



# MOBILE COUNTY PUBLIC SCHOOL SYSTEM

# MATHEMATICS

## Program Guide

### *Grades K - 12*

*Explore*  
*Understand*  
*Describe*  
*Compute*  
*Model*  
*Solve*  
*Reason*  
*Apply*





## **MOTTO**

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*Learning Today,  
Leading Tomorrow*

## **PURPOSE**

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*The purpose of the Mobile  
County Public School System is  
to equip and empower college  
and career ready graduates.*

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# GUIDING PRINCIPLES OF THE MCPSS MATHEMATICS PROGRAM

Success in postsecondary education and the 21st century workforce requires students to have foundational knowledge and skills in mathematics. The teachers and leaders in the Mobile County Public School System are committed to providing students with an engaging and challenging mathematics course of study. They find unique and profound ways that make the study of mathematics meaningful for students, allowing them to explore and analyze the world around them. The MCPSS mathematics program provides a comprehensive, systematic curriculum that ensures an appropriate progression of learning from kindergarten through the 12th grade.

## Alabama Mathematics Course of Study

The Alabama Mathematics Course of Study provides the framework for the Grades K-12 mathematics program in Alabama's public schools. Content standards in the document are fundamental and specific for each grade level/course. It defines the knowledge and skills students should know and be able to do after each course and upon graduation from high school. Mastery of the standards enables students to expand professional opportunities, understand and critique the world, and experience the joy, wonder, and beauty of Mathematics (National Council of Teacher of Mathematics [NCTM], 2018).

The standards contained in the Alabama Mathematics Course of Study are:

- aligned with college and work expectations;
- written in a clear, understandable, and consistent format;
- designed to include rigorous, focused, and critical content and application of knowledge through high-order skills;
- informed by high-performing mathematics curricula in other countries to ensure all students are prepared to succeed in our global economy and society; and
- grounded on sound, evidence-based research.

## MCPSS Mathematics Curriculum Design

Each year, a committee of district leaders and classroom teachers review the curriculum, instruction, and assessments utilized by teachers in the district to ensure that a high level of rigor is available for every student. This committee establishes a sequencing of the grade-level standards identified in the Alabama Mathematics Course of Study. This sequencing is correlated with district-provided instructional resources for use in classrooms throughout the district. Additional resources for intervention and enrichment are also provided to teachers for use with students.

In addition, various district- and state-level assessments are utilized to determine targeted needs across schools. Data from these assessments drives school improvement efforts and allows for individual support to be provided to meet the needs of all students. Adaptations to the design of the mathematics curriculum are made annually to best support instruction across the district.

## The Significance of a Comprehensive Program

Mathematics is the driving force in today's "information economy," as it serves as the foundation for careers related to science, technology, and engineering. Even more, the study of mathematics expands students' ability to reason and problem-solve, and mathematical literacy allows individuals to understand the enormous data available and make appropriate decisions based on that data. It is imperative that today's students are prepared to become tomorrow's mathematically and statistically literate consumers and producers of information (NCTM, *Catalyzing Change in High School Mathematics*, 2018).

**"We need to prepare students for THEIR future, not OUR past."**

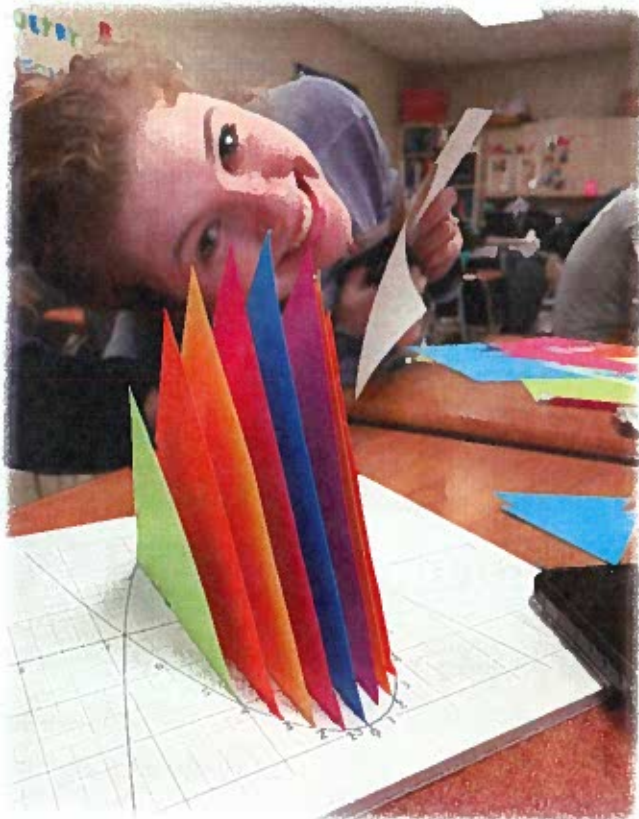
**Ian Jukes  
Educator & Futurist**

## True Understanding of Mathematics

The Standards for Mathematical Practice describe varieties of expertise that mathematics teachers at all grade levels seek to develop in their students. Students who truly understand mathematics recognize that it is more than memorizing procedures or computing values. Rather, true learning in mathematics comes when students can work collaboratively to explain their reasoning and express their understanding in multiple ways.

The eight Standards for Mathematical Practice provide a description of the behaviors and performances of mathematically proficient students.

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 generalities in repeated reasoning.



## Grade Band Overviews

### *Grades K-2*

Grades K-2 focus on developing the foundations of mathematics. Students actively explore and investigate the meaning and relationships of numbers through Foundations of Counting; Operations with Numbers: Base Ten; Operations with Algebraic Thinking; Data Analysis; Measurement; and Geometry. The K-2 curriculum standards establish the groundwork for future mathematics success.

### *Grades 3-5*

Grades 3-5 focus on strengthening the foundations of mathematics, empowering students for middle school mathematics, and developing their understanding of mathematics in relation to everyday life. Students in these grades extend their learning through Operations with Numbers: Base Ten; Operations with Numbers: Fractions; Operations and Algebraic Thinking; Data Analysis; Measurement; and Geometry. The 3-5 curriculum standards foster habits of mind that are necessary for building conceptual understandings of the mathematics needed for a lifetime.

