

# MATHEMATICS DEPARTMENT

## MATH CREDITS REQUIRED FOR GRADUATION: 3

**CONTENT MISSION STATEMENT:** All students will reason about; and make sense of, mathematics to be used in a lifelong learning process. Students will apply problem solving skills, communicate mathematically, interpret data, estimate and extend mathematical concepts using current technology.

Mathematics is the study of quantity and logic. Quantities may be represented with words, numbers, pictures or graphs, and algebraic symbols. As such, it is expected that all mathematics students will demonstrate a growing understanding of all four of these strands and how each strand gives information about the others. High school mathematics primarily consists of the branches of Algebra, Geometry, and Statistics. Algebra is where the symbols of mathematics are learned as well as the skills for working with various types of numbers, but words and pictures or graphs play an important role as well. Geometry is the study of relationships in figures (pictures), but again, words, numbers and algebraic notation are equally important. The chart below lists the mathematics department courses with their prerequisites.

COURSE TITLES	CREDIT	GRADE LEVEL				PREREQUISITE
		9	10	11	12	
Pre-Algebra	2 (1 Math & 1 Elective)	x				Placement
Algebra I Concepts	1	x				Placement
Algebra I <b>N</b>	1	x	x	x	x	8th Grade Math
Algebra I Plus+	.5 elective	x	x	x	x	Placement
Algebra II Concepts	1			x	x	Geometry & Placement
Algebra II <b>N</b>	1	x	x	x	x	Geometry and Algebra I
Honors Algebra II <b>N</b>	1	x	x	x	x	Honors Geometry or Teacher Recommendation
Geometry <b>N</b>	1	x	x	x	x	Algebra I
Honors Geometry <b>N</b>	1	x	x	x	x	Algebra I
Probability and Statistics <b>N</b>	1			x	x	Algebra II or Honors Algebra II
A.P. Statistics <b>N</b>	1			x	x	Pre-Calculus or Teacher Recommendation
Pre-Calculus <b>N</b>	1		x	x	x	Algebra II or Honors Algebra II
Honors Pre-Calculus <b>N</b>	1		x	x	x	Honors Algebra II or Teacher Recommendation
A.P. Calculus AB <b>N</b>	1			x	x	Honors Pre-Calculus
A.P. Calculus BC <b>N</b>	.5			x	x	A.P. Calculus AB

