Middle Country Central School District
Mathematics Department

The Middle Country Central School District Mathematics Department curriculum is designed to help students view mathematics as a coherent, logical, useful subject that develops their ability to make sense of a variety of problems. Our curriculum is focused on a few big ideas at each grade/course so that students form deeper understandings, gain greater skill and fluency, and more robustly apply what is learned. The mathematics department aims to prepare students for college and careers by emphasizing critical thinking, problem solving, and application across grade levels.

Below are the content area learning progressions for K-12 mathematics. These progressions span multiple grade levels to build students' understanding of more sophisticated mathematical concepts and applications.

	K	1	2	3	4	5	6	7	8	HS
Domains	Counting and Cardinality									Number and Quantity
	Numbers and Operations in Base Ten						Ratios and Proportional Relationships			
				Numbers and Operations - Fractions			The Number System			
	Operations and Algebraic Thinking						Expressions and Equations			Algebra
									Functions	Functions
	Geometry						Geometry			Geometry
	Measurement and Data						Statistics and Probability			Statistics and Probability

In addition, our curriculum across the K-12 spectrum is aligned to eight Standards for Mathematical Practice:
- Standard 1: Make sense of problems and persevere in solving them
- Standard 2: Reason abstractly and quantitatively
- Standard 3: Construct viable arguments and critique the reasoning of others
- Standard 4: Model with mathematics
- Standard 5: Use appropriate tools strategically
- Standard 6: Attend to precision
- Standard 7: Look for and make use of structure
- Standard 8: Express regularity in repeated reasoning

Elementary Mathematics
The elementary mathematics program at Middle Country is designed to build a strong mathematical foundation that will prepare students for the challenging content in middle and high school. Beginning in kindergarten with counting, and culminating in 5th grade with operations with fractions, students learn that units are the building blocks of numbers and counting. Pearson's enVision program is the primary resource used to support mathematics instruction at the elementary level.

Major content emphases in elementary grades

Kindergarten	First Grade

Counting and Cardinality
   • Know number names and count sequence.
   • Count to tell the number of objects.
   • Compare numbers.
Operations and Algebraic Thinking
   • Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from.
Number and Operations in Base Ten
   • Work with numbers 11-19 to gain foundations for place value.
	Operations and Algebraic Thinking
	   • Represent and solve problems involving addition and subtraction.
	   • Understand and apply properties of operations and the relationship between addition and subtraction.
	   • Add and subtract within 20.
	   • Work with addition and subtraction equations.
	Number and Operations in Base Ten
	   • Extend the counting sequence.
	   • Understand place value.
	   • Use place value understanding and properties of operations to add and subtract.
	Measurement and Data
	   • Measure lengths indirectly and by iterating length units.

Second Grade	**Third Grade**

Operations and Algebraic Thinking
   • Represent and solve problems involving addition and subtraction.
   • Add and subtract within 20.
   • Work with equal groups of objects to gain foundations for multiplication.
Number and Operations in Base Ten
   • Understand place value.
   • Use place value understanding and properties of operations to add and subtract.
Measurement and Data
   • Measure and estimate lengths in standard units.
   • Relate addition and subtraction to length.
	Operations and Algebraic Thinking
	   • Represent and solve problems involving multiplication and division.
	   • Understand the properties of multiplication and the relationship between multiplication and division.
	   • Multiply and divide within 100.
	   • Solve problems involving the four operations and identify and explain patterns in arithmetic.
	Number and Operations – Fractions
	   • Develop understanding of fractions as numbers.
	Measurement and Data
	   • Solve problems involving measurement and estimation of intervals of time, liquid volumes, and masses of objects.
	   • Geometric measurement: understand concepts of area and relate area to multiplication and to addition.

Fourth Grade	**Fifth Grade**

Operations and Algebraic Thinking
   • Use the four operations with whole numbers to solve problems.
Number and Operations in Base Ten
   • Generalize place value understanding for multi-digit whole numbers.
   • Use place value understanding and properties of operations to perform multi-digit arithmetic.
Number and Operations – Fractions
   • Extend understanding of fraction equivalence and ordering.
   • Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers.
   • Understand decimal notation for fractions, and compare decimal fractions.
	Number and Operations in Base Ten
	   • Understand the place value system.
	   • Perform operations with multi-digit whole numbers and with decimals to hundredths.
	Number and Operations – Fractions
	   • Use equivalent fractions as a strategy to add and subtract fractions.
	   • Apply and extend previous understandings of multiplication and division to multiply and divide fractions.
	Measurement and Data
	   • Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition.

Middle School Mathematics

In middle school, students build upon their knowledge of numbers, units, and operations by exploring the real number system, ratios, and proportional relationships. Students solve more complex equations and begin to explore linear equations in two variables. The middle school curriculum is designed to prepare all students to sit for the Common Core Algebra I Regents exam at the end of 8th grade. Algebra I is a NYS Graduation requirement.