### *Grades 6-8*

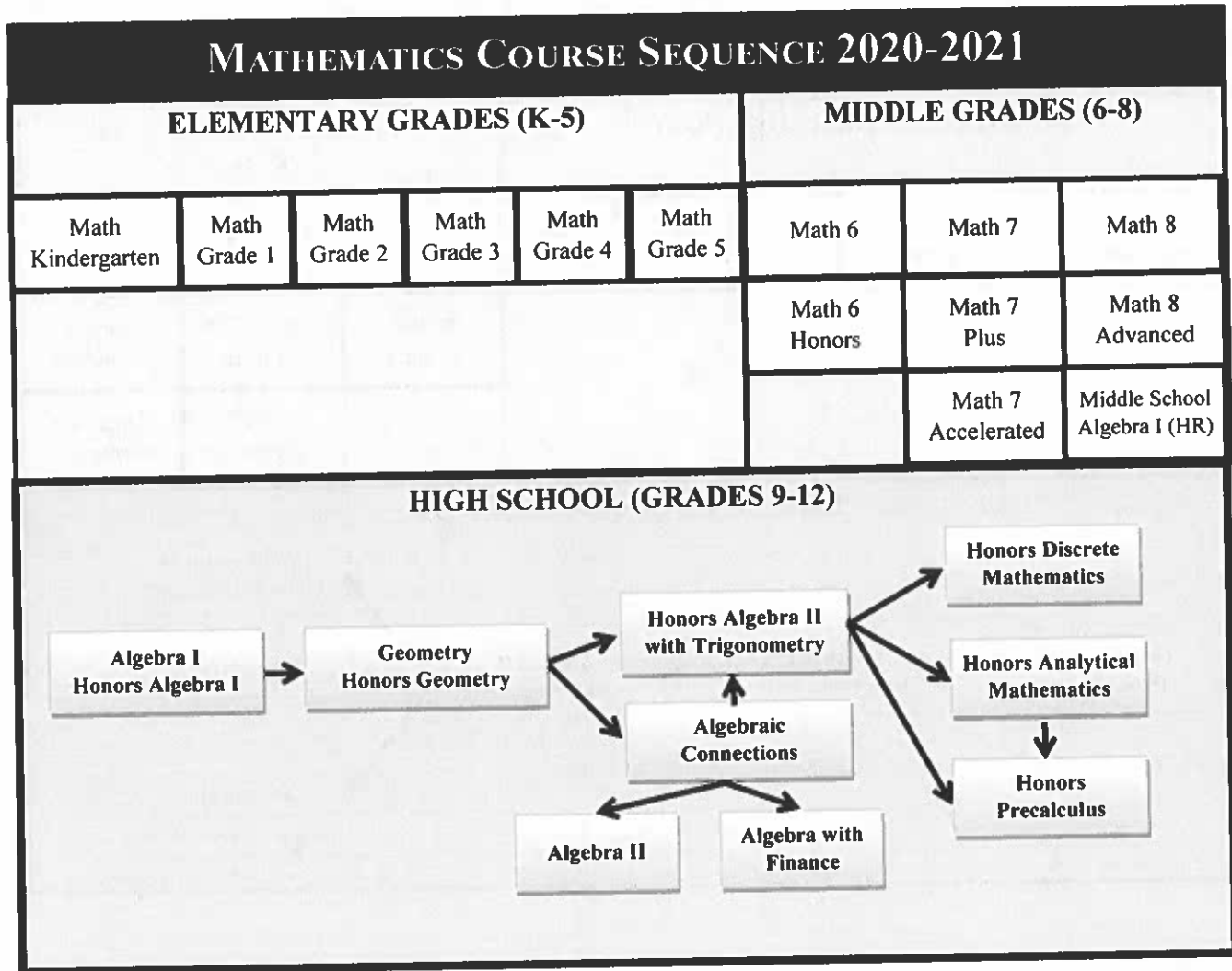
Grades 6-8 focus on solidifying the foundations of mathematics, empowering students for high school mathematics, and broadening their understanding of mathematics in relation to everyday life. Students in these grades develop proficiency with Proportional Reasoning; Number Systems and Operations; Algebra and Functions; Data Analysis, Statistics, and Probability; and Geometry and Measurement. The 6-8 curriculum standards provide a robust introduction into content that will allow for success in mathematical literacy and problem-solving.

### *Grades 9-12*

The high school mathematics course of study focuses on empowering students to meet their postsecondary goals; function as effective citizens who can use mathematics to make responsible decisions about their own lives and about society as a whole; and recognize mathematics as an inspiring, enjoyable, and significant human achievement. Students progress into an understanding that “mathematics is more than finding answers; mathematics requires reasoning and problem-solving in order to solve real-world and mathematical problems” (*Alabama Mathematics Course of Study*, 2019). Students consistently engage with the use of technology and other appropriate tools to explore and develop a deep understanding of mathematics.

# COURSE SEQUENCE IN THE MCPSS K-12 MATHEMATICS PROGRAM

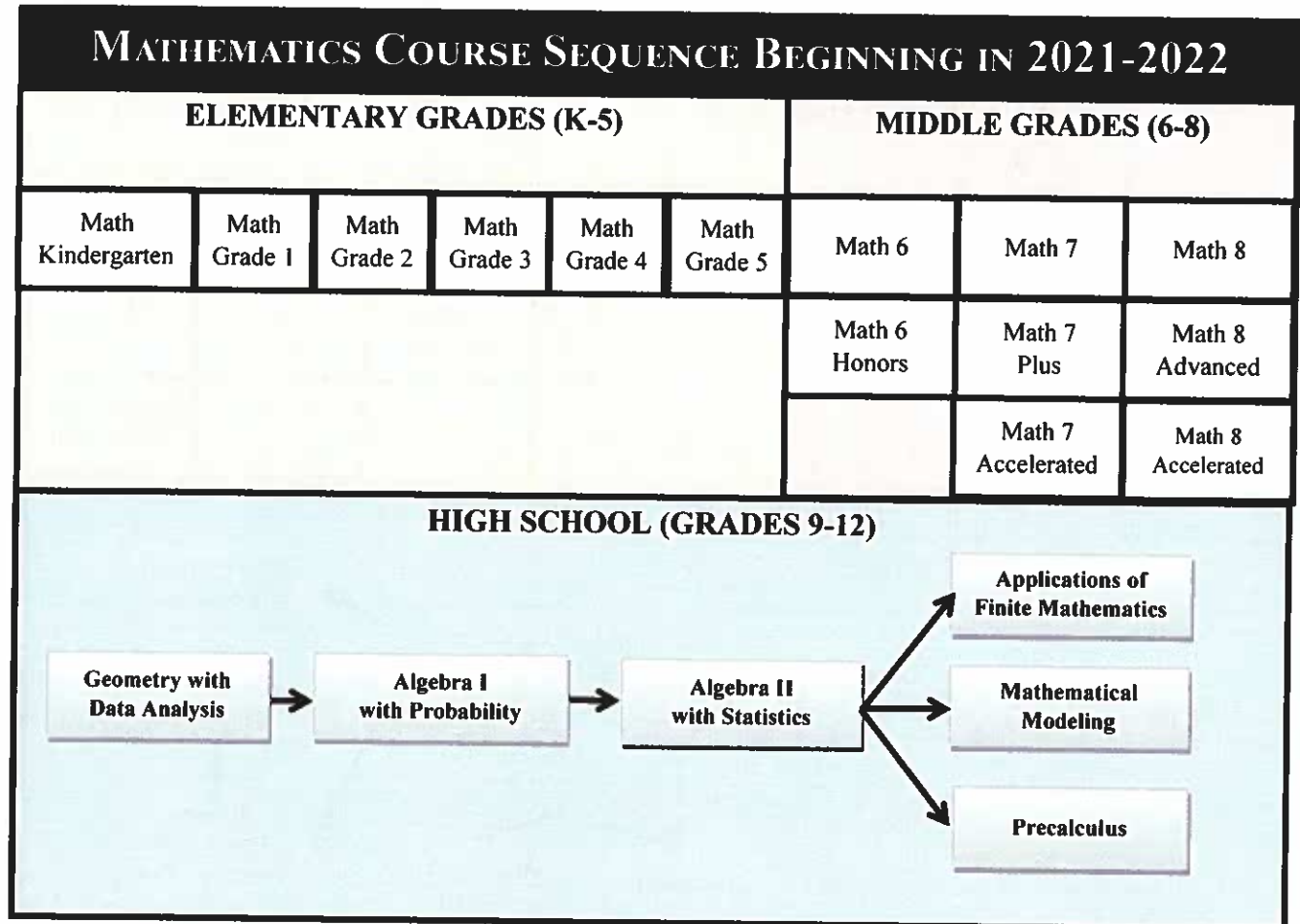
The course sequence indicated below is based on the 2016 Alabama Mathematics Course of Study. During the 2020-2021 school year, MCPSS will be transitioning to the 2019 Course of Study, with full implementation coming during the 2021-2022 school year. The course sequence on the following page represents the sequence that will be available to students beginning with the 2021-2022 school year.