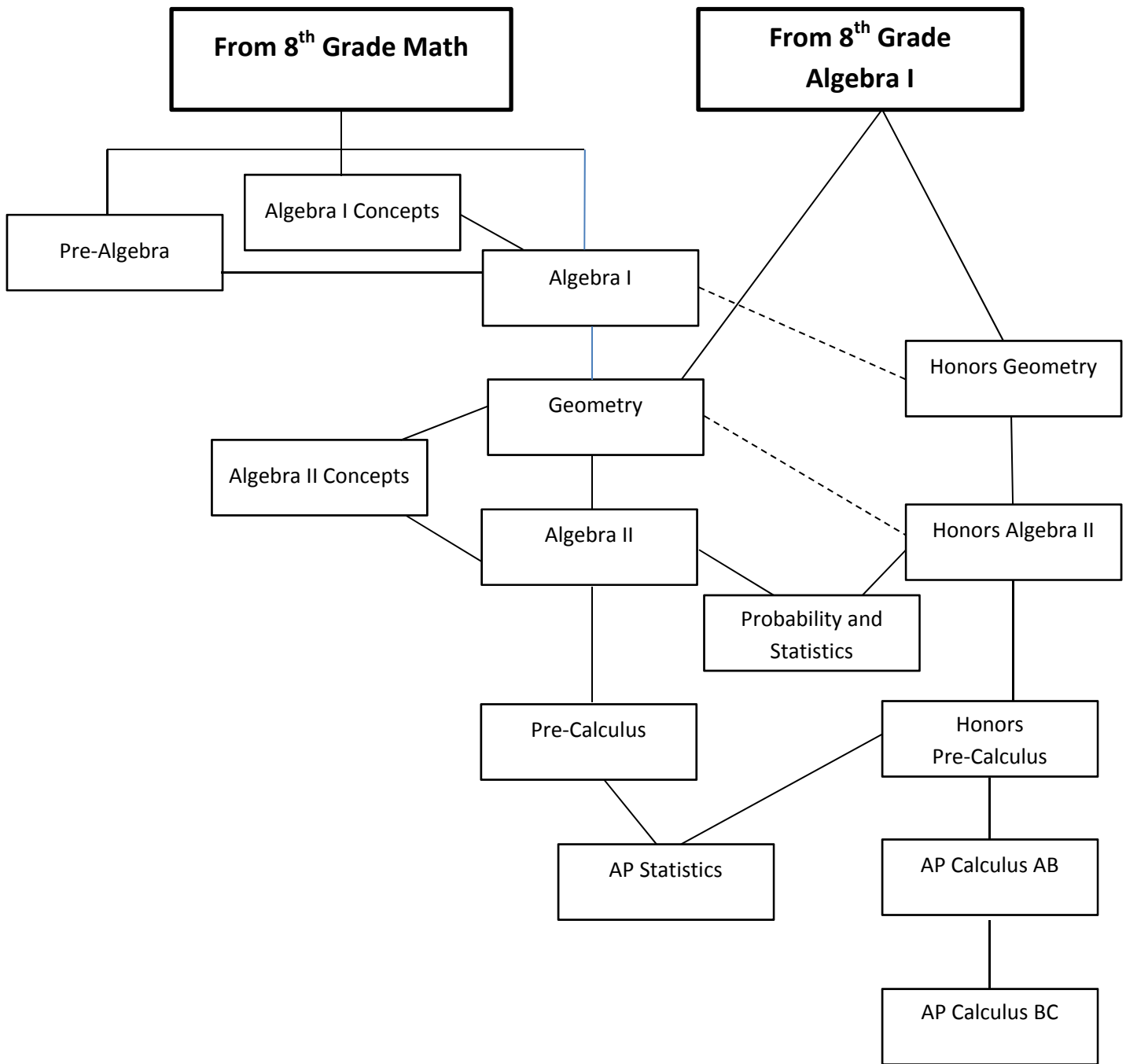
**N** - NCAA approved courses

\* Dual Credit - Students enrolling in these courses must have an ACT or Compass score on file in the Student Services Office. See your counselor.

### Mathematical Practice Standards:

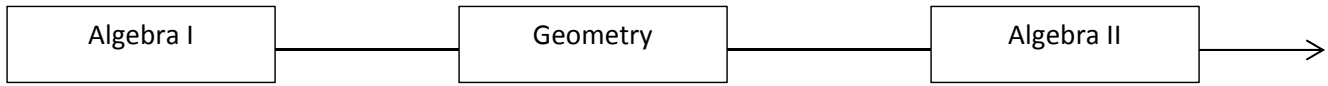
The students will:

