



The Massachusetts School of
Science, Creativity and Leadership

Acera School Middle School Math Course Guide

Draft as of April 2017

At Acera, students are placed into a math class based upon what they are ready to learn. Not all classes will be offered each year. Class topics will vary based on teacher and student interest as well as pacing needs.

Pre-algebra I (Math 6/7)

This class covers topics usually found in 6th and 7th grade classes. This is a common place for many incoming middle school students to start, as well as some students coming out of the Acera elementary program.

Topics might include: operations with fractions and decimals; percent; factors and primes; probability; area and perimeter of triangles, angles relationships, volume and surface area; operations with negative numbers; order of operations; similarity; variables and patterns, graphs; descriptive stats: drawing graphs, understanding populations, central tendency and variability

Pre-Algebra II (Math 7/8)

This class covers topics typically found in 7th and 8th grade classes. It involves more exposure to pre-algebra topics, room to explore and develop mathematical intuition and logical reasoning, and exposure to some topics in Algebra I. Some entering students will start here, some Acera students will take this class after Pre-Algebra I, and some students will skip this class.

Topics might include: similarity; percent; probability; surface area and volume; ratio and proportion; variables, tables and graphs; exponents; linear and non-linear situations; solving one and two-step equations; evaluating expressions and recognizing equivalent expressions; transformations on the coordinate plane; bivariate data and sampling methods. Potential projects and activities: Art and architecture; financial math; logic puzzles and number games, voting systems; figurate numbers

Intro to Algebra

This class covers material often found in 8th or 9th grade classes. The expectation is that all students will take this class at some point in their three years in middle school, unless they enter middle school past this level.

Topics include: Linear equations and functions: graphing, solving equations, modeling real-world situations; systems of linear equations; linear inequalities; exponential expressions with integer and rational exponents; rational expressions; distributive law: factoring and multiplying polynomials; quadratic equations and quadratic modeling; radical expressions; line of best fit, correlation between variables

Applications and Statistics

This is an applied math class meant to reinforce algebra skills while emphasizing connections between math and real world situations. It is appropriate for students who have completed Intro to Algebra or similar. It previews some topics in a typical Algebra II and Geometry class, but it is not a substitute for either. It also covers many topics not commonly found in middle or high school classes.

Topics might include: Recursively defined sequences; graphing lines and other functions; solving non-linear equations; modeling with exponential functions and introduction to logarithms; modeling physics phenomena



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using algebra; applications of similar triangles; geometric constructions, tessellations and transformations; statistics: correlation, including linear and exponential regression, chi-square tests, and data collection methods; using parametric equations in computer animation; voting systems and apportionment; conditional probability

Discrete Math

This class is intended for students who have completed intro to algebra (or similar) and who have an interest in theoretical math and logic. It previews some topics in Algebra II, but is not a substitute for that course. (Would not be offered in the same year as Number Theory.)

Topics might include: Graph theory; Combinatorics and probability; cellular automata; recursively defined sequences; fractional linear transforms; modular arithmetic and groups; functions on finite sets (permutation groups); finite projective geometry; figurate numbers; infinite sets

Number Theory and Proofs

This class is intended for students who have completed intro to algebra (or similar) and who have an interest in theoretical math and logic. It previews some topics in Algebra II, but is not a substitute for that course. (Would not be offered in the same year as Discrete Math.)

Topics might include: Fibonacci numbers; Euclidean algorithm; Diophantine equations; prime factorizations; modular arithmetic and groups; Fermat's Little Theorem and RSA encryption; continued fractions

Geometry

This class is our version of a standard high school geometry class. It is intended for strong math students getting ready to test out of geometry in high school. Most students taking this class will be in 8th grade.

Topics include: Angles, congruent triangles, parallelograms and quadrilaterals; area and volume, circle properties, right triangle trigonometry, constructions, coordinate geometry, transformations; two-column and paragraph proofs

Some years, we will offer a Geometry class that covers middle school topics, not high school topics, depending on the need of the students. In those years, topics might include area and volume, taxi cab geometry and other non-Euclidean geometries, circles and distances, parallel lines and angles, equations of lines, constructions, tessellations, and transformations. Depending on interest and need, this class would cover other types of topics, such as review of Algebra I, explorations with combinatorics, etc.

Algebra II/Precalc/Linear Algebra

This is an advanced math class for highly capable math students. It covers many topics found in an honors-level Algebra II and Precalculus class in high school.

Topics might include: Matrices, matrix multiplication, determinants, transformations; functions and transformations; exponential functions and growth, logarithmic functions; infinite series; complex numbers



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and Euler’s formula; Gaussian integers; conic sections; metric spaces and absolute value inequalities; polynomials, remainder theorem and factor theorem

Calculus and Advanced Topics

This class is for advanced students who have already taken our other offerings. This class will only be offered when there is demand for it. Topics might include: calculus, modern algebra, real analysis, topology, statistics, game theory, linear algebra, etc.

Typical Sequences

	6 th grade	7 th grade	8 th grade	9 th grade (after Acera)
A.	Pre-algebra I	Pre-algebra II	Intro to Algebra	Geometry
B.	Pre-algebra I or II	Intro to Algebra	Applications and Statistics	Geometry
C.	Pre-algebra I or II	Intro to Algebra	Discrete Math/Number Theory	Honors Geometry
D.	Pre-algebra I or II	Intro to Algebra	Geometry	Honors Algebra II
E.	Intro to Algebra	Applications and Statistics	Geometry	Honors Algebra II
F.	Intro to Algebra	Discrete Math/Number Theory	Geometry	Honors Algebra II
G.	Applications and Statistics	Geometry	Algebra II/Precalc	Precalc/Calculus
H.	Number Theory	Algebra II/Precalc	Discrete Math	Calculus

Placement and Planning

We work hard to make sure that students have an appropriate math class each year. We consider learning styles, background and prerequisites, rate of learning, student interests, and class fit while creating the classes each year. All students leaving Acera at the end of 8th grade should have, at a minimum, a strong understanding of prealgebra and Algebra I. While at Acera, all students should grow their love of math, whether that is through proof writing, creative problem solving, real world applications, or simply a solid understanding of a topic that they are proud of learning.



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We offer many classes that are part of the standard middle and high school sequence as well as classes and topics outside of that sequence. There are opportunities for students to accelerate and room for them to explore wonderful, exciting mathematics.

When a student is in their first year of middle school in 6th grade (or any year they enter), we will communicate with parents about their current placement and expectations for the future math sequence. There are three standard parent-teacher conferences in our school year, the listening conference in September, as well as conferences following on to narrative report cards which occur in December and in May. In the December conference, the core teacher will explain the types of math sequences available and discuss, with parents, potential options for 7th and 8th grades. During the May parent-teacher conference, in addition to meeting with the core teacher, parents will also meet with their student's math teacher. The math teacher will discuss the options for the following year(s), based on background, interest in math, ability, and with an eye to potential placement in high school. Of course, we will need to be flexible about these decisions, since students' growth and achievement can be unpredictable. We want to communicate with parents about the types of math their students will learn at Acera, and what we anticipate would be the appropriate expectation for placement when that particular student gets to high school. If necessary, both core teachers and math teachers are available to discuss these issues in later years and at other times, especially if there is a major change in math path plans.