

# MATH DEPARTMENT



Arts & Communications



Business, Management Marketing & Technology



Health Science



Engineering/Manufacturing & Industrial Technology



Human Services



Natural Resources & Agriscience

VPAA – Meets Visual, Performing & Applied Arts Requirement

OLE – Partially Meets Online Learning Experience Requirement

GR/MMC – Meets Graduation Requirements based on Michigan Merit Curriculum

SMR – Senior Math Related

<b>ALGEBRA I</b> (OLE) – E090	<b>REQUIRED CLASS</b>	7, 8, 10	1.0 credit
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**PREREQUISITE:** It is expected that students entering Algebra I are able to recognize and solve mathematical and real-world problems involving linear relationships and to make sense of and move fluently among the graphic, numeric, symbolic, and verbal representations of these patterns.

Algebra 1 includes the study of families of functions including linear, quadratic, polynomial, exponential, rationals, and bivariate data analysis. Students will also develop their knowledge of power (including roots, cubics, and quartics). Algebra 1 draws upon and connects to topics related to numbers and geometry by including the formalized study of the real number system and its properties, and by introducing elementary number theory. Use of the graphing calculator is embedded in the course.

<b>ACCELERATED GEOMETRY</b> (GR/MMC) – E100		8, 9	1.0 credit
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**PREREQUISITE:** Algebra 1. Geometry builds on a number of key geometric topics developed in the middle grades, namely relationships between angles, triangles, quadrilaterals, circles, and simple three-dimensional shapes. It is expected that students beginning Geometry are able to recognize, classify, and apply properties of simple geometric shapes, know and apply basic similarity and congruence theorems, understand simple constructions with a compass and straight edge, and find area and volume of basic shapes.

Students studying Geometry should develop analytic and spatial reasoning skills. Work is done with two-dimensional and three-dimensional figures in real-world contexts, building spatial visualization skills and deepening the understanding of shapes and relationships. Areas of study include: right triangle trigonometry, algebraic reasoning applied to geometric situations, transformations of linear and quadratic functions to geometric transformations, and coordinate Geometry. The study of formal logic and proof helps students to understand the axiomatic system that underlies mathematics through the presentation and development of postulates, definitions, and theorems. Students should develop deductive reasoning skills. This rigorous course moves more rapidly and studies the topics in greater detail than in regular Geometry.

<b>GEOMETRY (OLE) – E110</b>	<b>REQUIRED CLASS</b>	9, 10	1.0 credit
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**PREREQUISITE:** Geometry builds on a number of key geometric topics developed in the middle grades, namely relationships between angles, triangles, quadrilaterals, circles, and simple three-dimensional shapes. It is expected that students beginning Geometry are able to recognize, classify, and apply properties of simple geometric shapes, know and apply basic similarity and congruence theorems, understand simple constructions with a compass and straight edge, and find area and volume of basic shapes.

Students studying Geometry should develop analytic and spatial reasoning skills. Work is done with two-dimensional and three-dimensional figures in real-world contexts, building spatial visualization skills and deepening the understanding of shapes and relationships. Areas of study include: right triangle trigonometry, algebraic reasoning applied to geometric situations, transformations of linear and quadratic functions to geometric transformations, and coordinate Geometry. The study of formal logic and proof helps students to understand the axiomatic system that underlies mathematics through the presentation and development of postulates, definitions, and theorems. Students should develop deductive reasoning skills.

<b>ALGEBRA II (OLE) – E120</b>	<b>REQUIRED CLASS</b>	9, 10, 11	1.0 credit
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**PREREQUISITE:** Geometry, Algebra I

Students continue the study of function families including: quadratic, polynomial, radical, rational, exponential, and logarithmic functions. The topic of conic sections fuses algebra with geometry. Units of study include sequences and iteration as well as univariate statistical applications and trigonometry. Students will develop an understanding that algebraic thinking is an accessible and powerful tool that can be used to model and solve real-world problems. Use of the graphing calculator is embedded in the course.

<b>ACCELERATED ALGEBRA II (OLE) (GM/MMC) – E130</b>		9, 10, 11	1.0 credit
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**PREREQUISITE:** 1) Geometry and Algebra I and Teacher recommendation or  
2) Algebra I and Accelerated Geometry and Teacher recommendation

Students continue the study of function families including: quadratic, polynomial, radical, rational, exponential, and logarithmic functions. The topic of conic sections fuses algebra with geometry. Units of study include sequences and iteration as well as univariate statistical applications and trigonometry. Students will develop an understanding that algebraic thinking is an accessible and powerful tool that can be used to model and solve real-world problems. This rigorous course moves more rapidly and studies the topics in greater detail than in regular Algebra II. Use of the graphing calculator is embedded in the course.

