

# Mathematics

Algebra 1  
Plane Geometry  
Geometry, Design, and Construction  
Algebra 2 Essentials  
Algebra 2  
Algebra 2 and College Algebra with Trigonometry  
College Algebra and Statistics  
Precalculus and Trigonometry  
Analytic Geometry, Precalculus, and Discrete Mathematics  
Introduction to Calculus & Statistics

Introduction to Finite Mathematics & Statistics  
Analytic Geometry, Precalculus, and Discrete Mathematics  
AP Calculus AB  
AP Calculus BC  
Multivariable Calculus and Linear Algebra  
AP Statistics  
Computer Science  
AP Computer Science  
EL Math Resource

## MATHEMATICS FLOW CHART

Mathematics as a discipline is an important and beautiful human endeavor, and mathematics has applications in many areas. All students, to the extent of their abilities, should have the opportunity to take part in the broader aspects of mathematics as a way of thinking, as a cultural heritage, and as an experience in grasping ideas, seeing their interrelations, and communicating them to others.

7th	8th	Freshman	Sophomore	Junior	Senior
<b>LEVEL 2</b>					
		Algebra 1	Plane Geometry	Algebra 2 Essentials	College Alg/Prob & Stats
		Algebra 1	Plane Geometry Geometry, Design, and Construction (level 9)	Algebra 2	Placement based on teacher recommen- dation for one of the following courses: Precalculus & Trig, or College Algebra & Statistics
	Algebra 1	Plane Geometry	Algebra 2	Precalculus & Trigonometry	Intro to Finite Math & Stats
<b>LEVEL 3</b>					
		Algebra 1	Plane Geometry Geometry, Design, and Construction (level 9)	Algebra 2	Precalculus & Trigonometry
	Algebra 1	Plane Geometry	Algebra 2	Precalculus & Trigonometry	Placement based on teacher recommen- dation for one of following courses: AP Calculus AB, AP Statistics, AP Computer Science, Analytic Geometry, Precalculus & Discrete Math, or Intro Calc & Stats
<b>LEVEL 4</b>					
Algebra 1	Plane Geometry	Algebra 2 & College Alg with Trig	Analytic Geometry, Precalculus & Discrete Math	AP Calculus BC or AP Computer Science	MVCalculus/Linear Algebra, AP Statistics, or AP Computer Science
	Algebra 1	Plane Geometry	Algebra 2 & College Alg with Trig	Analytic Geometry, Precalculus & Discrete Math	AP Calculus BC, AP Statistics, or AP Computer Science
<b>NOTES:</b> <ul style="list-style-type: none"> <li>Two class titles separated by a forward slash denote a full-year sequence.</li> <li>Computer Science is a full-year enrichment course that can be taken after Geometry. This course does not fulfill the graduation requirement in Mathematics. It is not a prerequisite for AP Computer Science.</li> </ul>					

The goals for students reflect those stated in the Principles and Standards for School Mathematics published by the National Council of Teachers of Mathematics:

- to value mathematics;
- to become confident in one’s ability to do mathematics;
- to become a mathematical problem solver;
- to communicate mathematically;
- to reason mathematically; and
- to use technology appropriately.

### ALL COURSES IN THIS DEPARTMENT RECEIVE MAJOR CREDIT. (1.0 CREDIT)

Credit for the first semester is required for enrollment in the second semester of all courses. Mathematics courses taken in junior high school do not receive credit toward graduation from New Trier. *For a visual representation of mathematics courses, please see the departmental flow chart on page 58.*

### HOMEWORK STATEMENT

The primary purpose of homework in mathematics is to enhance classroom learning. Both the student and the teacher use homework to evaluate the learning process. Homework also includes opportunities for students to:

- Refine their skills through practice;
- Check for understanding;
- Develop independent learning skills, including the use of resources such as the textbook and class notes;
- Apply and investigate learned concepts in new contexts; and
- Preview new content.

**Please keep in mind that homework goes beyond the solving of assigned problems. For homework to be an effective part of the learning process, it consists not only of written work but also of reflection by the student on his or her level of understanding.**

While each classroom provides a unique learning experience, the following homework standards exist for all mathematics courses:

- Homework is routinely assigned. In many courses, it is assigned on a daily basis.
- Students should typically expect to invest 30-60 focused minutes per assignment. The required time will vary by student and course.
- The quality of work should provide sufficient detail to convey the problem-solving process to other students and to the teacher.
- Students are expected to check for accuracy.
- Students are expected to follow up on homework difficulties with available resources, including the textbook, class notes, the teacher, math resource centers, and classmates.