### Important Notes Regarding the MCPSS Math Course Sequence:

- Additional upper level mathematics courses are available to students, including Advanced Placement courses (Calculus AB/BC, Statistics, and Computer Science), International Baccalaureate (IB) coursework, and Cambridge International School coursework.
- All students in the Mobile County Public School System must earn 4 mathematics credits to graduate. All students on a college-bound trajectory are encouraged to take mathematics each year of high school.
- Based on scheduling availability, schools may offer a lab course simultaneously with the Algebra I and Geometry courses. These lab courses are intended for students who may need additional support to be successful in Algebra I and Geometry. These lab courses earn elective credit.
- During the 2020-2021 school year, middle school students who meet certain requirements may earn a graduation credit by taking Algebra I in the 8th grade.

The course sequence indicated below is based on the 2019 Alabama Mathematics Course of Study. This course sequence will take effect during the 2021-2022 school year. All high school students entering the 9th grade in the 2021-2022 school year will take Geometry with Data Analysis. Any student entering the 10th grade in the 2021-2022 school year who completed Algebra I in the previous school year will take Geometry with Data Analysis. High school students who previously earned credits in Algebra I and Geometry will move into the Algebra II with Statistics course during the 2021-2022 school year.



**Important Notes Regarding the MCPSS Math Course Sequence:**

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- All students in the Mobile County Public School System must earn 4 mathematics credits to graduate. All students on a college-bound trajectory are encouraged to take mathematics each year of high school.
- Based on scheduling availability, schools may offer a lab course simultaneously with the Algebra I and Geometry courses. These lab courses are intended for students who may need additional support to be successful in Algebra I and Geometry. These lab courses earn elective credit.

# ADDITIONAL INFORMATION ABOUT THE MATHEMATICS PROGRAM

## Middle School Accelerated Program

Accelerated courses are available in the 7th and 8th grades. These courses have been carefully aligned and specifically designed for middle school students who show particular motivation and interest in mathematics. Students who complete both Math 7 Accelerated and Math 8 Accelerated will meet all of the standards for the Math 7, Math 8, and Algebra I with Probability courses. In other words, standards for three years of mathematics will be merged into two years. Students who take these courses should be prepared to move through the content at a rapid pace; as such, only those students who have demonstrated a high level of motivation and interest in studying mathematics should take these courses.

Students who complete Math 7 Accelerated and Math 8 Accelerated will be prepared to enter Geometry with Data Analysis in Grade 9 and then accelerate directly into Algebra II with Statistics. To be eligible to take Math 8 Accelerated, students *must* take Math 7 Accelerated in the previous school year. This accelerated pathway will provide students an opportunity to take additional, specialized mathematics coursework in high school. It is important to note that students who complete Math 7 Accelerated and Math 8 Accelerated will not earn a graduation credit; therefore, these students will still be required to complete four mathematics courses in high school.



## Parental Support of Mathematical Instruction

Successful learning of mathematics is supported by the establishment of a positive attitude towards mathematics at home. Parents should encourage their child to view mathematics as a way to communicate about the world around them. Identifying opportunities to talk about math in real and applied settings will help students make sense of mathematics, particularly in the early years.

As students progress through grade levels, it is important for parents to communicate with their child's teacher to learn

**MATHEMATICS  
is not about numbers,  
equations, computations,  
or algorithms: it is about  
UNDERSTANDING.**

*William Paul Thurston*

how they can best help at home. Though most parents are comfortable with the procedural processes for computing answers, focusing solely on these processes can reduce the development of students' long-term conceptual understanding and diminish the growth of problem-solving skills. Parents should expect to see their child solve problems in multiple ways, not just using an algorithm or procedure.

## Key Terms in Mathematical Instruction

*Automaticity:* The ability to perform mathematical operations accurately and quickly.

*Discourse:* Discussions about mathematics that allow students to articulate their understanding of concepts.

*Fluency:* The ability to use strategies and/or procedures that are flexible, efficient, accurate, and generalizable to answer mathematical questions.

*Modeling:* Using mathematics to solve a complicated real-world problem where there is no clear-cut method to solve the problem.

*Standard Algorithm:* A generally accepted method used to perform a particular mathematical computation.

*Strategy:* A plan or approach to find an answer or solve a problem.

# CURRICULUM SPECIFICATIONS FOR MATH GRADES K-5

## Math Kindergarten—Quarterly Content

### *Quarter 1*

**Counting & Cardinality:** write numbers 0 to 10; connect numbers to quantities; count out objects to determine how many (up to 10); compare numbers between 1 and 10.

### *Quarter 2*

**Counting & Cardinality:** determine if one group has more objects than another group

**Operations & Algebraic Thinking:** decompose numbers up to 10 into pairs; find numbers that make 10

**Geometry:** name shapes; describe objects using names of shapes; relate the position of objects relative to each other; distinguish between 2-D and 3-D shapes; analyze and compare 2-D and 3-D shapes presented

in different ways; model real objects by building and drawing shapes; compose simple shapes to form larger shapes

**Measurement & Data:** classify objects into categories; count the number of objects in each category and sort categories by count

### *Quarter 3*

**Operations & Algebraic Thinking:** represent addition and subtraction in a variety of ways; solve addition and subtraction word problems within 10; decompose numbers up to 10 into pairs; find numbers that make 10; add and subtract within 5 fluently

### *Quarter 4*

**Counting & Cardinality:** write numbers 0 to 20; count objects to determine how many (up to 20); count to 100 by ones and tens; count forward beginning from a number other than 1

**Number & Operations in Base Ten:** compose and decompose numbers from 11 to 19 into ten ones and some further ones

**Measurement & Data:** describe the measure of an object (such as length and width); compare objects by describing one as having “more of” or “less of” a measurable attribute

## Math Grade 1—Quarterly Content

### *Quarter 1*

**Operations & Algebraic Thinking:** solve word problems involving addition and subtraction (within 10); apply properties of operations to add and subtract; recognize subtraction as finding an unknown-addend; relate counting to addition and subtraction; fluently add and subtract (within 10); find an unknown whole number in an addition or subtraction equation with three whole numbers

### *Quarter 2*

**Operations & Algebraic Thinking:** solve word problems involving addition and subtraction (within 20); solve word problems involving 3 whole numbers (sum up to 20); apply properties of operations to add and subtract; add and subtract (within 20); understand the meaning of the = sign; find an unknown whole number in an addition or subtraction equation with three whole numbers

**Numbers & Operations in Base Ten:** understand place value of two-digit numbers (two-digit numbers are made up sets of “tens” and “ones”)

### *Quarter 3*

**Numbers & Operations in Base Ten:** count to 120 (starting at a number other than 1); read and write numerals; understand place value of two-digit numbers (two digit numbers are made up of sets of “tens” and “ones”); compare two-digit numbers using the  $>$ ,  $=$ , and  $<$  symbols; add within 100 using a variety of strategies; add or subtract 10 from a number mentally; subtract multiples of 10 from multiples of 10 for numbers between 10 and 90

