This document summarizes the curriculum revision process as outlined in Policy 105.

**Math Update: Summary of the Research and Curriculum Development Phases**

During the 2014-15 school year, we engaged in the research phase for math and during the 2015-16 school year, we began creating math units as a part of the curriculum development process. The following information is a summary of the research phase that we have used to guide our curriculum development process. Each research phase concludes with a list of recommendations the curriculum committees consider as they develop the curriculum. The committee included K-12 SCASD teachers, administrators, instructional coaches, math coordinator, mathematics education, math, and special education professors from Penn State.

**Phase 1: Research**

The math research committee worked with K-12 teachers and administrators in our district as well as educators from Penn State University (from the math education, math, and special education departments) to consider the most current research about mathematics education. We considered the National Research Council’s seminal work from *Adding it Up: Helping Children Learn Mathematics* (2001) which defines mathematical proficiency by:

- **conceptual understanding**—comprehension of mathematical concepts, operations, and relations
- **procedural fluency**—skill in carrying out procedures flexibly, accurately, efficiently, and appropriately
- **strategic competence**—ability to formulate, represent, and solve mathematical problems
- **adaptive reasoning**—capacity for logical thought, reflection, explanation, and justification
- **productive disposition**—habitual inclination to see mathematics as sensible, useful, and worthwhile, coupled with a belief in diligence and one’s own efficacy.

Math curriculum and the supporting resources used to teach the curriculum should include opportunities to foster the development of each of these five facets of mathematical proficiency. The Standards for Mathematical Practice, discussed next, were framed around these five qualities of mathematical proficiency.

The core of our research focused on the Standards for Mathematical Practice, from the National Council for Teachers of Mathematics and the PA Core Academic Standards, which is a list of eight core mathematical practices all students experience as ways to engage in high level math
problem solving. After the committee studied these practices, we created a list of attributes we desire in a mathematically empowered student. These attributes will drive our curriculum, instruction, and assessment as we work through phases two and three of our curriculum development process. In addition, we studied the Mathematics Teaching Practices also supported by the National Council of Teachers of Mathematics, which will guide our professional development to support instructional practices with our teachers. The committee read the book, *Principles to Action: Ensuring Mathematical Success for All* from the National Council of Teachers of Mathematics ([link to executive summary](#)), which provided excellent background for both the Standards for Mathematical Practice and the Mathematical Teaching Practices.

The PA Core Standards call for the following key shifts in Mathematics: greater focus on fewer topics, coherence - linking topics and thinking across grades, and rigor - pursuing conceptual understanding, procedural skills and fluency, and application with equal intensity. By making the Standards for Mathematical Practice a core focus for curriculum development, resource selection, and professional development, we are ensuring that our students experience a high quality curriculum which develops the skills and processes necessary to be empowered mathematical thinkers and problem solvers while at the same time apply efficient and accurate procedures. According to the Common Core State Standards Initiative: the Preparing America's Students for College and Career (2016), “Correctly applying mathematical knowledge depends on students having a solid conceptual understanding and procedural fluency.”

Our goal with this process is to create a curriculum based on the PA Academic Standards using the Understanding by Design framework which delineates what students need to know, do and understand. These Academic Standards delineate the skills students need to be proficient in mathematics and the practice standards delineate the experiences and instructional processes students need to have in order to attain those skills.

**Data Analysis**

At the time of our committee's work, we only had achievement data based on the previous PA Academic Standards. Overall, SCASD performs better than the state at all grade levels in all courses. SCASD continues to perform well on AP exams as well as the SAT. Given the new PA Academic Standards, several areas have emerged as needs as we have begun the curriculum writing process: elementary curriculum that builds mathematical understanding supported by a core resource that also authentically supports conceptual understanding, fractions, decimals, and measurement conversion at grade 4, addition and subtraction with fractions and algebraic patterns and relationships at grade 5, continued work with algebra and data at grade 6, and at grades 7 and 8, continued alignment work between our curriculum and the PA Core Standards and eligible content.