Specific homework policies will vary among courses and teachers. Additional information can be found in teachers’ Course Expectations documents distributed at the beginning of the school year.

# Mathematics Courses

## Algebra 1 level 2 & level 2 (Co-Taught)

OPEN TO FRESHMEN  
PREREQUISITE: NONE

This course is a complete course in elementary algebra. Because students in this course may not have a solid foundation in the arithmetic and prealgebra skills necessary for success in beginning algebra, this class meets every day. This course provides extra support to build a solid foundation for future mathematics courses.

## Algebra 1 levels 2 & 3

OPEN TO FRESHMEN  
PREREQUISITE: NONE

Elementary algebra focuses on the structure of the real number system. The solution of equations, inequalities, and systems of equations and inequalities is presented. Graphing, both as a means of displaying data and analyzing data in one and two dimensions, is an integral part of these courses. A sound foundation in arithmetic and prealgebra skills is essential for success in these courses.

## Plane Geometry levels 2, level 2 (Co-Taught), 3, & 4

OPEN TO FRESHMEN AND SOPHOMORES  
PREREQUISITE: ALGEBRA 1

The basic content of this course is plane geometry with integration of transformations and coordinate geometry. This course develops geometric concepts, including the study of formal proofs (including coordinate and indirect methods) and algebraic applications. Algebra is used extensively for areas, volumes, lengths, angle measures, and graphing.

## Geometry, Design, and Construction-Team level 9

OPEN TO FRESHMEN AND SOPHOMORES  
PREREQUISITE: ALGEBRA 1  
MATH DEPARTMENTAL APPROVAL REQUIRED

In this *team-taught, double-block* course, students learn plane geometry concepts by applying real-world construction concepts through Computer Aided Design as they create and build small projects, such as playhouses and gazebos. Throughout the course, students develop skills in teamwork, problem solving, and project management. This course covers all necessary plane geometry concepts and will prepare students to enter an Algebra 2 course in the following year. Prior experience in woodworking is not required. *This course fulfills the graduation requirement for mathematics and fine and/or practical arts.*

## Algebra 2 Essentials level 2

OPEN TO JUNIORS  
PREREQUISITE: PLANE GEOMETRY, LEVEL 2  
DEPARTMENTAL APPROVAL REQUIRED

This intermediate algebra course is a continuation of Algebra 1. An emphasis is placed upon understanding relations and functions, including quadratic functions, exponential functions, logarithmic functions, and rational functions. The unit circle, probability, series and sequences, and the complex number system are introduced. Additional emphasis is placed on the development of skills necessary to be successful in mathematics. This course covers the majority of content in the Algebra 2, level 2 course, including that content necessary for standardized testing and state standards. Students who complete this course and want to take a fourth year of mathematics must enroll in College Algebra/Probability & Statistics in the following year.

## Algebra 2 levels 2, level 2 (Co-Taught), & 3

OPEN TO SOPHOMORES AND JUNIORS  
PREREQUISITE: PLANE GEOMETRY

This intermediate algebra course is a continuation of Algebra 1, including the solutions of equations, inequalities, and systems. An emphasis is placed upon understanding relations and functions, including quadratic functions, exponential functions, logarithmic function, rational functions, and polynomial functions. The unit circle, probability and statistics, series and sequences, and the complex number system are introduced.

## Algebra 2 and College Algebra with Trigonometry level 4

OPEN TO FRESHMEN AND SOPHOMORES  
PREREQUISITE: PLANE GEOMETRY, LEVEL 4

This highly accelerated course includes topics from intermediate algebra, college algebra, and trigonometry. First semester includes a rigorous study of functions and transformations, including quadratic functions, polynomial functions, rational functions, exponential functions, and logarithmic functions. Second semester includes an in-depth study of trigonometry and an introduction to probability. This course includes the equivalent of one semester of trigonometry.

## College Algebra and Statistics level 2

OPEN TO SENIORS  
PREREQUISITE: ALGEBRA 2 OR ALGEBRA 2 ESSENTIALS  
DEPARTMENTAL APPROVAL REQUIRED

This course provides a fourth year of mathematics for students who want an alternative to the traditional senior mathematics course which includes a semester of trigonometry. The content of this course includes functions and their graphs, matrices, linear programming, probability, introductory statistics, and right triangle trigonometry.