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

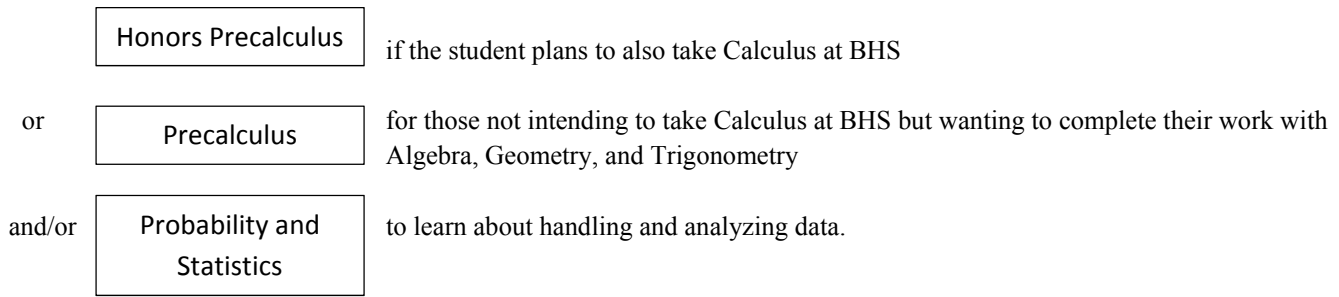


----possible path

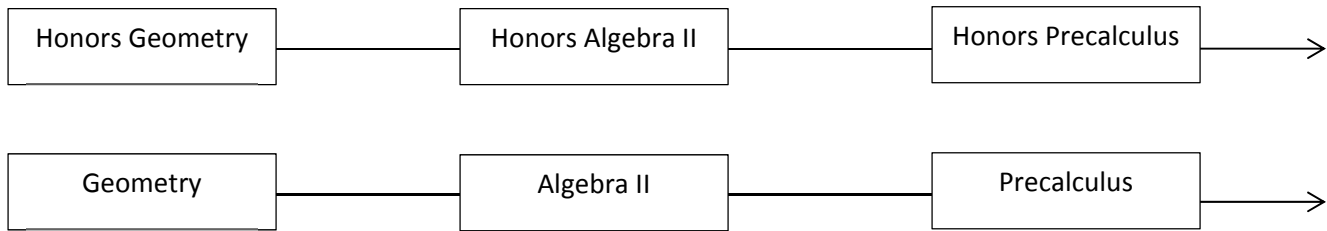
The Iowa Core standards require ALL students take Algebra I, Geometry and Algebra II in order to be college and career ready upon high school graduation. Some universities also recommend or require Precalculus. Therefore, most students at Bettendorf High School will take this sequence to fulfill their three Math credits for graduation.



It is also recommended that a student take Math during their Senior year, and most students will go on to one or more of these:

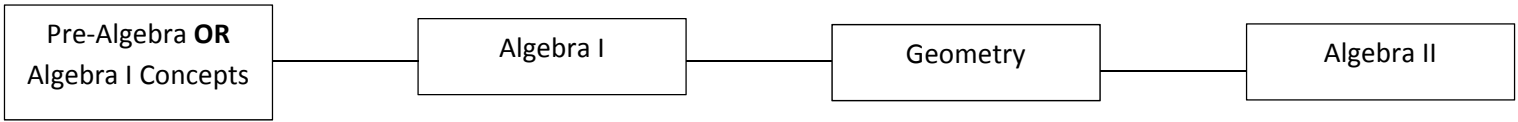


Students taking Honors Algebra I in 8th grade will still need three credits of High School math. Depending on how well the Algebra curriculum is mastered, some will start as shown above with Algebra I in 9th grade. Most students will take one of these sequences, followed by Calculus, Probability and Statistics, or both:



These are not intended to be unchangeable "tracks" and a student may, with teacher recommendation, take either Algebra II or Honors Algebra II after either Geometry or Honors Geometry and before either Precalculus or Honors Precalculus. However, students wanting to take Honors Precalculus must take Honors Algebra II. It is important to note that Honors PreCalculus is required for enrollement in AP Calculus; therefor students intending to take AP Calculus while in high school should take both Honors Algebra II and Honors Precalculus

Students who have struggled with 8th Grade Math may be placed in Pre-Algebra or Algebra I Concepts their freshman year and follow the progression below, taking Algebra II during senior year.



# COURSE SELECTIONS

## PRE-ALGEBRA

201311

GRADES: 9

\*PREREQUISITE: PLACEMENT

2 CREDIT/4 TERMS

(1 Math & 1 Elective Credit)

Pre-Algebra is for students who need more work in foundational topics in math before taking Algebra 1. The course emphasizes making sense of rational numbers by covering such topics as addition, subtraction, multiplication and division of whole numbers, decimals, and fractions in addition to percentages and exponents. Understanding algebraic expressions, ratio, proportion, linear functions graphs and inequalities are emphasized in order to prepare students for enrollment in Algebra. Students will use the Standards for Mathematical Practice daily during the course.

### Benchmarks

The students will:

- use all four operations to compute with fractions.
- solve equations using all four operations.
- represent a linear function with a graph, table, rule, and explanation in context and should be able to find any representation when provided one of the others
- solve systems of equations represented in tables and graphs.
- symbolically manipulate expressions in order to solve problems including those with fractional coefficients.
- solve contextual word problems using multiple strategies, including making tables, looking for patterns, drawing , diagrams, and creating a table of guesses to assist with writing and solving a variable equation.
- describe various transformations on a coordinate grid.
- represent data using scatterplots and describe associations.
- collect and analyze data and make predictions based on the trend of the data.
- compare ratios, calculate unit rates and slope ratios.
- analyze the slope of a line graphically, numerically, and contextually.
- recognize and solve problems involving proportional relationships.
- recognize and use the properties of similar shapes to solve problems.
- use the Pythagorean Theorem and its converse to solve problems in 2 and 3 dimensions.
- use square and cube roots.
- represent and simplify expressions using positive and negative exponents.
- represent and compare large and small numbers using standard and scientific notation.