**Measurement & Data:** tell and write time in hours and half-hours; organize, represent, and interpret data with up to three categories

### *Quarter 4*

**Numbers & Operations in Base Ten:** add within 100 using a variety of strategies

**Measurement & Data:** order and compare three objects by length; express the length of an object as a whole number of length units

**Geometry:** distinguish between attributes that define an object versus those that do not define an object; create composite shapes from 2-D and 3-D shapes; partition circles into two and four equal shares

## Math Grade 2—Quarterly Content

### *Quarter 1*

**Operations & Algebraic Thinking:** solve 1 step and 2 step word problems involving addition and subtraction within 100; add and subtract within 20 mentally

**Numbers & Operations in Base Ten:** add and subtract within 100 fluently; explain why addition and subtraction strategies work

**Measurement & Data:** represent data by drawing a picture graph or a bar graph





### Quarter 2

**Operations & Algebraic Thinking:** solve 1 step and 2 step word problems involving addition and subtraction within 100  
**Numbers & Operations in Base Ten:** understand place value of three-digit numbers; count within 1,000 by skip counting 5s, 10s, and 100s; read and write numbers to 1,000; compare three-digit numbers using the  $>$ ,  $=$ , and  $<$  symbols; add 10 or 100 to a number between 100 and 900 mentally  
**Measurement & Data:** tell and write time to the nearest 5 minutes (using a.m. and p.m.); solve word problems involving bills and coins (using \$ and ¢ symbols)

### Quarter 3

**Numbers & Operations in Base Ten:** add up to four two-digit numbers; add and subtract within 1,000 using a variety of strategies; explain addition and subtraction strategies  
**Measurement & Data:** measure the length of an object using appropriate tools; measure the length of an object twice using units of different lengths; estimate lengths (using inches, feet, centimeters, and meters); determine how much longer one object is than another

### Quarter 4

**Operations & Algebraic Thinking:** determine whether a group has an odd or even number of members (up to 20); add to find the number of objects arranged in rectangular arrays  
**Geometry:** recognize and draw shapes having specific attributes; partition a rectangle into rows and columns; partition circles into two, three, or four equal shares; determine how many of each share makes a whole  
**Measurement & Data:** solve word problems involving lengths using addition and subtraction (within 100); represent whole numbers as lengths from 0 on a number line

## Math Grade 3—Quarterly Content

### Quarter 1

**Operations & Algebraic Thinking:** interpret the meaning of a whole number multiplied by a whole number; solve word problems using multiplication within 100; apply properties of operations to multiply; multiply within 100 fluently  
**Numbers & Operations in Base Ten:** round whole numbers to the nearest 10 or 100; add and subtract within 1,000 (including the standard algorithm)

### Quarter 2

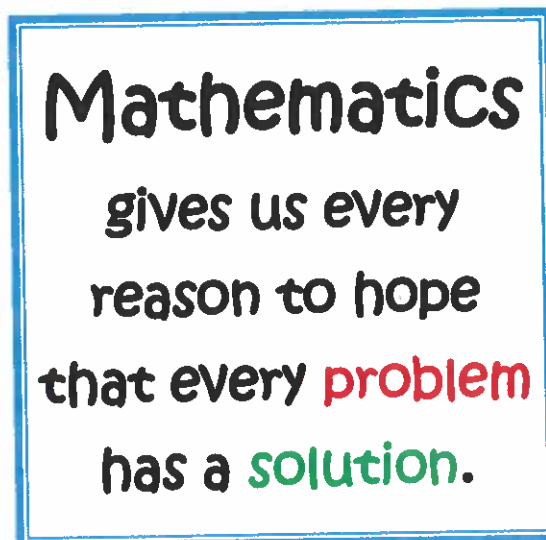
**Numbers & Operations in Base Ten:** multiply one-digit numbers by multiples of 10  
**Operations & Algebraic Thinking:** interpret the meaning of a whole number divided by a whole number; solve word problems using multiplication and division within 100; find an unknown number in a multiplication or division equation; understand division as finding an unknown factor; multiply and divide within 100 fluently; identify arithmetic patterns  
**Measurement & Data:** recognize area as an attribute of plane figures; measure area by counting unit squares; relate area to the operations of multiplication and division

### Quarter 3

**Operations & Algebraic Thinking:** solve two-step word problems using all four operations; represent word problems using a letter standing for an unknown quantity  
**Measurement & Data:** represent a data set using a scaled bar graph and a scaled picture graph; measure lengths of objects using rulers to generate data  
**Number & Operations—Fractions:** interpret the meaning of a fraction expressed as  $1/b$ ; understand a fraction as a number on the number line; explain equivalence of fractions; compare fractions (only use denominators of 2, 3, 4, and 6)

### Quarter 4

**Measurement & Data:** tell and write time to the nearest minute; measure time intervals in minutes; solve word problems involving addition and subtraction of time intervals in minutes; measure and estimate liquid volumes and masses of objects (using grams, kilograms, and liters); solve word problems involving masses or volumes using all four operations; solve problems involving perimeters of polygons  
**Geometry:** understand shapes in different categories share attributes; identify types of quadrilaterals; partition shapes into parts with equal areas



## Math Grade 4—Quarterly Content

### Quarter 1

**Operations & Algebraic Thinking:** interpret a multiplication equation as a comparison; solve word problems involving multiplicative comparison; solve multistep word problems using the four operations (including those with remainders); represent word problems using equations using a letter for an unknown quantity; find all factor pairs for a whole number between 1 and 100  
**Numbers & Operations in Base Ten:** understand place value by recognizing that a digit in one place represents ten times what it represents in the place to its right; read and write multi-digit whole numbers; compare multi-digit numbers using the  $>$ ,  $=$ , and  $<$  symbols; round multi-digit numbers to any place; add and subtract multi-digit numbers using the standard algorithm

### Quarter 2

**Operations & Algebraic Thinking:** solve multistep word problems using the four operations (including those with remainders); find all factor pairs for a whole number between 1 and 100

**Numbers & Operations in Base Ten:** multiply a number of up to four digits by a one-digit number; multiply two two-digit numbers; divide a number of up to four digits by a one-digit number (including those with remainders)

**Measurement & Data:** know relative sizes of measurement units (such as km, m, cm; kg, g; lb, oz; hr, min, sec); record measurement equivalents; apply the area and perimeter formulas for rectangles

### Quarter 3

**Numbers & Operations—Fractions:** explain why a fraction is equivalent to another fraction; generate equivalent fractions; compare fractions with different numerators and different denominators (only use denominators of 2, 3, 4, 5, 6, 8, 10, and 100); decompose a fraction into a sum of fractions with the same denominator; add and subtract mixed numbers with like denominators; solve word problems involving the addition and subtraction of fractions with the same denominator; multiply a fraction by a whole number; add two fractions with denominators of 10 and 100

**Measurement & Data:** display a set of measurements in fractions of a unit on a line plot; solve addition and subtraction problems involving information presented in line plots

### Quarter 4

**Measurement & Data:** solve word problems involving distances, time, liquid, volume, mass, and money using the four operations (including problems with fractions or decimals); define an angle; measure angles using a protractor; recognize angle measure as additive; find unknown angle measures using addition and subtraction