<b>BUSINESS MATHEMATICS (OLE) (GR/MMC) (SMR) – E135</b>		12	.5 credit
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This course provides the basic experience and skill in mathematics needed for jobs in the office and business occupations. Time is spent relating the fundamentals of mathematics to various business situations, office work, retailing and personal finance.

**PRECALCULUS** (GR/MMC) (SMR) - E155 11, 12 1.0 credit

PREREQUISITE: Successful completion of Algebra II or Accelerated Algebra II and teacher recommendation

Precalculus is the preparation for calculus. The study of the topics, concepts, and procedures of precalculus deepens students' understanding of algebra and extends their ability to apply algebra concepts and procedures at higher conceptual levels, as a tool, and in the study of other subjects. Topics include: functions, exponential and logarithmic functions, quadratic functions, polynomial functions, rational functions and difference quotients, systems of equations, sequences, series, parametric equations, and conic sections. The theory and application of trigonometry and functions are developed in depth. New mathematical tools, such as vectors, matrices, and polar coordinates are introduced, with an eye toward modeling and solving real-world problems. Limit theory will be introduced in this course. Use of the graphing calculator is embedded in the course.

**ACCELERATED PRECALCULUS** (GR/MMC) (SMR) - E157 10, 11, 12 1.0 credit

PREREQUISITE: Successful completion of Algebra II or Accelerated Algebra II and teacher recommendation

Accelerated Precalculus is the preparation for AP Calculus, or a college level Calculus I course. The study of the topics, concepts, and procedures of Accelerated Precalculus deepens students' understanding of algebra and extends their ability to apply algebra concepts and procedures at higher conceptual levels, as a tool, and in the study of other subjects. Topics include: functions, exponential and logarithmic functions, quadratic functions, polynomial functions, rational functions and difference quotients, systems of equations, sequences, series, mathematical induction, parametric equations, and conic sections. The theory and application of trigonometry and functions are developed in depth. New mathematical tools, such as vectors, matrices, polar coordinates, limits and derivatives are introduced. This rigorous course moves more rapidly and studies the topics in greater detail than in regular precalculus. Limit theory will be introduced in this course. Use of the graphing calculator is embedded in the course.

**INTRODUCTION TO CALCULUS (A) AND DISCRETE MATHEMATICS** (GR/MMC) (SMR) – E160 12 1.0 credit

PREREQUISITE: Successful completion of Precalculus or Accelerated Precalculus

Introduction to Calculus and Discrete Mathematics is a rigorous one-year college preparatory course, which includes a review of topics in Algebra, including: Functions (exponential, logarithmic, quadratic, polynomial, rational functions), and Translations and Reflections of the Functions. The course continues with the topics of: Systems of Linear Equations and Matrices with Linear Programming, and an Introduction to Sets and Probability with the Binomial Theorem. A study of the Derivative includes: Limits, Rates of Change, the Definition of the Derivative, and Techniques for finding the Derivative. The study of Curve Sketching includes Using First and Second Derivatives, and Limits at Infinity. Applications of the Derivative include finding the Maximum, the Minimum, Implicit Differentiation and Related Rates. Integration is introduced including: Anti-Derivatives, Area and the Definite Integral, and The Fundamental Theorem of Calculus.

**ADVANCED PLACEMENT CALCULUS AB** (GR/MMC) (SMR) – E161 11, 12 1.0 credit

PREREQUISITE: Successful completion of 4 years of secondary mathematics including Accelerated Trigonometry/Analytic Geometry or Precalculus or Accelerated Precalculus and teacher recommendation

The topics of instruction in AP Calculus AB focus on differential and integral calculus including: functions, graphs and limits, derivatives, and integrals. Problems are explored from multiple viewpoints including, algebraic, numerical, and graphical. Problem solving is developed throughout the course with an emphasis on practical applications. Students have the opportunity to take the Advanced Placement Calculus AB Examination for possible college credit. Graphing calculators are required for the AP tests.

**ADVANCED PLACEMENT CALCULUS BC** (OLE) (GR/MMC) (SMR) – E162 11, 12 1.0 credit

PREREQUISITE: Successful completion of 4 years of secondary mathematics including Accelerated Trigonometry/Analytic Geometry or Precalculus or Accelerated Precalculus and teacher recommendation

The topic outline for AP Calculus BC includes all AP CALCULUS AB topics. Additional topics include: parametric, polar, and vector functions, derivatives of parametric, polar, and vector functions, applications of integrals, antiderivatives, and polynomial approximations and infinite sequences and series. Students have the opportunity to take the Advanced Placement Calculus BC Examination for possible college credit. Graphing calculators are required for the AP tests.