## ALGEBRA I CONCEPTS

201317

GRADES: 9

\*PREREQUISITE: PLACEMENT

1 CREDIT/2 TERMS

Algebra I Concepts is for students who need more work on middle school math standards before taking Algebra 1. An integral part of this course is understanding algebraic expressions, ratio, proportion, and linear functions and their multiple representations. Students will use the Standards for Mathematical Practice daily during the course.

### Benchmarks

The students will:

- solve equations using all four operations.
- represent a linear function with a graph, table, rule, and explanation in context and should be able to find any representation when provided one of the others
- solve systems of equations represented in tables and graphs.
- symbolically manipulate expressions in order to solve problems including those with fractional coefficients.
- solve contextual word problems using multiple strategies, including making tables, looking for patterns, drawing , diagrams, and creating a table of guesses to assist with writing and solving a variable equation.
- describe various transformations on a coordinate grid.
- represent data using scatterplots and describe associations.
- collect and analyze data and make predictions based on the trend of the data.
- compare ratios, calculate unit rates and slope ratios.
- analyze the slope of a line graphically, numerically, and contextually.
- recognize and solve problems involving proportional relationships.
- recognize and use the properties of similar shapes to solve problems.
- use the Pythagorean Theorem and its converse to solve problems in 2 and 3 dimensions.

- use square and cube roots.
- represent and simplify expressions using positive and negative exponents.
- represent and compare large and small numbers using standard and scientific notation.

## **ALGEBRA I N**

**203111**

**GRADES: 9-12**

**\*PREREQUISITE: 8TH GRADE MATH**

**1 CREDIT/2 TERMS**

Algebra 1 aims to deepen and extend student understanding built in previous courses by focusing on developing fluency with solving linear equations and inequalities and systems; extending these skills to solving quadratic and exponential functions; exploring functions, including sequences, graphically, numerically, symbolically and verbally; and using regression techniques to analyze the fit of models to distributions of data. On a daily basis, students in Algebra 1 use problem solving strategies, questioning, investigating, analyzing critically, gathering and constructing evidence, and communicating rigorous arguments justifying their thinking. Students learn in collaboration with others, sharing information, expertise, and ideas. The course is well balanced between procedural fluency (algorithms and basic skills), deep conceptual understanding, strategic competence (problem solving), and adaptive reasoning (extension and transference). The lessons in the course meet all of the content standards of the Common Core State Standards for Mathematics and imbeds the CCSS Standards for Mathematical Practice as an integral part of the lessons in the course.

### Benchmarks

The students will:

- represent a function with a graph, table, rule, and context and should be able to find any representation when provided one of the others (for linear, quadratic, and exponential relationships).
- symbolically manipulate expressions in order to solve problems, such as factoring, distributing, multiplying polynomials, expanding exponential expressions, etc.
- analyze the slope of a line multiple ways, including graphically, numerically, contextually (as a rate of change), and algebraically.
- solve simple and complex equations and inequalities using a variety of strategies, including rewriting (such as factoring, distributing, or completing the square), undoing (such as extracting the square root or subtracting a term from both sides of an equation), and looking inside (such as determining the possible values of the argument of an absolute value expression).
- solve a system of two linear or non-linear equations and inequalities with two variables using a variety of strategies, both graphically and algebraically.
- recognize and represent arithmetic and geometric sequences, including using tables, graphs, and either recursive or explicit formulas.
- construct exponential models and solve problems, and compare to linear models
- investigate a variety of functions including square root, cube root, absolute value, piecewise, step, and simple inverse functions.
- use function notation.
- collect, analyze, interpret, and make predictions from, two-variable data, including determining regression lines, correlation coefficient, and creating residual plots.
- understand the differences between association and causation, and to interpret correlation in context.
- compare distributions of one-variable data.

## **ALGEBRA 1 Plus+**

**203115**

**GRADES: 9-12**

**\*PREREQUISITE: PLACEMENT**

**.5 ELECTIVE CREDIT/SEMESTER  
Block opposite PE**

Algebra + is designed to support a student while they are concurrently enrolled in Algebra 1. The course will meet every other day for a full block during the semester that the student is enrolled in Algebra 1. The course will support the student by providing a preview of the vocabulary, reading and previously learned math concepts before the student's Algebra 1 class. The Algebra + class will also provide an opportunity for extra practice on math procedures after they have been learned in Algebra class.