**Numbers & Operations—Fractions:** use decimal notation for fractions with denominators 10 or 100; compare two decimals to hundredths using the  $>$ ,  $=$ , and  $<$  symbols

**Geometry:** draw points, lines, line segments, rays, angles, and perpendicular/parallel lines; classify 2-D figures based on parallel/perpendicular lines and angles of specified size; recognize a line of symmetry for a 2-D figure



## Math Grade 5—Quarterly Content

### Quarter 1

**Numbers & Operations in Base Ten:** understand place value by recognizing how a digit in one place is related to its value in a place to its right or its left; explain patterns when multiplying or dividing a number by powers of 10; read, write, and compare decimals to the thousandths place; compare decimals using the  $>$ ,  $=$ , and  $<$  symbols; round decimals to a given place value; multiply multi-digit numbers using the standard algorithm; divide a number (up to four digits) by a number (up to two digits) using a variety of strategies; perform all four operations on decimals to the hundredths place

### Quarter 2

**Number & Operations—Fractions:** add and subtract fractions with unlike denominators; solve word problems involving addition and subtraction of fractions; estimate the reasonable of answers to word problems involving fractions; interpret the meaning of a fraction as the numerator divided by the denominator; interpret the meaning of a fraction multiplied by a fraction or whole number; find the area of rectangles involving fractional side lengths; divide whole numbers by fractions

### Quarter 3

**Numbers & Operations—Fraction:** interpret multiplication as scaling (resizing); explain what happens when a number is multiplied by a fraction greater than 1 and when it is multiplied by a fraction less than 1; solve real world problems involving multiplication of fractions; divide fractions by whole numbers

**Measurement & Data:** convert different-sized standard measurement units; solve multistep word problems involving conversions; display a set of measurements in fractions of a unit on a line plot

**Operations & Algebraic Thinking:** evaluate expressions that include grouping symbols (parentheses, brackets, or braces); translate verbal statements involving calculations with numbers into a mathematical expression

### Quarter 4

**Geometry:** identify the components that define the coordinate system; plot ordered pairs on the coordinate plane; graph points in the first quadrant and interpret the meaning of the coordinate values in context; relate attributes belonging to a category of 2-D figures to its subcategories; classify 2-D figures in a hierarchy based on properties

**Measurement & Data:** understand concepts of volume measurement; define a “unit cube”; find the volume of a solid by counting the number of unit cubes that comprise the figure; relate volume to multiplication and addition; solve real world problems involving volume; find the volume of right rectangular prisms using unit cubes and formulas

**Operations & Algebraic Thinking:** generate numerical patterns using two given rules; form and graph ordered pairs of corresponding terms from two patterns

# CURRICULUM SPECIFICATIONS FOR MATH GRADES 6-8

## Math 6 & Math 6 Honors—Quarterly Content

### *Quarter 1*

**Ratios & Proportional Relationships:** understand the meaning of a ratio; use ratio language to describe a ratio relationship; understand the concept of a unit rate; use rate language to describe the context of a ratio relationship; create tables of equivalent ratios; compare ratios using tables; solve unit rate problems; find a percent of a quantity; solve problems involving finding the whole, given a part or percent; convert measurement units using ratio reasoning

**The Number System:** divide fractions; solve word problems involving division of fractions; divide multi-digit numbers using the standard algorithm; perform operations on multi-digit decimals; find the greatest common factor of two numbers; find the least common multiple of two numbers

### *Quarter 2*

**Expressions & Equations:** evaluate expressions involving exponents; write, read, and evaluate expressions in which letters stand for numbers; use appropriate terms to identify parts of an expression; evaluate expressions for specific values of their variables; generate equivalent expressions using properties; identify when two expressions are equivalent; discuss the meaning of solving an equation or inequality; substitute values into an equation or inequality to determine if it is a solution; use variables to represent an unknown number in an expression; solve problems by writing and solving one-step equations; understand the meaning of inequalities of the form  $x > c$  and  $x < c$ ; discuss the meaning of independent and dependent variables; analyze the relationship between independent and dependent variables using graphs, tables, and equations

### *Quarter 3*

**The Number System:** describe quantities using positive and negative numbers; recognize opposite signs of numbers as indicating locations on opposite sides of 0 on a number line; understand signs numbers in ordered pairs; graph pairs of integers on a coordinate plane; write, interpret, and explain statements of order for rational numbers; understand the absolute value of a number; solve problems by graphing points in all four quadrants of the coordinate plane

**Geometry:** draw polygons in the coordinate plane; use coordinates to find the length of a side of a polygon; find the area of triangles, special quadrilaterals, and polygons using composition and decomposition strategies; represent 3-D figures using nets (using rectangles and triangles); use nets to find surface area; find the volume of a right rectangular prism with fractional edge lengths

### *Quarter 4*

**Statistics & Probability:** recognize a statistical question; describe a set of data by its center, spread, and shape; distinguish between measures of center and measures of variation; display data on dot plots, histograms, and box plots; describe the nature of an attribute under investigation; identify and interpret the meaning of the median, mode, interquartile range, and mean absolute deviation of data



## Math 7 & Math 7 Plus—Quarterly Content

### *Quarter 1*

**Ratios & Proportional Relationships:** compute unit rates associated with ratios of fractions; determine if two quantities are in a proportional relationship; identify the constant of proportionality (unit rate); represent a proportional relationship with an equation; explain with a point on the graph of a proportional relationship means in context; solve multistep ratio and percent problems using proportions

**Geometry:** solve problem involving scale drawings

**The Number System:** add and subtract rational numbers; describe situations in which quantities add to make zero; represent the sum and difference of rational numbers on a number line

### *Quarter 2*

**The Number System:** multiply and divide rational numbers; interpret the product of two rational numbers in context; define a rational number as a fraction (a quotient of integers); convert rational numbers to decimals; solve real world problems involving the four operations on rational numbers (including complex fractions)

**Expressions & Equations:** add, subtract, factor, and expand linear expressions; demonstrate how quantities in an expression are related by rewriting the expression in a different form; solve real world problems using positive and negative rational numbers in any form; convert between forms of rational numbers; construct simple equations and inequalities to solve problems; solve word problems leading to two-step equations; solve word problems leading to two-step inequalities; graph the solution set of an inequality on a number line; interpret the meaning of a solution in the context of the problem

### Quarter 3

**Ratios & Proportional Reasoning:** solve multistep ratio and percent problems using proportions

**Statistics & Probability:** understand the use of a sample to gain information about a larger population; determine if a sample is representative of a population; discuss the benefits of using a random sample; draw inferences about a population using data from a random sample; generate multiple samples to gauge variation in estimates; assess the degree of overlaps of two data distributions by comparing the differences in mean and median; draw comparative inferences about two populations using measures of center and measures of variability from random samples

**Geometry:** describe the 2-D figures that result from slicing 3-D figures; solve problems using the formulas for area and circumference of a circle; solve multistep problems using facts about supplementary, complementary, vertical, and adjacent angles; solve real world problems involving area, volume, and surface area of 2-D and 3-D objects composed of various shapes

### Quarter 4

**Statistics & Probability:** understand that probability is expressed as a number between 0 and 1, with larger numbers indicating greater likelihood; approximate probability by collecting data; develop a probability model (both uniform and non-uniform) to find probabilities of events; find probabilities of compound events using a variety of strategies