As a part of the data collection process, we asked all K-12 math educators to complete a brief survey on their understanding and use of the mathematical practices as well as respond to how well their core resource supports the mathematical practices. The recommendations section below include conclusions from the data collected through this survey.
Recommendations

- Create K-12 curriculum aligned to standards including a K-12 scope and sequence.
- Continue CMP3 as the core resource in 6-8.
- K-5 needs feedback from 6th grade teachers.
- Help K-5 students to think flexibly and have a deeper conceptual understanding.
- Make sure elementary has real world application focus.
- K-5 says consider multiple resources but consider a scope and sequence with a related math resource. The current math resource does not support the mathematical practices to the extent that is needed.
- K-5 also needs to make sure to work on questioning as opposed to leading a question.
- Consider offering a real world application math course at the high school level as a way for students to explore math for a fourth credit of mathematics.
- Consider questions about meeting advanced math students and the potential impact on tracking.
- Establish a defensible plan to differentiate between advanced and regular math.
- Create assessments that truly reflect a student’s readiness for advanced math.
- Provide interventions that are available to close the achievement gap of low-level learners….not just meet them at their level.
- Establish cross-team and cross-grade level conversations to share mathematical curriculum, content and practices.
- Ongoing professional development K-12.
- Focus on conceptual math learning

Phase 2: Math Curriculum Writing

The K-12 math curriculum writing teams have completed the K-12 scope and sequence outlining units by grade level and course. Additional work will be done this year to complete each phase of the curriculum so that it can be implemented in grades 6-12 in 2017-18. Over the summer and throughout next year, professional development will be provided to support teachers’ use of the curriculum and the mathematical practices. Grades 6-8 will continue to utilize the revised and updated Connected Math resource because of its alignment with the PA Core Standards and our curriculum. Most high school math courses will continue to use current core resources while additional supplementary materials are reviewed and considered.

For grades K-5, stage 1 of the curriculum framework, which identifies what students need to know, do, and understand, will be completed this summer. The elementary math committee is in the process of reviewing math resources through the use of a rubric to determine viable programs we can consider. Given the ELA change effort at elementary this year, we decided to delay a full math implementation until 2018-19 for grades K-5. However, all elementary teachers will have access to stage 1 of the curriculum framework as well as a supplementary teacher resource that supports the mathematical practices called Math in Practice by Heinemann. Providing another year for our elementary teachers to more fully implement our ELA (reading, writing, speaking and listening) curriculum as well as reader’s and writer’s workshop will allow teachers to become more proficient in this area before adding a math change to their repertoire. We will begin to build readiness for a math implementation by providing professional development around the mathematical practices next year.
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Grade K Math Course Description:
In Kindergarten, instructional time will focus on two critical areas: (1) representing, relating, and operating on whole numbers, initially with sets of objects; (2) describing shapes and space. More learning time in Kindergarten will be devoted to developing number sense than to other mathematical topics. (PDE, Standards Aligned System)

Standards for Mathematical Practice (Included in all units)
Make sense of problems and persevere in solving them.
Attend to precision.
Reason abstractly and quantitatively.
Construct viable arguments and critique the reasoning of others.
Model with mathematics.
Use appropriate tools strategically.
Look for and make use of structure.
Look for and express regularity in repeated reasoning.

Counting and Cardinality through 10
CC.2.1.K.A.1 Know number names and write and recite the count sequence.  
CC.2.1.K.A.2 Apply one to one correspondence to count the number of objects.

Counting and Cardinality through 20
CC.2.1.K.A.1 Know number names and write and recite the count sequence.
CC.2.1.K.A.2 Apply one to one correspondence to count the number of objects.

Represent and Solve Problems to 5
CC.2.2.K.A.1 Extend the concepts of putting together and taking apart to add and subtract within 10. (to 5 in this unit)

Represent and Solve Problems to 10
CC.2.2.K.A.1 Extend the concepts of putting together and taking apart to add and subtract within 10.

Compose and Decompose Numbers 11-20
CC.2.1.K.A.1 Know number names and write and recite the count sequence.
CC.2.1.K.A.2 Apply one to one correspondence to count the number of objects.
CC.2.1.K.B.1 Use place value to compose and decompose numbers within 19.

Describe and Compare Measurable Attributes of Objects
CC.2.4.K.A.1 Describe and compare attributes of length, area, weight, and capacity of everyday objects.

Classify and Sort Objects
CC.2.4.K.A.4 Classify objects and count the number of objects in each category.

Identify and Describe Shapes
CC.2.3.K.A.1 Identify and describe two and three dimensional shapes.

Compare, Create, and Compose Shapes
CC.2.3.K.A.2 Analyze, compare, create, and compose two and three dimensional shapes.
**Grade 1 Math Course Description:**

In Grade 1, instructional time will focus on four critical areas: (1) developing understanding of addition, subtraction, and strategies for addition and subtraction within 20; (2) developing understanding of whole number relationships and place value, including grouping in tens and ones; (3) developing understanding of linear measurement and measuring lengths as iterating length units; and (4) reasoning about attributes of, and composing and decomposing geometric shapes. (PDE, Standards Aligned System)

**Standards for Mathematical Practice (Included in all units)**

- Make sense of problems and persevere in solving them.
- Attend to precision.
- Reason abstractly and quantitatively.
- Construct viable arguments and critique the reasoning of others.
- Model with mathematics.
- Use appropriate tools strategically.
- Look for and make use of structure.
- Look for and express regularity in repeated reasoning.