## **ALGEBRA II CONCEPTS**

**204211**

**GRADES: 11-12**

**\*PREREQUISITE: GEOMETRY & PLACEMENT**

**1 CREDIT/2 TERMS**

Algebra II Concepts prepares students who have struggled with math courses in the past to either take Algebra II at the high school level OR to take Algebra 2, Math for Liberal Arts or Statistics at Eastern Iowa Community Colleges. Topics for the course include numeracy, proportional reasoning, algebraic reasoning, functions, geometry and student success strategies. When completed, the successful student will develop mathematical maturity through problem solving, critical thinking and writing. The course includes work in the online ALEX program to individualize learning for each student in addition to the whole class lessons.

### Benchmarks

The students will gain skills and understanding in:

- Numeracy – operations, magnitude, estimation skills, quantitative reasoning, measurement sense, summarizing data, reading and interpreting data from graphs, basic statistics and probability
- Proportional Reasoning – verbal and numerical representations, comparisons of proportional relationships, applications to real-world relationships
- Algebraic Reasoning – uses of variables, evaluating variable values, constructing and solving equations and inequalities involving one or more variables, using exponents, solving quadratics, logarithms
- Functions – translating into mathematical representations, function behaviors, linear models, characteristics of functions, rate of change, mathematical models of real-world scenarios
- Mathematical Success – using technology, critical thinking, analyzing patterns, presenting information using tables, graphs, words, and equations, study skills strategies, test-taking strategies.

## **ALGEBRA II N**

**204111**

**GRADES: 9-12**

**\*PREREQUISITE:**

**GEOMETRY AND ALGEBRA I**

**1 CREDITS/2 TERMS**

Algebra II aims to apply and extend what students have learned in previous courses by focusing on finding connections between multiple representations of functions, transformations of different function families, finding zeros of polynomials and connecting them to graphs and equations of polynomials, modeling periodic phenomena with trigonometry, and understanding the role of randomness and the normal distribution in making statistical conclusions.

On a daily basis, students in Algebra II use problem solving strategies, questioning, investigating, analyzing critically, gathering and constructing evidence, and communicating rigorous arguments justifying their thinking. Students learn in collaboration with others, sharing information, expertise, and ideas.

### Benchmarks

The students will:

- visualize, express, interpret and describe, and graph functions (and their inverses, in many cases). Given the graph, students will be able to represent the function with an equation, and vice-versa, and transform the graph.
- use variables and functions to represent relationships given in tables, graphs, verbally stated problems, and geometric diagrams and recognize the interconnection between these multiple representations.
- apply the use of multiple algebraic representations to model and solve problems represented as real world situations or simulations from such subject areas as economics, biology, chemistry and physics.
- solve linear or quadratic equations in one variable, mixed systems in two variables, and linear systems of equations in three or more variables, including solving with graphical methods.
- use order and equivalence properties of algebra to rewrite complicated algebraic expressions and equations in more useful forms.
- rewrite rational expressions
- perform arithmetic operations on polynomials.
- understand the relationship between zeros and factors of polynomials.
- perform operations with complex numbers, and solve quadratics with complex solutions.
- model periodic phenomena with trigonometric functions.
- use concepts of randomness and bias to design surveys and interpret their results.
- use the normal distribution to model samples and to make inferences as appropriate.
- use margin of error and sample-to-sample variability to evaluate statistical decisions.

## **HONORS ALGEBRA II N**

**204121**

**GRADES: 9-12**

**\*PREREQUISITE:**

**HONORS GEOMETRY  
OR TEACHER RECOMMENDATION**

**1 CREDIT/2 TERMS**

Honors Algebra II aims to apply and extend what students have learned in previous courses by focusing on finding connections between multiple representations of functions, transformations of different function families, finding zeros of polynomials and connecting them to graphs and equations of polynomials, modeling periodic phenomena with trigonometry, and understanding the role of randomness and the normal distribution in making statistical conclusions.

On a daily basis, students in Algebra 2 use problem solving strategies, questioning, investigating, analyzing critically, gathering and constructing evidence, and communicating rigorous arguments justifying their thinking. Students learn in collaboration with others, sharing information, expertise, and ideas.