**Geometry:** draw geometric shapes given specific conditions; recognize that the length of the longest side of a triangle must be larger than the sum of the lengths of the other two sides; recognize that the sum of the angles of a triangle is  $180^\circ$

## Math 8 & Math 8 Adv.—Quarterly Content

### Quarter 1

**Geometry:** rotate, reflect, and translate lines and angles in the coordinate plane; determine if two figures in the coordinate plane are congruent by describing the sequence that exhibits the congruence between them; describe the effect of dilations, translations, rotations, and reflections on 2-D figures; determine if two figures are similar by a sequence of rotations, reflections, translations, and dilations

**Expressions & Equations:** graph proportional relationships and recognize the unit rate as the slope of the graph; recognize that the slope of a line is the same between any two distinct points on the line; solve multistep linear equations; determine when a linear equation has one solution, no solutions, or infinitely many solutions

### Quarter 2

**Expressions & Equations:** solve systems of two linear equations by graphing, substitution, and elimination; recognize that the solution to a system of linear equations is the point where the two lines intersect

**Geometry:** use facts about the angle sum and exterior angles of a triangle, as well as angles created when parallel lines are cut by a transversal, to solve problems; use the angle-angle criterion for similarity of triangles to solve problems

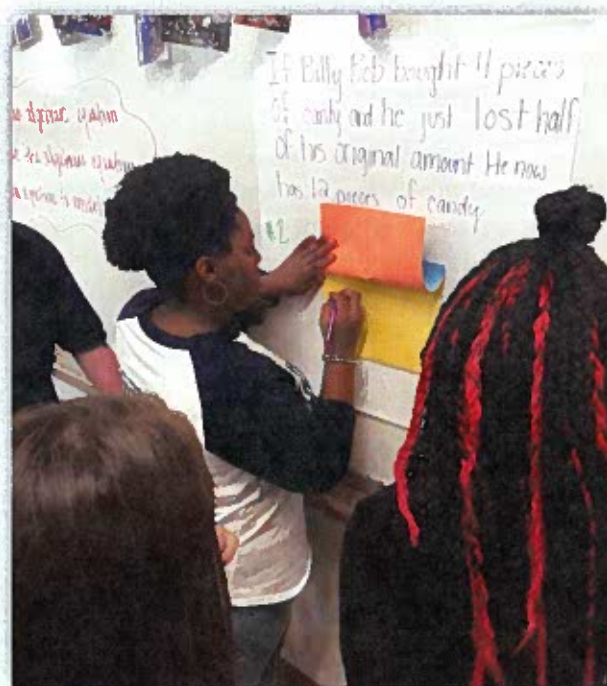
**Functions:** determine when a relation is a function; graph the set of ordered pairs that comprise a function; compare two functions that may be represented algebraically, graphically, numerically, or verbally; distinguish between functions that are linear and those that are not linear; construct a function to model a linear relationship between two variables; determine the slope (rate of change) and initial value ( $y$ -intercept) of the function; interpret the meaning of the rate of change and the initial value of the linear function in terms of the context it represents; describe components of a function (linear vs. nonlinear, increasing vs. decreasing)

### Quarter 3

**The Number System:** distinguish between numbers that are rational and those that are irrational; find the decimal expansion of a rational number; convert repeating decimals to a fraction; compare the size of irrational numbers and locate them approximately on a number line

**Expressions & Equations:** apply properties of exponents to simplify expressions; evaluate square roots of perfect squares and cube roots of perfect cubes; rewrite very large or very small numbers in scientific notation; use scientific notation to determine how many times larger one number is than the other; perform operations on numbers written in scientific notation (including with the use of technology)

**Geometry:** explain a proof of the Pythagorean Theorem; apply the Pythagorean Theorem to find unknown side-lengths of a right triangle in real world problems; use the converse of the Pythagorean Theorem to determine if a triangle is a right triangle; use the Pythagorean Theorem to find the distance between two points in the coordinate plane



#### Quarter 4

**Geometry:** use the formulas for the volumes of cones, cylinders, and spheres to solve problems

**Statistics & Probability:** construct scatter plots for a set of bivariate data; describe patterns that appear in a scatter plot (positive or negative association, linear or nonlinear association); define the statistical terms of outlier and clustering; fit a straight line to a scatter plot that suggests a linear association; use the equation of a best fit line to solve problems in context; interpret the meaning of the slope and intercept of a best fit line; display frequencies of bivariate data in a two-way table and use them to describe possible associations

The **essence of mathematics** is not to make *simple things complicated*, but to **make complicated things simple.**

### Math 7 Accelerated—Quarterly Content

#### Quarter 1

**Number Systems & Operations:** add, subtract, multiply, and divide integers, signed fractions, and decimals; describe situations in which two quantities add to zero; use a number line to demonstrate addition and subtraction of rational numbers; develop rules for multiplying signed numbers; interpret the quotient of integers as a rational number; convert a rational number to a decimal; solve real world problems involving operations on rational numbers (including complex fractions); distinguish between numbers that are rational and those that are irrational; convert repeating decimals into fractions; locate approximations of irrational numbers on a number line

**Algebra & Functions:** add, subtract, factor, and expand linear expressions; use properties of exponents to simplify expressions; rewrite very large or very small numbers in scientific notation; perform operations on numbers written in scientific notation (including with the use of technology); solve multistep problems involving rational numbers, converting between forms as needed; use mental computation and estimation to assess the reasonableness of answers; generate expressions in equivalent forms; construct simple equations to solve problems

#### Quarter 2

**Proportional Reasoning:** compute unit rates associated with ratios of fractions; determine if two quantities are in a proportional relationship; identify the constant of proportionality (unit rate); represent a proportional relationship with an equation; explain what a point on the graph of a proportional relationship means in context; solve multistep problems using proportional reasoning (include interest, tax, gratuities, commissions, markups, and percents)

**Geometry & Measurement:** solve problems involving scale drawings of geometric figures

**Algebra & Functions:** evaluate square roots of perfect squares and cube roots of perfect cubes; solve word problems leading to two-step equations; solve word problems leading to two-step inequalities; graph the solution set of a inequality on a number line; interpret the meaning of a solution in the context of the problem; represent constraints by equations and/or inequalities; solve multistep linear equations; determine if a linear equation has one solution, no solutions, or infinitely many solutions; interpret the solutions of equations and inequalities in context

**Data Analysis, Statistics, & Probability:** differentiate between a sample and a population; discuss the benefits of using a random sample to make inferences about a population; compare various sampling techniques; discuss situations where statistical bias may exist; assess the degree of overlaps of two data distributions by comparing the differences in mean and median; draw comparative inferences about two populations using measures of center and measures of variability from random samples

#### Quarter 3

**Data Analysis, Statistics, & Probability:** understand that probability is expressed as a number between 0 and 1; approximate probability by collecting data

**Geometry & Measurement:** draw geometric shapes given specific conditions; recognize that the length of the longest side of a triangle must be larger than the sum of the lengths of the other two sides; recognize that the sum of the angles of a triangle is  $180^\circ$ ; describe the 2-D figures that are created by slicing 3-D figures; solve area and circumference problems; explain the relationships between circumference, diameter, area, and radius; solve multistep problems involving facts about supplementary, complementary, vertical, and adjacent angles; find missing angle measures using properties of parallel lines cut by a transversal; solve real world problems involving the area, volume, and surface area of 2-D and 3-D figures composed of various figures; calculate the volumes of 3-D figures using formulas; rotate, reflect, and translate lines and angles in the coordinate plane; determine if two figures in the coordinate plane are congruent by describing the sequence that exhibits the congruence between them; describe the effect of dilations, translations, rotations, and reflections on 2-D figures; determine if two figures are similar by a sequence of rotations, reflections, translations, and dilations