## Precalculus and Trigonometry level 2 & level 2 (Co-Taught)

OPEN TO JUNIORS AND SENIORS  
PREREQUISITE: ALGEBRA 2  
DEPARTMENTAL APPROVAL REQUIRED

This course builds on the topics studied in Algebra 2 and includes the equivalent of one semester of trigonometry. The curriculum includes a rigorous study of exponential, logarithmic, trigonometric, polynomial, and rational functions. An in-depth study of additional topics in trigonometry, inequalities, analysis of graphs of functions, conic sections, vectors, and limits is also included. Transformations of functions are highlighted throughout the course. Emphasis is placed on problem-solving techniques with an aim to build upon and extend skills gained in previous math courses. Students who register for this course should have earned at least a “C” in 2-level Algebra 2 and received a recommendation from their Algebra 2 teacher to take this course.

## Precalculus and Trigonometry level 3

OPEN TO JUNIORS AND SENIORS  
PREREQUISITE: ALGEBRA 2

This course builds on the topics studied in Algebra 2 and includes the equivalent of one semester of trigonometry. The curriculum includes a rigorous study of exponential, logarithmic, trigonometric, polynomial, and rational functions. The course also includes in-depth study of analytic trigonometry, analytic geometry, analysis of graphs of functions, conic sections, and parametric and polar equations. Students are introduced to the mathematics of limits and to math modeling. The course requires students to synthesize key concepts from all prerequisite math courses, with a focus on application of the material in a variety of contexts.

## Analytic Geometry, Precalculus, and Discrete Mathematics level 4

OPEN TO SOPHOMORES, JUNIORS, AND SENIORS  
PREREQUISITE: ALGEBRA 2 AND COLLEGE ALGEBRA WITH TRIGONOMETRY

This course builds upon the topics studied in Algebra 2, College Algebra/Trigonometry. The content includes two and three dimensional vectors, conics, transformations (including matrix definitions), and topics of discrete mathematics (including algorithms, graphs and trees, combinatorics, probability, and statistics). Introductory calculus topics are discussed.

## Introduction to Finite Mathematics and Statistics level 2

OPEN TO SENIORS  
PREREQUISITE: PRECALCULUS AND TRIGONOMETRY, LEVEL 2  
DEPARTMENTAL APPROVAL REQUIRED

This course builds a foundation for the study of topics in finite mathematics, statistics, and calculus that may be included in an introductory college mathematics course. Finite math topics include cryptography, voting methods, congressional redistricting, fair division, and game theory. Probability and statistics are topics of major focus in both semesters. A review of precalculus topics is given in the second semester as a precursor to a preview of calculus.

## Introduction to Calculus & Statistics level 3

OPEN TO SENIORS  
PREREQUISITE: PRECALCULUS AND TRIGONOMETRY, LEVEL 3  
DEPARTMENTAL APPROVAL REQUIRED

In the first semester of this course, there is an emphasis on applied topics in calculus, including a basic study of derivatives and their applications in physical science, business, and optimization. In the second semester, statistics topics extend students' prior learning beyond describing data to include investigation and projects involving experimental design, sampling distributions, confidence intervals, and some hypothesis testing. In addition, topics in mathematical modeling include, but are not limited to, fractals, probability, graph theory, and cryptography.

## Analytic Geometry, Precalculus, and Discrete Mathematics level 3

OPEN TO JUNIORS AND SENIORS  
PREREQUISITE: ALGEBRA 2 AND COLLEGE ALGEBRA WITH TRIGONOMETRY, LEVEL 4 OR PRECALCULUS AND TRIGONOMETRY, LEVEL 3  
DEPARTMENTAL APPROVAL REQUIRED

This course is a precalculus course with an emphasis on proofs. It serves as a precalculus course for students who have completed 4-level Algebra 2/College Algebra & Trigonometry and is an option for students who have completed 3-level precalculus but do not take calculus or statistics. Topics studied include two and three-dimensional vectors, the logic of proofs and problem solving, analyzing functions, complex numbers and number systems, and a preview of calculus.

## AP Calculus AB level 4

OPEN TO SENIORS  
PREREQUISITE: PRECALCULUS AND TRIGONOMETRY, LEVEL 3 OR ANALYTIC GEOMETRY, PRECALCULUS, AND DISCRETE MATHEMATICS  
DEPARTMENTAL APPROVAL REQUIRED

This course provides the equivalent of one semester of college calculus. Topics studied include limits, continuity, derivatives and their applications, slope fields, and integrals and their applications. Students enrolled in this course are required to take the Advanced Placement examination in AB Calculus. On the basis of this examination, the student's college will determine how much advanced placement and/or credit in college mathematics the student will receive.