### Benchmarks

The students will:

- visualize, express, interpret and describe, and graph functions (and their inverses, in many cases). Given the graph, students will be able to represent the function with an equation, and vice-versa, and transform the graph.
- use variables and functions to represent relationships given in tables, graphs, verbally stated problems, and geometric diagrams and recognize the interconnection between these multiple representations.
- apply the use of multiple algebraic representations to model and solve problems represented as real world situations or simulations from such subject areas as economics, biology, chemistry and physics.
- solve linear or quadratic equations in one variable, mixed systems in two variables, and linear systems of equations in three or more variables, including solving with graphical methods.
- use order and equivalence properties of algebra to rewrite complicated algebraic expressions and equations in more useful forms.
- rewrite rational expressions
- perform arithmetic operations on polynomials.
- understand the relationship between zeros and factors of polynomials.
- perform operations with complex numbers, and solve quadratics with complex solutions.
- model periodic phenomena with trigonometric functions.
- solve trigonometric equations and prove trigonometric identities.
- use concepts of randomness and bias to design surveys and interpret their results.
- use the normal distribution to model samples and to make inferences as appropriate.
- use margin of error and sample-to-sample variability to evaluate statistical decisions.

## **GEOMETRY N**

**203411**

**GRADES: 9-12**

**\*PREREQUISITE:**

**ALGEBRA I**

**1 CREDIT/2 TERMS**

Geometry is the second course in a sequence of college preparatory mathematics courses. It emphasizes several big ideas in an integrated algebra/geometry context. The key concepts addressed in this course are Transformations, symmetry, similarity and congruence of plane figures, tools for analyzing and measuring shapes (such as the Pythagorean Theorem, trigonometric ratios, the Laws of Sines and Cosines, and coordinate geometry), investigation of relationships, conjecture and proof, geometric construction, algebra and probability.

### Benchmarks

The students will:

- pose mathematical questions, such as “What if...?,” meaningfully and appropriately.
- make conjectures and test their validity.
- recognize and represent patterns mathematically or in prose.
- appreciate geometry as a connected, systematic branch of mathematics.
- apply geometry to solve problems in both mathematical and real-world contexts.
- critique a logical argument.
- communicate their mathematical understanding effectively and formulate complete, logical arguments to support their conclusions.
- use algebra to formulate and solve equations arising from geometric situations on and off a coordinate grid.
- exhibit creativity and perseverance in mathematical problem solving, with the ability to determine when an approach is not working and a new direction is needed.

## **HONORS GEOMETRY N**

**203421**

**GRADES: 9-12**

**\*PREREQUISITE: ALGEBRA I**

**1 CREDIT/2 TERMS**

Honors Geometry differs from Geometry both in emphasis and content. In this course there will be more emphasis on geometry as a system of deductive logic. The students will be required to prove more theorems than in Geometry. By completing more abstract proofs with a greater degree of mathematical rigor than is required in Geometry, the students of Honors Geometry will gain a greater understanding of geometry as a deductive system. Honors Geometry will include all topics covered in Geometry. In addition, the course will include such topics as inductive/deductive reasoning, logic, and other more advanced topics.

### Benchmarks

The students will:

- apply the rules of logic to make sound conclusions.
- study the relationships between lines, segments and angles.
- draw conclusions from postulates, definitions and theorems.
- categorize triangles as right, acute, obtuse, isosceles, scalene, or equilateral.
- prove triangles congruent.
- study the relationships of inequality as they pertain to the sides and angles of a triangle.
- draw conclusions from parallel lines and their related pairs of angles.

- categorize quadrilaterals as parallelograms, rectangles, rhombuses, squares or trapezoids, and have a working knowledge of their properties.
- know the basis for proving triangles similar.
- use proportional segment lengths to solve problems.
- apply the Pythagorean theorem.
- use the ratios of trigonometry to find missing parts of a right triangle.
- study properties of circles, their chords, radii, diameters, secants and tangents.
- compute areas of polygons.

## **PROBABILITY AND STATISTICS N**

**206311**

**GRADES: 11-12**

**\*PREREQUISITE: ALGEBRA II OR HONORS ALGEBRA II**

**1 CREDIT/2 TERMS**

Statistical Analysis of data is used in areas ranging from opinion polls to engineering, from education and psychology studies to marketing and advertising. Statistics is the study of the collection, organization, presentation and interpretation of numerical data. Probability is the study of chance and how to quantify or measure uncertainty. In Probability and Statistics, the students will learn to collect a data sample, estimate what the sample says about the population as a whole, and make decisions based on their analysis.