#### Quarter 4

**Proportional Reasoning:** determine whether two variables are in a proportional relationship; recognize the unit rate of a proportional relationship as the slope of the graph; interpret the components of a linear equation written as  $y = mx + b$ ; recognize that the slope of a line is the same between any two distinct points on the line; find the slope of a line joining two given points; interpret the slope of a line as the rate of change of the graph and the  $y$ -intercept of the line as the initial value; compare proportional and non-proportional relationships represented algebraically, graphically, numerically, or verbally

**Algebra & Functions:** create a linear function to represent a relationship between two variables in context; graph linear functions on a coordinate plane; interpret the rate of change (slope) and initial value of a linear function from a description of a relationship given two points on the function; recognize that the point where two functions intersect is a solution to an equation where one function is equal to the other function; find approximate solutions by graphing, making a table of values, or using technology

**Data Analysis, Statistics, & Probability:** develop a probability model (both uniform and non-uniform); collect and use data to predict probabilities; compare probabilities from a model to observe frequencies; find probabilities of simple and compound events through experimentation; represent sample spaces for compound events using various methods; design and use a simulation to generate frequencies for compound events

**Note:** *Students who complete Math 7 Accelerated during the 2020-2021 school year and Math 8 Accelerated during the 2021-2022 school year will not be required to take Algebra I with Probability in high school, as all of the standards in that course have been distributed over the two middle school accelerated courses.*

*However, students taking these two middle school accelerated courses do NOT earn a graduation credit; these students will be required to complete four mathematics courses in high school to complete graduation requirements.*

## Middle School Algebra I—Quarterly Content

*Algebra I builds on foundational mathematics content learned by students in Grades K-7 by expanding mathematics understanding to provide students with a strong mathematics education. Content is designed to engage students in a variety of mathematical experiences that include the use of reasoning and problem-solving skills. Middle school students who complete Algebra I in the 8th grade will earn a high school graduation credit for the course.*

#### Quarter 1

Unit 1: Pre-Algebra Concepts

Unit 2: Solving Linear Equations and Inequalities

Unit 3, Part 1: Graphs of Linear Functions

#### Quarter 2

Unit 3, Part 2: Constructing Linear Functions

Unit 4: Systems of Linear Equations

Unit 5: Statistics and Probability

#### Quarter 3

Unit 6, Part 1: Solving Quadratic Equations

Unit 6, Part 2: Graphs of Quadratic Functions

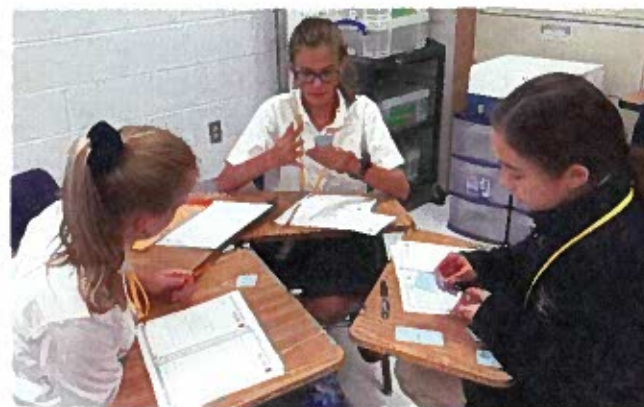
Optional Unit: Rational Functions

#### Quarter 4

Unit 7: Properties of Exponents and Radical Expressions

Unit 8: Exponential Functions

Unit 9: Sequences



# CONTENT INFORMATION FOR HIGH SCHOOL MATHEMATICS COURSES

## Algebra I

*Algebra I builds on foundational mathematics content learned in Grades K-8 by expanding mathematics understanding to provide students with a strong mathematics education. Content is designed to engage students in a variety of mathematical experiences that include the use of reasoning and problem-solving skills. Students may take Algebra I or Honors Algebra I. In addition, a lab course (elective credit) may be paired with Algebra I for students who may need additional support to be successful with the content of the course.*

- Unit 1: Pre-Algebra Concepts
- Unit 2: Solving Linear Equations and Inequalities
- Unit 3, Part 1: Graphs of Linear Functions
- Unit 3, Part 2: Constructing Linear Functions
- Unit 4: Systems of Linear Equations
- Unit 5: Statistics and Probability
- Unit 6, Part 1: Solving Quadratic Equations
- Unit 6, Part 2: Graphs of Quadratic Functions
- Unit 7: Properties of Exponents and Radical Expressions
- Unit 8: Exponential Functions
- Unit 9: Sequences

## Geometry

*Geometry increases students' knowledge of shapes and their properties through geometry-based applications, many of which are observable in aspects of everyday life. This knowledge helps develop visual and spatial sense, as well as strong reasoning skills. This course will require students to make conjectures and to use reasoning to validate or negate those conjectures. The use of proofs, constructions, and technology will enhance reasoning skills and enable students to better understand more complex mathematical concepts. Students may take Geometry or Honors Geometry. In addition, a lab course (elective credit) may be paired with Geometry for students who may need additional support to be successful with the content of the course.*

- Unit 1: Basics of Geometry
- Unit 2: Transformational Geometry
- Unit 3: Geometric Theorems
- Unit 4, Part 1: Triangle Congruence
- Unit 4, Part 2: Triangle Properties
- Unit 5: Similarity
- Unit 6: Trigonometric Principles
- Unit 7: Quadrilateral Theorems and Congruence
- Unit 8: 2-D and 3-D Geometry
- Unit 9: Circles
- Unit 10: Making Decisions Using Probability

## Algebraic Connections

*Algebraic Connections is designed for students who wish to increase their mathematical knowledge and skills prior to enrollment in the Algebra II course or the Algebra II with Trigonometry course. Algebraic Connections expands upon the concepts of Algebra I and Geometry, with an emphasis on application-based problems. This course provides opportunities to incorporate the use of technology through its emphasis on applying functions to make predictions and to calculate outcomes.*

- Unit 1: The Real Number System
- Unit 2: Linear Equations and Inequalities
- Unit 3: Graphs of Linear Equations and Inequalities
- Unit 4: Solving Systems of Equations and Inequalities
- Unit 5: Topics in Geometry
- Unit 6, Part 1: Solving Quadratic Equations
- Unit 6, Part 2: Graphs of Quadratic Functions
- Unit 7: Personal Finance
- Unit 8: Measurement



## Algebra II

*Algebra II is designed to extend students' algebraic knowledge and skills beyond Algebra I. Students are encouraged to solve problems using a variety of methods that promote the development of improved communication skills and foster a deeper understanding of mathematics. To help students appreciate the power of algebra, application-based problems are incorporated throughout the course. The use of appropriate technology is used for numerical and graphical investigations.*

- Unit 1: Polynomials
- Unit 2: Rational Functions
- Unit 3: Radicals and Rational Exponents
- Unit 4: Logarithms and Exponential Functions
- Unit 5: Probability
- Unit 6: Conic Sections