**Place Value**

- CC.2.1.1.B.1 Extend the counting sequence to read and write numerals to represent objects.
- CC.2.1.1.B.2 Use place value concepts to represent amounts of tens and ones to compare two digit numbers.

**Facts to 10**

SCASD Use mental strategies to add and subtract within 10.

**Patterns**

SCASD Recognize and create patterns (AB, ABC, AAB, ABCD, and ABB)

**Number Operations: Addition and Subtraction within 20**

- CC.2.2.1.A Represent and solve problems involving addition and subtraction within 20.
- CC.2.2.1.A.2 Understand and apply properties of operations and the relationship between addition and subtraction.

**Relationship Between Addition and Subtraction**

- CC.2.2.1.A.2 Understand and apply properties of operations and the relationship between addition and subtraction.

**Geometry**

- CC.2.3.1.A.1 Compose and distinguish between two and three dimensional shapes based on their attributes.

**Foundations of Numbers Through 20**

- CC.2.1.1.B.1 Extend the counting sequence to read and write numerals to represent objects.
- CC.2.1.1.B.2 Use place value concepts to represent amounts of tens and ones to compare two digit numbers.

**Time**

- CC.2.4.1.A.2 Tell and write time to the nearest half hour using both analog and digital clocks.

**Money**

SCASD Identify coins and their value.
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<th>CC.2.3.1.A.2 Use the understanding of fractions to partition shapes into halves and quarters.</th>
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<td>CC.2.2.1.A.2 Understand and apply properties of operations and the relationship between addition and subtraction.</td>
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<td>CC.2.4.1.A.1 Order lengths and measure them both indirectly and by repeating length units.</td>
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**Grade 2 Math Course Description:**
In Grade 2, instructional time will focus on four critical areas: (1) extending understanding of base-ten notation; (2) building fluency with addition and subtraction; (3) using standard units of measure; and (4) describing and analyzing shapes and partitioning them into equal-sized pieces (halves, quarters and thirds) while developing an understanding that the more pieces in the whole, the smaller the piece. (PDE, Standards Aligned System)

**Standards for Mathematical Practice (Included in all units)**
- Make sense of problems and persevere in solving them.
- Attend to precision.
- Reason abstractly and quantitatively.
- Construct viable arguments and critique the reasoning of others.
- Model with mathematics.
- Use appropriate tools strategically.
- Look for and make use of structure.
- Look for and express regularity in repeated reasoning.

<table>
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<td>CC.2.1.2.B.1 Use place value concepts to represent amounts of tens and ones and to compare three digit numbers.</td>
</tr>
<tr>
<td>CC.2.1.2.B.2 Use place value concepts to read, write, and skip count to 1000.</td>
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<th>Patterns</th>
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<td>SCASD Recognize, create, and extend patterns.</td>
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**Fact Fluency to 20**
CC.2.2.2.A.2 Use mental strategies to add and subtract within 20.

**Time**
CC.2.4.2.A.2 Tell time to the nearest five minutes using both analog and digital clocks.

**Money**
CC.2.4.2.A.3 Solve problems and make change using coins and paper currency with appropriate symbols.

**Fractions**
CC.2.3.2.A.2 Use the understanding of fractions to partition shapes into halves, quarters, and thirds.

**Addition and Subtraction within 100 and Story Problems**
CC.2.2.2.A.1 Represent and solve problems involving addition and subtraction within 100.
CC.2.4.2.A.3 Solve problems and make change using coins and paper currency with appropriate symbols.
CC.2.4.2.A.6 Extend the concepts of addition and subtraction to problems involving length.

**Measurement**
CC.2.4.2.A.1 Measure and estimate lengths in standard units using appropriate tools.
CC.2.4.2.A.6 Extend the concepts of addition and subtraction to problems involving length.