### Benchmarks

The students will:

- identify the types of sampling and experimental designs
- display and describe categorical and quantitative variables
- calculate descriptive statistics
- calculate simple and compound probabilities utilizing tree diagrams, Venn diagrams, and two-way contingency tables
- find the expected values and standard deviation of probability distributions, geometric distributions, and Poisson distributions
- identify the properties of normal models, sampling models, t models, and chi-square models
- find probabilities and values of the standard normal distribution, t-distribution, and chi-square distribution using a table and graphing calculator
- calculate and interpret confidence intervals for z-intervals, t-intervals, 1-proportion z-intervals, and chi-square intervals of variance using a table and graphing calculator
- perform and interpret hypothesis testing for z tests, t tests, 1 proportion z-tests, and chi-square tests of variance using a table and graphing calculator

## **AP STATISTICS N**

**206321**

**GRADE: 11-12**

**\*PREREQUISITE: PRE-CALCULUS OR  
TEACHER RECOMMENDATION**

**1 CREDIT/2 TERMS**

This course will be an introductory, non-calculus based course in statistics built around four main topics.

### Benchmarks

- I. Exploring Data: Observing Patterns and Departures from Patterns
  - A. Interpreting graphical displays of distributions of univariate data
  - B. Summarizing distributions of univariate data
  - C. Comparing distributions of univariate data
  - D. Exploring bivariate data
  - E. Exploring categorical data
- II. Planning a Study: Deciding What and How to Measure
  - A. Overviews of methods of data collection
  - B. Planning and conducting surveys
  - C. Planning and conducting experiments
  - D. Generalizability of results from observational studies, experimental studies and surveys
- III. Anticipating Patterns: Producing Models Using Probability Theory and Simulation
  - A. Probability as relative frequency
  - B. Combining independent random variables
  - C. The normal distribution
  - D. Sampling distributions
- IV. Statistical Inference: Confirming Models
  - A. Confidence intervals
  - B. Tests of significance



### C. Special cases of normally distributed data

#### **PRE-CALCULUS N**

**205321**

**GRADES: 10-12**

**\*PREREQUISITE:**

**ALGEBRA II OR HONORS ALGEBRA II**

**1 CREDIT/2 TERMS**

This course strengthens and extends concepts learned in previous algebra courses. It is intended for students who desire a high level math course without an emphasis on analytic proof or limit theory. Graphing calculators are used extensively to analyze the behavior of functions and solve problems.

#### Benchmarks

The students will:

- use the graphing calculator to graph math models of problems and generate value tables for functions.
- use coordinate geometry to find lengths and midpoints of segments.
- determine the characteristics of linear and quadratic functions (e.g., slope, intercepts, maxima/minima).
- determine the intersections of graphs algebraically and graphically.
- solve a variety of equations over the real and complex number sets.
- solve inequalities algebraically and graphically (using graphing calculators).
- identify characteristics of polynomial functions (e.g., zeros, symmetry, degree, leading coefficients).
- use transformations of graphs (e.g., shifts, stretch/shrink).
- determine related functions, such as composite and inverse functions.
- identify characteristics of rational functions (e.g., vertical and horizontal asymptotes, slant asymptotes).
- evaluate or simplify exponential and logarithmic expressions.
- apply exponential and logarithmic expressions to real world problems (e.g., compound interest, population growth).
- solve exponential and logarithmic equations.
- describe angles by measure (degree or radian) or relationship (complementary, supplementary).
- determine trigonometric values for given angles.
- use trigonometric values to solve problems.
- use the Law of Sines and Law of Cosines to solve problems.
- determine trigonometric function values for any real number.
- graph trigonometric functions.
- solve linear systems using Row-Echelon and Gaussian elimination.
- perform basic matrix arithmetic.
- solve linear systems using matrices (with and without calculators).
- solve trigonometric equations
- prove trigonometric identities

#### **HONORS PRE-CALCULUS N**

**205311**

**GRADES: 10-12**

**\*PREREQUISITE:**

**HONORS ALGEBRA II**

**1 CREDIT/2 TERMS**

**OR TEACHER RECOMMENDATION**

This course encompasses the basics of analytic geometry and trigonometry coupled with additional topics and should serve to unify and reinforce the students accumulated knowledge from previous mathematics courses. The vocabulary of relations and functions is related to different types of functions throughout the course. Polynomial functions over the complex numbers are formed, given their zeros. Further topics include proofs over the real numbers and proofs by mathematical induction as well as applications of the binomial theorem. Of the topics of analytic geometry, particular emphasis is placed on coordinate geometry proofs and the study of conic sections. Arithmetic and geometric sequences and series are studied along with limits of sequences and sums of infinite series. In the study of trigonometry, particular emphasis is placed on both the trigonometric functions and the inverse trigonometric functions and their graphs, the proofs of trigonometric identities, the solutions of trigonometric equations and the solutions of triangles using the law of sines and the law of cosines. Where appropriate, graphing calculators are used.