## AP Calculus BC level 4

OPEN TO JUNIORS AND SENIORS  
PREREQUISITE: ANALYTIC GEOMETRY, PRECALCULUS AND DISCRETE MATHEMATICS  
DEPARTMENTAL APPROVAL REQUIRED

This course is the equivalent of a full-year of college calculus. All the topics in AP calculus AB are studied in this course. Other topics include motion in the plane, Euler's method, parametric and polar functions, improper integrals, and sequences and series. Students enrolled in this course are required to take the Advanced Placement examination in BC Calculus. On the basis of this examination, the student's college will determine how much advanced placement and/or credit in college mathematics the student will receive.

## AP Statistics level 4

OPEN TO SENIORS  
PREREQUISITE: PRECALCULUS AND TRIGONOMETRY, LEVEL 3 OR ANALYTIC GEOMETRY, PRECALCULUS, AND DISCRETE MATHEMATICS  
DEPARTMENTAL APPROVAL REQUIRED

This course provides college-level work in statistics, data analysis, and probability. The course is built around four broad conceptual themes: 1) Exploring Data: observing patterns, and departures from patterns; 2) Planning a Study: deciding what and how to measure; 3) Anticipating Patterns in Advance: introducing probability and simulation; and 4) Statistical Inference: confirming models. Students enrolled in this course are required to take the Advanced Placement examination in Statistics. On the basis of the student's performance on this examination, the student's college will determine how much advanced placement and/or credit in college statistics the student will receive.

## Multivariable Calculus and Linear Algebra level 4

OPEN TO SENIORS  
PREREQUISITE: AP CALCULUS BC

This course is a two-semester course that follows AP Calculus BC. The first semester covers topics in multivariable calculus, including vectors in two and three-dimensions, solid analytic geometry, differential calculus of several variables, including directional derivatives and gradients, and line and surface integrals. The second semester of the course is linear algebra. The course includes general vector spaces in n-dimensional Euclidean space and over the complex numbers, inner product spaces, eigenvalues and eigenvectors, linear transformations, applications of vector spaces, and numerical methods.

## Computer Science levels 9 & 4

OPEN TO SOPHOMORES, JUNIORS, AND SENIORS  
PREREQUISITE: PLANE GEOMETRY

This enrichment course is an introduction to computer science with an emphasis on computer programming. As a project-based course, the majority of class time is spent writing code to create programs. Students study programming concepts such as loops, decisions, lists and arrays, and event-driven coding. Students then apply these concepts to solve problems using different algorithms, data representation, and computational thinking in multiple programming languages.

In level 4, more varied applications and complex algorithms are explored. In addition, there is a higher expectation of independent learning both in and outside of class. This course can be taken at either level as a stand-alone experience or as a precursor to AP Computer Science.

## AP Computer Science level 4

OPEN TO JUNIORS AND SENIORS  
PREREQUISITE: PRECALCULUS AND TRIGONOMETRY, LEVEL 3, ANALYTIC GEOMETRY, PRECALCULUS, AND DISCRETE MATHEMATICS, LEVEL 3, OR ANALYTIC GEOMETRY, PRECALCULUS, AND DISCRETE MATHEMATICS, LEVEL 4  
DEPARTMENTAL APPROVAL REQUIRED

This course provides the equivalent of one semester of college computer science. The major emphases of the course are programming methodology, algorithms, and real world applications. Students will learn the programming language required in the Advanced Placement course description in Computer Science A. Students enrolled in this course are required to take the Advanced Placement examination in Computer Science A. On the basis of the student's performance on this examination, the student's college will determine how much advanced placement and/or credit in computer science the student will receive. This course is not open to sophomores.

## EL Math Resource level 8

This course serves English Learners as they transition into mainstream math classes. The course primarily helps students identify new vocabulary in advance of each chapter and provides strategies for learning and properly applying the terms. Additionally, there is support for understanding math concepts as they relate to the difficulties faced by an English Learner. The teacher will be in contact with the classroom math teacher, but students will be expected to develop their own self-advocacy skills. This course is taken in addition to a mainstream math class. Enrollment is based on placement by the EL Coordinator.