for students who wish to pursue a non-Calculus based math class. For students moving from Geometry or Pre-Calculus to Hn Prob and Stat, please use the following performance levels as a guide when deciding between Hn Prob and Stat and higher level Calculus based courses:

Prerequisite Course:

- Algebra II 430 Hn or 431 CP
- Geometry | Math Analysis 420 Hn or 421 CP

Recommended Academic Performance Levels for Teacher Recommendation:

- < 74% in Course 420 or Course 459
- < 84% in Course 421 or Course 458

**Mathematics – Advanced Placement Course Offerings**

AP Statistics <sup>CH</sup> <i>Advanced Placement</i>	Course 450	1.0 Credit MA or EL	Grades: 11, 12	HAC Access
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This is a rigorous, time-consuming, advanced placement course, which introduces the major concepts and tools for collecting, analyzing, and drawing conclusions from data. The topics for AP Statistics are divided into four major themes: exploratory analysis, planning a study, probability, and statistical inference. This course follows the AP curriculum. Students engaged in the college admission process should understand that prospective colleges want to see high school students enrolled in AP mathematics courses as evidence that the student is taking a challenging, rigorous course load.

Prerequisite: It is recommended that students achieve the following performance levels:

- 84% or higher in Honors Mathematics classes in grades 9-11
- 94% or higher in CP Mathematics classes in grades 9-11

**Advanced Placement Calculus AB and BC**

Topic A	Topic B	Topic C
Review of Pre-Calculus	Calculus I (101)	Calculus II (201)

AP Calculus AB <sup>CH</sup> <i>Advanced Placement</i>	Course 460	1.0 Credit MA or EL	Grades: 11,12	HAC Access
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This rigorous advanced placement course follows the College Board Advanced Placement (AP) Curriculum Framework. Students engaged in the college admission process should understand that prospective colleges want to see high school students enrolled in AP mathematics courses as evidence that the student is taking a challenging, rigorous course load.

This Advanced Placement course will include the study of two fundamental problems of Calculus:

- 1) finding the slope of the tangent to a curve which is determined by the derivative, and
- 2) finding the area of a region under a curve, or the volume within a curved surface of revolution, which is determined by the definite integral.

The focus of study will include strategies for differentiation and integration of various functions (algebraic, trigonometric, and transcendental). Optimization techniques will be used to determine the maximum and minimum values of a data set and/or rate of change for a given data set.

Prerequisite Course:

- Hn Differential Calculus 442
- Hn Pre-Calculus 458

Recommended Academic Performance Levels for Teacher Recommendation:

- 84% or higher in Course 442 or Course 458

AP Calculus BC <sup>CH</sup> <i>Advanced Placement</i>	Course 461	1.0 Credit MA or EL	Grades: 11,12	HAC Access
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This rigorous advanced placement course follows the College Board Advanced Placement (AP) Curriculum Framework.

This Advanced Placement course will include the study of two fundamental problems of Calculus:

- 1) finding the slope of the tangent to a curve which is determined by the derivative, and
- 2) finding the area of a region under a curve, or the volume within a curved surface of revolution, which is determined by the definite integral.

The focus of study will include strategies for differentiation and integration of various functions (algebraic, trigonometric, and transcendental). Optimization techniques will be used to determine the maximum and minimum values of a data set and/or rate of change for a given data set. The AP Calculus BC course is more rigorous and covers all the concepts and procedures of Calculus AB plus the additional content tested on the BC exam including more advanced integration techniques, work with sequences and series, Taylor polynomials, and calculus techniques applied to parametric, polar and vector functions.

Prerequisite Course:

- Hn Differential Calculus 442
- Hn Pre-Calculus 458

Recommended Academic Performance Levels for Teacher Recommendation:

- 94% or higher in Course 442 or Course 458

## Prior Math Courses Offerings:

Algebra I / CP <sup>CH</sup>	Course 411	1.0 Credit MA	Grade: 9	Recommendation
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The goal of this course is to develop algebraic skills and concepts and to enhance problem solving ability that every student needs to succeed in college, technical school, or the working world. A secure foundation in basic mathematical skills, fractions, and decimals is essential for success. Topics covered in this course include number theory, polynomial expressions and equations, products and factors of polynomials, coordinate graphing, graphing linear equations, determining, and analyzing the slope of lines, probability, and radical and rational expressions. Algebra skills and concepts needed to solve equations, inequalities and systems of equations will be developed. Algebraic problem-solving techniques will be employed to solve relevant applications. Graphing calculator technology will be introduced.

Hn Algebra II <sup>CH</sup>	Course 430	1.0 Credit MA	Grades: 9,10	Recommendation
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The fast-paced nature of the honors level course relies on students possessing strong, independent work habits. Students will experience a fast-paced, challenging investigation of many topics including transformations of linear, quadratic, and polynomial functions, modeling with linear, quadratic, polynomial, exponential, and logarithmic functions, solving linear and non-linear systems, operations with polynomial functions, exploring radical functions, and working with sequences and series. Graphing calculator technology will accompany students throughout the course.

Algebra II /CP <sup>CH</sup>	Course 431	1.0 Credit MA	Grades: 9,10,11	Recommendation
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Algebra II is a demanding course designed to challenge the student through a more thorough investigation of many topics, including transformations of linear, quadratic, and polynomial functions, modeling with linear, quadratic, polynomial, exponential, and logarithmic functions, solving linear and non-linear systems, operations with polynomial functions, exploring radical functions, working with sequences, and investigating probability. Graphing calculator technology will accompany students throughout the course. Graphing calculator technology is a course requirement.

Hn Geometry   Math Analysis <sup>CH</sup>	Course 420	1.0 Credit MA	Grades: 10,11,12	Recommendation
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This course is recommended for those students who have completed Honors Algebra II or who have completed Algebra II in high school and are looking for a rigorous course. Students are expected to have a solid understanding of algebraic processes. This course provides a well-rounded mathematical experience that exposes students to a variety of rigorous topics across multiple disciplines. Among these, students will explore advanced quantitative concepts connected to algebraic and graphical representations, learn to describe the relationships between variables in linear, quadratic, and exponential models, and empower them to manipulate and analyze advanced mathematical expressions. A survey of data analysis follows including investigations of relationships between two variables, probability calculations, parameter estimation, measures of center, and scrutiny of data collection methods. The course culminates with a thorough investigation of Geometry - including, but not limited to properties of polygons, triangles, quadrilaterals, circles, perpendicular and parallel lines, bisectors, congruence transformations, similarity transformations, perimeters, areas, and volumes. Successful completion of the class will leave the students well prepared for advanced pre-calculus and/or statistics coursework.

Geometry   Math Analysis <sup>CH</sup>	Course 421	1.0 Credit MA	Grades: 10,11,12	Recommendation
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This course provides a well-rounded mathematical experience that exposes students to a variety of rigorous topics across multiple disciplines. Among these, students will explore advanced quantitative concepts connected to algebraic and graphical representations, learn to describe the relationships between variables in linear, quadratic, and exponential models, and empower them to manipulate and analyze advanced mathematical expressions. A survey of data analysis follows including investigations of relationships between two variables, probability calculations, parameter estimation, measures of center, and scrutiny of data collection methods. The course culminates with a thorough investigation of Geometry - including, but not limited to properties of polygons, triangles, quadrilaterals, circles, perpendicular and parallel lines, bisectors, congruence transformations, similarity transformations, perimeters, areas, and volumes. Successful completion of the class will leave the students well prepared for advanced pre-calculus and/or statistics coursework.