#### Benchmarks

The students will:

- explore the characteristics of functions using the graphing calculator as a tool.
- compute the composite of two functions and justify its domain.
- use slope, distance, midpoint, equations of lines in proving geometric theorems algebraically.
- test special cases, establish a pattern, and verify a statement by mathematical induction.
- find any term or terms of a binomial expansion as well as the complete expansion.
- specify the general term definition and the recursive definition of a sequence.
- use algebra necessary in solving problems with arithmetic and geometric sequences and series.

- use synthetic division, the Rational Root Theorem, Descartes' Rule of Signs, and the Bounds for the Real Roots in solving polynomial equations.
- determine a third-degree or a fourth-degree polynomial equation, given its roots.
- determine equation of a circle, parabola, ellipse or hyperbola under certain given conditions.
- from equation of a circle, parabola, ellipse or hyperbola, determine characteristics of that conic section.
- understand right triangle trigonometry, the wrapping function on the unit circle, and trigonometry from the standpoint of an angle in standard position.
- determine the period, amplitude and phase shift of  $y = A \sin [ B ( x - C ) ]$ .
- prove trigonometric identities.
- use the sum, difference, double-angle and half-angle formulas of trigonometry.
- simplify expressions involving inverse trigonometric functions.
- solve triangles using right triangle trigonometry, the Law of Sines, the Law of Cosines.
- use limits to find slope of a tangent line to a curve.

## **AP CALCULUS AB N**

**205811**

**GRADES: 11-12**

**\*PREREQUISITE: HONORS PRE-CALCULUS**

**1 CREDIT/2 TERMS**

Honors Advanced Placement Calculus AB will be offered during the fall semester each year. The course consists of two terms of work in calculus and related topics comparable to courses in colleges and universities. Topics include limits and continuity of functions, derivatives and integrals. Graphing calculators will be extensively used throughout the study of Calculus, both for the ability to graphically determine information about a function and for the numeric techniques for finding approximate results, which will also be studied. Two forms of an Advanced Placement Exam in late spring offer the students the opportunity to earn up to two semesters of college credit at most colleges and universities. This course prepares students for the Calculus AB form. For the Calculus BC form, students should plan to take this course followed by Honors AP Calculus BC.

### Benchmarks

The students will:

- prove certain limits using the precise delta-epsilon definition of a limit of a function.
- find limits by rationalizing the numerator and using L'Hospital's Rule.
- compute the derivatives of sums, differences, products and quotients of functions along with using the Chain Rule.
- compute derivatives by implicit differentiation and use this to solve related rate problems.
- determine local and absolute maximum and minimum values of functions.
- determine concavity and points of inflection of functions.
- solve applied maximum and minimum problems.
- have a working knowledge of the Intermediate Value Theorem, Mean Value Theorem and The Fundamental Theorem of Calculus.
- evaluate an integral using a variety of techniques.
- find the area between two curves, the volumes of solids of revolution, and the average value of a function.
- solve certain differential equations, including those applicable to exponential growth or decay.

## **AP CALCULUS BC N**

**205911**

**GRADES: 11-12**

**\*PREREQUISITE: AP CALCULUS AB**

**.5 CREDIT/1 TERM**

Honors Advanced Placement Calculus BC will be offered during the third term each year. The course continues the study of calculus begun in Honors Advanced Placement Calculus AB. Topics extend the work with limits, derivatives and integrals to functions written in polar and vector forms and functions represented parametrically. Students completing this course will be able to choose either the Calculus AB or the Calculus BC forms of the Advanced Placement tests to earn college credit at most colleges and universities.

### Benchmarks

The students will:

- represent curves with function equations, parametric or polar equations or as an infinite series of terms
- analyze an integral and apply an appropriate method for finding the integral value, then apply the integral to solve problems including but not limited to physics, economics, probability, medicine, business and engineering.
- compute area between curves in rectangular as well as in polar coordinates.
- compute the length of a curve, whether the curve be represented parametrically or not.
- compute the surface area of a solid of revolution, whether the curves be represented parametrically or not.
- determine the convergence or divergence of an infinite series, using a variety of techniques.
- determine the interval of convergence of a power series.
- use vector notation and analyze vector functions.