**COMPUTER SCIENCE I** (OLE) (GR/MMC) (SMR) – E200 10<sup>1</sup>, 11, 12 .5 credit

PREREQUISITE: Completion of Algebra I with “C” average or better. (Occasional exceptions may be made for students showing outstanding potential.)

Computer Science I is an introductory course for students interested in learning the structure and logic of a formal programming language. The course is especially intended for students who may enroll in computer science courses in college. The Computer Science I course will emphasize program structure and design while developing standard programming algorithms and conventional procedures. The topics of study will include program development, functions and procedures, data structures, sorting routines with respect to efficiency, and text files and formatted output.

<sup>1</sup>Tenth grade students may elect this course providing they have met the prerequisite and are also taking a mathematics course within the mathematics department pathway. This course may NOT be taken by tenth grade students in lieu of a mathematics course that contains Mathematics High School Content Expectations (HSCEs) as defined by the Michigan Department of Education.

**COMPUTER SCIENCE II (GR/MMC) (SMR) – E210**

10, 11, 12

.5 credit

PREREQUISITE: Successful Completion of Computer Science I

Computer Science II is a continuation of the one-semester Computer Science I course. The course is designed for college-bound students who will major in a scientific or technical discipline that requires computer involvement. The course emphasizes computer science algorithms and their implementation using static and dynamic data structures. Students will study arrays in further detail. The course also will include an introduction to stacks, queues, linked lists, and binary trees. Emphasis will be on computer science topics using formal-structured program design.

● Tenth grade students may elect this course providing they have met the prerequisite and are also taking a mathematics course within the mathematics department pathway. This course may NOT be taken by tenth grade students in lieu of a mathematics course that contains Mathematics High School Content Expectations (HSCEs) as defined by the Michigan Department of Education.

**AP COMPUTER SCIENCE A (OLE) (GR/MMC) (SMR) – E215**

11, 12

1.0 credit

AP Computer Science A is an introduction to Object-Oriented computer programming using a high-level programming language such as Java. The course will emphasize program structure and design while developing standard programming algorithms and conventional procedures. Classes, member functions, inheritance, polymorphism, operator overloading, sorting routines, and the AP Case study will be covered in this course.

**PROBABILITY AND STATISTICS (OLE) (GR/MMC) (SMR) – E300**

10, 11, 12

.5 credit

This course inter-relates data analysis, statistics, and probability through the methods of investigation, modeling, and simulation. Students conduct experiments and analyze and interpret data through measures of central tendency and measures of variability. They draw conclusions and make predictions based on data and evaluate the effectiveness of their experiments and components thereof. The use of technology (graphing calculators, computer programs and simulators, etc) is utilized frequently.

**AP STATISTICS (OLE) (GR/MMC) (SMR) – E310**

10, 11, 12

1.0 credit

PREREQUISITE: Algebra II or concurrently with Accelerated Algebra II

*Experimental Design:* Students will design appropriate experiments in order to draw conclusions that can be generalized to the population of interest. Students will also interpret studies and experiments to determine whether the conclusions from the studies warrant consideration.

*Exploring Data:* Students will collect and examine data; displaying the patterns that emerge. Data from students in class as well as real world data sets will be gathered and used to illustrate concepts.

*Producing Models Using Probability and Simulation:* Students will learn to anticipate patterns and produce models for prediction. Students will use simulations to model situations that are not practical to replicate using other methods.

*Statistical Inference:* Students will learn what can be generalized about the population. Students will also consider how to investigate research questions, design a study, and interpret the results.

Students use computers/graphing calculators to fit mathematical models to data, and also to produce graphs designed for statistical analysis. Students are expected to read critically and interpret problem situations described in writing, and to write reports. This course prepares students to take the Advanced Placement Statistics examination.

**ADVANCED ALGEBRA/GEOMETRY (UCMST) (GR/MMC) – E800**

9

1.0 credit

PREREQUISITE: Acceptance into the UCMST program and successful completion of Algebra I

Advanced Algebra/Geometry is designed to develop understanding of advanced mathematical topics such as mathematical modeling, rational expressions, an analysis of absolute value expressions, radicals and rational exponents, matrices, n-dimensional systems of equations, and Euclidean Geometry.