## **Honors Algebra II with Trigonometry**

*Algebra II with Trigonometry is designed to extend students' knowledge of Algebra I with additional algebraic and trigonometric content. Mastery of the content standards for this course is necessary for student success in higher-level mathematics. The use of appropriate technology is encouraged for numerical and graphical investigations that enhance analytical comprehension.*

- Unit 1: Linear Equations and Inequalities
- Unit 2: Systems of Equations and Matrices
- Unit 3: Quadratic Functions
- Unit 4: Polynomial Functions
- Unit 5: Rational Functions
- Unit 6: Radical Functions and Rational Exponents
- Unit 7: Exponential and Logarithmic Functions
- Unit 8: Trigonometric Functions
- Unit 9: Probability

## **Honors Precalculus**

*Precalculus is designed for students who have successfully completed the Algebra II with Trigonometry course. This course is considered to be a prerequisite for success in calculus and college mathematics. Algebraic, graphical, numerical, and verbal analyses are incorporated during investigations of the Precalculus content standards. Parametric equations, polar relations, vector operations, and limits are introduced. Content for this course also includes an expanded study of polynomial and rational functions, conic sections, trigonometric functions, and logarithmic and exponential functions.*

- Unit 1: Functions
- Unit 2: Applications of Functions
- Unit 3: Rational Functions and Limits
- Unit 4: Compositions, Inverses, Exponentials, & Logarithms
- Unit 5, Part 1: Trigonometric Functions
- Unit 5, Part 2: Analytic Trigonometry
- Unit 6: Vectors
- Unit 7: Polar, Complex, and Parametric Functions
- Unit 8: Conic Sections
- Unit 9: Statistics and Probability



## **Honors Analytical Mathematics**

*Considered to be parallel in rigor to Precalculus, Analytical Mathematics provides a structured introduction to important areas of emphasis in most postsecondary studies that pursue a concentration in mathematics. Linear algebra, logic, vectors, and matrices are topics that are given more in-depth coverage than in previous courses. Application-based problem solving and the use of advanced technological tools are integral parts of this course.*

- Unit 0: Prerequisite Skill Review
- Unit 1: Operations on Vectors
- Unit 2: Operations on Matrices and Systems of Equations
- Unit 3: ACT/Workkeys Preparation
- Unit 4: Polynomial Functions and Limits
- Unit 5: Logic and Boolean Algebra
- Unit 6: Trigonometric Functions & Analytical Trigonometry
- Unit 7: Polar Coordinates, Euler's, & De Moivre's Theorems

## **Honors Discrete Mathematics**

*Discrete Mathematics is designed for students who have successfully completed the Algebra II with Trigonometry course and who choose not to continue mathematics study in the Precalculus or Analytical Mathematics courses. This course expands upon the topics of matrices, combinatorial reasoning, counting techniques, algorithms, sequences, series, and their applications. Students are expected to work in both individual and group settings to apply problem solving strategies and to incorporate technological tools that extend beyond traditional instructional practices.*

- Unit 1: Sets and Set Notation
- Unit 2: Number Theory and Number History
- Unit 3: Sequences and Series
- Unit 4: Matrices
- Unit 5: Combinatorics
- Unit 6: Voting Methods
- Unit 7: Graph Theory

## **Algebra with Finance**

*Algebra with Finance integrates algebra, probability and statistics, and geometry to solve financial problems that occur in everyday life. This course offers students opportunities to construct, question, model, and interpret financial situations through symbolic algebraic, graphical, geometric, and verbal representations.*

- Unit 1: Mathematical Operations: Algebra, Statistics, & Geometry
- Unit 2: Consumer Credit and Banking Services
- Unit 3: Investing
- Unit 4: Employment and Income Tax
- Unit 5: Automobile Ownership and Operation
- Unit 6: Independent Living



# ADVANCED MATHEMATICS COURSEWORK OPPORTUNITIES

## **Advanced Placement (AP) Calculus AB/BC**

*AP Calculus AB/BC focuses on students' understanding of calculus concepts and provides experience with methods and applications. The courses feature a multi-representational approach to calculus, with concepts, results, and problems expressed graphically, numerically, analytically, and verbally. Exploring connections among these representations builds understanding of how calculus applies limits to develop important ideas, definitions, formulas, and theorems. A sustained emphasis on clear communication of methods, reasoning, justifications, and conclusions is essential. Technology is used to reinforce relationships among functions, to confirm written work, to implement experimentation, and to assist in interpreting results.*

Unit 1: Limits and Continuity

Unit 2: Differentiation: Definition & Fundamental Properties

Unit 3: Differentiation: Composite, Implicit, & Inverse Functions

Unit 4: Contextual Applications of Differentiation

Unit 5: Analytical Applications of Differentiation

Unit 6: Integration and Accumulation of Change

Unit 7: Differential Equations

Unit 8: Applications of Integration

Unit 9: Parametric Equations, Polar Coordinates, & Vector-Valued Functions — BC ONLY

Unit 10: Infinite Sequences & Series — BC ONLY

## **Advanced Placement (AP) Statistics**

*The AP Statistics course introduces students to the major concepts and tools for collecting, analyzing, and drawing conclusions from data. There are four themes evident in the content, skills, and assessment in the AP Statistics course: exploring data, sample and experimentation, probability and simulation, and statistical inference. Students use technology, investigations, problem solving, and writing as they build conceptual understandings.*

Unit 1: Exploring One-Variable Data

Unit 2: Exploring Two-Variable Data

Unit 3: Collecting Data

Unit 4: Probability, Random Variables, and Probability Distributions

Unit 5: Sampling Distributions

Unit 6: Inference for Categorical Data—Proportions

Unit 7: Inference for Quantitative Data—Means

Unit 8: Inference for Categorical Data—Chi Square

Unit 9: Inference for Quantitative Data—Slopes



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## **Advanced Placement (AP) Computer Science**

*AP Computer Science A introduces students to computer science through programming. Fundamental topics in this course include the design of solutions to problems, the use of structures to organize large sets of data, the development and implementation of algorithms to process data and discover new information, the analysis of potential solutions, and ethical and social implications of computing systems. The course emphasizes object-oriented programming and design using the Java programming language.*

Unit 1: Primitive Types

Unit 2: Using Objects

Unit 3: Boolean Expressions and If Statements

Unit 4: Iteration

Unit 5: Writing Classes

Unit 6: Array

Unit 7: ArrayList

Unit 8: 2D Array

Unit 9: Inheritance

Unit 10: Recursion

*The AP Computer Science Principles course provides students with opportunities to develop computational thinking skills vital for success across all disciplines, such as using computational tools to analyze and study data and working with large data sets to analyze, visualize, and draw conclusions from trends. The course engages students in the creative aspects of the field by allowing them to develop computational artifacts based on their interests. Students will also develop effective communication and collaboration skills by working individually and collaboratively to solve problems, and will discuss and write about the impacts these solutions could have on their society.*

Big Idea 1: Creativity

Big Idea 2: Abstraction

Big Idea 3: Data and Information

Big Idea 4: Algorithms

Big Idea 5: Programming

Big Idea 6: The Internet

Big Idea 7: Global Impact

## **International Baccalaureate and Cambridge**

Additional mathematics coursework is available through the International Baccalaureate (IB) and Cambridge programs. Contact schools offering these programs for information.

*IB Schools: Davidson HS and Murphy HS  
Cambridge International School: Alma Bryant HS*

