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.

Algebra I – 411

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. All topics in this course will prepare students for successful completion of the Algebra I Keystone exam. A TI Graphing Calculator is recommended.

Algebra II – Honors Hn 430

The fast-paced nature of the honors level course relies on students possessing strong, independent work habits. In order to sharpen employability skills, students will have opportunities to collaborate with peers and present solutions to the class. 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, working with sequences and series, and investigating probability including permutations and combinations. The Honors course will also include study of trigonometric ratios and functions. Graphing calculator technology will accompany students throughout the course. Topics will be covered in more depth than in the CP level course, 431. All topics covered in this course will prepare students for successful completion of the Algebra I Keystone exam.

Algebra II – College Preparatory CP 431

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. All topics covered in this course will prepare students for successful completion of the Algebra I Keystone exam.

Geometry and Math Analysis – Honors Hn 420

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 and Math Analysis – College Preparatory CP 421

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.

Differential Calculus – Honors Hn 442

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.

Probability and Statistics – Honors Hn 445

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.

Pre-Calculus – Honors Hn 458

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.

Pre-Calculus – College Preparatory CP 459

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, trigonometric identities, explicit and recursive formulas for sequences, Pascal's Triangle and the Binomial Theorem, and the logic of solving inequalities.

Mathematics – Advanced Placement Course Offerings

Statistics - Advanced Placement AP 450

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.

Calculus AB – Advanced Placement AP 460

This rigorous advanced placement course follows the College Board Advanced Placement (AP) Curriculum Framework.

Big Idea 1   **Enduring understanding**
Limits   The concept of a limit can be used to understand the behavior of functions.
Big Idea 2   **Enduring understanding**
Derivatives   The derivative of a function is defined as the limit of a difference quotient and can be determined using a variety of strategies. A function's derivative, which itself is a function, can be used to understand the behavior of the function. The derivative has multiple interpretations and applications including those that involve instantaneous rates of change. The Mean Value Theorem connects the behavior of a differentiable function over an interval to the behavior of the derivative of that function at a point on the interval.
Big Idea 3   **Enduring understanding**
Integrals and the Fundamental Theorem of Calculus
Anti-differentiation is the inverse process of differentiation. The definite integral of a function over an interval is the limit of a Riemann sum over that interval and can be calculated using a variety of strategies. The Fundamental Theorem of Calculus, which has two distinct formulations, connects differentiation and integration. The definite integral of a function over an interval is a mathematical tool with many interpretations and applications involving accumulation. Anti-differentiation is an underlying concept involved in solving separable differential equations. Solving separable differential involves determining a function or relation given its rate of change.

Calculus BC – Advanced Placement AP 461

This rigorous advanced placement course follows the College Board Advanced Placement (AP) Curriculum Framework.

Big Idea 1   **Enduring understanding**
Limits   The concept of a limit can be used to understand the behavior of functions.
Big Idea 2   **Enduring understanding**
Derivatives   The derivative of a function is defined as the limit of a difference quotient and can be determined using a variety of strategies. A function's derivative, which itself is a function, can be used to understand the behavior of the function. The derivative has multiple interpretations and applications including those that involve instantaneous rates of change. The Mean Value Theorem connects the behavior of a differentiable function over an interval to the behavior of the derivative of that function at a point on the interval.
Big Idea 3   **Enduring understanding**
Integrals and the Fundamental Theorem of Calculus
Anti-differentiation is the inverse process of differentiation.