**ADVANCED ALGEBRA/INTRO TO DISCRETE MATHEMATICS (UCMST) (GR/MME) – E805B.1**

9

1.0 credit

PREREQUISITE: Acceptance into the UCMST program and successful completion of Algebra I and Geometry

Advanced Algebra/Intro to Discrete Mathematics contains topics found in Advanced Algebra and Discrete Mathematics. The course is designed to develop understanding of advanced mathematical topics such as mathematical modeling, rational expressions, an analysis of absolute value expressions, radicals and rational exponents, matrices, and n-dimensional systems of equations. Topics in Discrete Mathematics include, but are not limited to, matrix applications, advanced counting & probability, logic, set theory, introduction to graph theory, and recursion.

**BEGINNING C++ COMPUTER SCIENCE/STATISTICS (GR/MMC) – NR90** 9 1.0 credit

Beginning C++ Computer Science is designed to develop understanding of data analysis, and to provide an introduction to computer programming (C++ syntax). Using scientific data, emphasis is placed on the applications of statistics and computer science. Students apply the fundamentals of object-oriented programming to problem solving. The course continues with these topics in Statistics:

- **Data exploration and study design.** Students explore and compare univariate and bivariate data sets using both graphical and numerical summary measures and learn principles of data collection and study design that aim to minimize bias and variability of resulting data.
- **Probability models and their application.** Students use discrete probability distributions as models for random systems and use conditional probability and Bayes' Theorem to solve applied problems. The normal distribution is studied and sampling distributions for means and proportions are developed based on the normal distribution.
- **Statistical inference.** Students learn the logic and terminology of confidence interval estimation and significance testing. They learn to apply these techniques to questions involving means and proportions in one and two sample settings, to categorical data, and to the simple linear regression model.
- **Model assessment.** Students learn to assess the validity of assumptions of statistical and probabilistic models and to assess the effect of departures from model assumptions.

**MATHEMATICAL ANALYSIS (UCMST) (GR/MMC) – E810** 10 1.0 credit

PREREQUISITE: Successful completion of Advanced Algebra/Geometry or Advanced Algebra/Intro to Discrete Mathematics

Analysis is designed to develop an in-depth understanding of functions, including power, polynomial, rational, exponential, logarithmic, and trigonometric functions. Units on conic sections and vectors are also included.

**FOUNDATIONS of CALCULUS (UCMST) (GR/MME) – E820A.2** 11 .5 credit

PREREQUISITE: Successful completion of Mathematical Analysis

Foundations of Calculus are designed to provide theoretical foundations for the study of higher mathematics and computer science. Students study sequences and series, probability, n-dimensional vectors, parametric and polar equations, logic and proofs, limit theory, and differential calculus.

**ADVANCED PLACEMENT STATISTICS (GR/MME) – E835BAP.1**

11

0.5 credit

PREREQUISITE: Successful completion of Mathematical Analysis and Foundations of Calculus

Advanced Placement Statistics is the study of topics in mathematics which can be grouped into four categories:

**Experimental Design:** Students will design appropriate experiments in order to draw conclusions that can be generalized to the population of interest. Students will also interpret studies and experiments to determine whether the conclusions from the studies warrant consideration.

**Exploring Data:** Students will collect and examine data; displaying the patterns that emerge. Data from students in class as well as real world data sets will be gathered and used to illustrate concepts.

**Producing Models Using Probability and Simulation:** Students will learn to anticipate patterns and produce models for prediction. Students will use simulations to model situations that are not practical to replicate using other methods.

**Statistical Inference:** Students will learn what can be generalized about the population. Students will also consider how to investigate research questions, design a study, and interpret the results.

Students use computers and graphing calculators to fit mathematical models to data, and also to produce graphs designed for statistical analysis. Students are expected to read critically and interpret problem situations described in writing, and to write reports. This course prepares students to take the Advanced Placement Statistics examination.

Preparation for the AP Statistics Exam will be incorporated into the course. For those students who achieve a 4 or 5 on the exam, college credit can be awarded.

**ADVANCED PLACEMENT COMPUTER SCIENCE – JAVA (GR/MMC) - NR85**

11

1.0 credit

PREREQUISITE: Successful completion of Mathematical Analysis

Advanced Placement Computer Science – JAVA is designed to provide advanced training in computer science using the Java language. Topics of study include fundamental and advanced algorithms, data structures and data manipulation, discrete mathematics, linked lists, stacks and recursion.

**ADVANCED PLACEMENT CALCULUS BC (UCMST) (GR/MMC) (SMR) – E840**

12

1.0 credit

PREREQUISITE: Successful completion of 4 years of high school mathematics including Foundations of Calculus and AP Statistics.

AP Calculus BC is designed to prepare the student for the Advanced Placement Examination. The topics of instruction include the topics of Calculus I, Calculus II, and Calculus III. Graphing calculators are required for the AP tests.