Major content emphases in middle school

Grade 6	Grade 7 (Prealgebra)	Grade 8 (Algebra I)
Ratios and Proportional Relationships • Understand ratio concepts and use ratio reasoning to solve problems. The Number System • Apply and extend previous understandings of multiplication and division to divide fractions by fractions. • Apply and extend previous understandings of numbers to the system of rational numbers. Expressions and Equations • Apply and extend previous understandings of arithmetic to algebraic expressions. • Reason about and solve one-variable equations and inequalities. • Represent and analyze quantitative relationships between dependent and independent variables.	Ratios and Proportional Relationships • Analyze proportional relationships and use them to solve real-world and mathematical problems. The Number System • Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers. Expressions and Equations • Use properties of operations to generate equivalent expressions. • Solve real-life and mathematical problems using numerical and algebraic expressions and equations. • Work with radicals and integer exponents. • Understand the connections between proportional relationships, lines, and linear equations. Functions • Define, evaluate, and compare functions. Geometry • Understand congruence and similarity using physical models, transparencies, or geometry software. • Understand and apply the Pythagorean Theorem.	Seeing Structure in Expressions • Interpret the structure of expressions Arithmetic with Polynomials and Rational Expressions • Perform arithmetic operations on polynomials Creating Equations • Create equations that describe numbers or relationships Reasoning with Equations and Inequalities • Understand solving equations as a process of reasoning and explain the reasoning • Solve equations and inequalities in one variable • Represent and solve equations and inequalities graphically Interpreting Functions • Understand the concept of a function and use function notation • Interpret functions that arise in applications in terms of the context Interpreting Categorical and Quantitative Data • Interpret linear models

High School Mathematics

The high school mathematics curriculum is designed to formalize and extend the work done in the middle school. Students work extensively with more complicated functions and move towards formal mathematical arguments. This coursework will prepare students for college and careers beyond high school. Students are required to earn four credits in mathematics for graduation.

Students have access to two additional Regents exams in mathematics, Geometry and Algebra II. These courses are offered at the Regents and Honors level. Both exams are required for students who are seeking an Advanced Regents Diploma.

Major content emphases for Geometry and Algebra II:

Geometry	Algebra II
Congruence • Understand congruence in terms of rigid motions • Prove geometric theorems Similarity, Right Triangles, and Trigonometry • Understand similarity in terms of similarity transformations • Prove theorems using similarity • Define trigonometric ratios and solve problems involving right triangles Expressing Geometric Properties with Equations • Use coordinates to prove simple geometric theorems algebraically Modeling with Geometry • Apply geometric concepts in modeling situations	The Real Number System • Extend the properties of exponents to rational exponents Seeing Structure in Expressions • Interpret the structure of expressions • Write expressions in equivalent forms to solve problems Arithmetic with Polynomials and Rational Expressions • Understand the relationship between zeros and factors of polynomials Reasoning with Equations and Inequalities • Understand solving equations as a process of reasoning and explain the reasoning • Represent and solve equations and inequalities graphically Interpreting Functions • Interpret functions that arise in applications in terms of the context Building Functions • Build a function that models a relationship between two quantities Making Inferences and Justifying Conclusions • Make inferences and justify conclusions from sample surveys, experiments and observational studies

In addition, the mathematics department offers a variety of electives, college-tie, and advanced placement courses.

Electives	College-Tie Courses	AP Classes
Logic/Topics in Math Intermediate Algebra Advanced Algebra Survey of Mathematics Probability Finite Mathematics Visual C++ Programming Mathematical Applications 1 and 2	College Precalculus College Statistics College Calculus College Accounting College Intro to Web Design *Note: Students may opt to pay for college credits for these courses through an affiliated college	AP Calculus AB AP Calculus BC AP Statistics AP Computer Science A *Note: Students are expected to sit for the AP exam if they enroll in the course

Resources

<u>Standards and Testing</u>

Standards

- Common Core Learning Standards (http://www.corestandards.org/Math/)
- Next Generation Learning Standards (http://www.nysed.gov/curriculum-instruction/teachers/new-york-state-next-generation-mathematics-learning-standards)
- AP Course Information (https://apstudent.collegeboard.org/apcourse)

Testing

- 3-8 Mathematics Testing Information (https://www.engageny.org/3-8)
- Past Regents Exams (http://www.nysedregents.org/)

<u>Content Support</u>

Videos/Instruction

- Khan Academy (https://www.khanacademy.org/)
- LearnZillion (https://learnzillion.com/resources/99913-math-instructional-videos)
- Math Open Reference (https://www.mathopenref.com/)

Practice

- ST Math – kindergarten and Grade 6 AIS only (https://www.stmath.com/)
- Castle Learning – log in required (http://www.castlelearning.com/)
- MathBits (https://mathbits.com/)
- HMH Textbook Login for GO Math, Algebra I, Geometry, and Algebra II (https://www.hmhco.com/one/login/)

Tools

- Desmos Online Graphing Calculator (https://www.desmos.com/calculator)
- Desmos Online Scientific Calculator (https://www.desmos.com/scientific)
- Free printable graph paper (http://www.math-aids.com/Graph_Paper/)

Activities to Develop Mathematical Reasoning

- Estimation 180 (http://www.estimation180.com/)
- Which One Doesn't Belong? (http://wodb.ca/)