**Geometry**
CC.2.3.2.A.1 Analyze and draw two dimensional and three dimensional shapes having specified attributes.

**Data**
CC.2.4.2.A.4 Represent and interpret data using line plots, picture graphs, and bar graphs.
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<tr>
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<tr>
<td>CC.2.2.2.A.3 Work with equal groups of objects to gain foundation for multiplication.</td>
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</tbody>
</table>
Grade 3 Math Course Description:
In Grade 3, instructional time will focus on five critical areas: (1) developing understanding of multiplication and division and strategies for multiplication and division within 100; (2) developing understanding of fractions, especially unit fractions (fractions with numerator 1); (3) developing understanding of the structure of rectangular arrays and of area and perimeter; (4) describing and analyzing two-dimensional shapes; and (5) solving problems involving measurement and estimation of intervals of time, money, liquid volumes, masses, and lengths of objects. (PDE, Standards Aligned System)

Standards for Mathematical Practice (Included in all units)
- Make sense of problems and persevere in solving them.
- Attend to precision.
- Reason abstractly and quantitatively.
- Construct viable arguments and critique the reasoning of others.
- Model with mathematics.
- Use appropriate tools strategically.
- Look for and make use of structure.
- Look for and express regularity in repeated reasoning.

**Place Value and Operations with Whole Numbers in Addition and Subtraction**
- CC.2.1.3.B.1 Apply place value understanding and properties of operations to perform multi-digit arithmetic.
- CC.2.2.3.A.4 Solve problems involving the four operations, and identify and explain patterns in arithmetic.

**Concepts of Multiplication and Division**
- CC.2.1.3.B.1 Apply place value understanding and properties of operations to perform multi-digit arithmetic.
- CC.2.2.3.A.1 Represent and solve problems involving multiplication and division.
- CC.2.2.3.A.2 Understand properties of multiplication and the relationship between multiplication and division.
- CC.2.2.3.A.3 Demonstrated multiplication and division fluency.
- CC.2.2.3.A.4 Solve problems involving the four operations, and identify and explain patterns in arithmetic.

**Measurement**
- CC.2.4.3.A.1 Solve problems involving measurement and estimation of temperature, liquid, volume, mass and length.
- CC.2.4.3.A.2 Tell and write time to the nearest minute and solve problems by calculating time intervals.
- CC.2.4.3.A.3 Solve problems and make change involving money using a combination of coins and bills.
- CC.2.4.3.A.5 Determine the area of a rectangle and apply the concept to multiplication and to addition.
- CC.2.4.3.A.6 Solve problems involving perimeters of polygons and distinguish between linear and area measures.

**Data**
- CC.2.4.3.A.4 Represent and interpret data using tally charts, tables, pictographs, line plots, and bar graphs.

**Understanding Fractions**
- CC.2.1.3.C.1 Explore and develop an understanding of fractions as numbers.

**Geometry**
- CC.2.3.3.A.1 Identify, compare, and classify shapes and their attributes.
- CC.2.3.3.A.2 Use the understanding of fractions to partition shapes into parts with equal areas and express the area of each part as a unit fraction.
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<td><strong>CC.2.1.3.B.1</strong> Apply place value understanding and properties of operations to perform multi-digit arithmetic.</td>
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<tr>
<td><strong>CC.2.2.3.A.1</strong> Represent and solve problems involving multiplication and division.</td>
</tr>
<tr>
<td><strong>CC.2.2.3.A.2</strong> Understand properties of multiplication and the relationship between multiplication and division.</td>
</tr>
<tr>
<td><strong>CC.2.2.3.A.3</strong> Demonstrated multiplication and division fluency.</td>
</tr>
<tr>
<td><strong>CC.2.2.3.A.4</strong> Solve problems involving the four operations, and identify and explain patterns in arithmetic.</td>
</tr>
</tbody>
</table>
### Grade 4 Math Course Description:
In Grade 4, instructional time will focus on four critical areas: (1) developing understanding and fluency with multi-digit multiplication including familiarity with patterns, factors and multiples, and developing understanding of dividing to find quotients involving multi-digit dividends; (2) developing an understanding of fraction/decimal equivalence, addition and subtraction of fractions with like denominators, and multiplication of fractions by whole numbers; (3) understanding that geometric figures can be analyzed and classified on their properties, such as having parallel sides, perpendicular sides, particular angle measures, and symmetry; and (4) solving problems involving length, weight, liquid, mass, volume, time, area, and perimeter. (PDE, Standards Aligned System)

### Standards for Mathematical Practice (Included in all units)
Make sense of problems and persevere in solving them.
Attend to precision.
Reason abstractly and quantitatively.
Construct viable arguments and critique the reasoning of others.
Model with mathematics.
Use appropriate tools strategically.
Look for and make use of structure.
Look for and express regularity in repeated reasoning.

### Exploring Place Value of Multi-Digit Whole Numbers
CC.2.1.4.B.1 Apply place value concepts to show an understanding of multi-digit numbers.

### Place Value and Operations with Whole Numbers in Addition and Subtraction
CC.2.1.4.B.2 Use place value understanding and properties of operations to perform multi-digit arithmetic.
CC.2.2.4.A.1 Represent and solve problems involving the four operations.
CC.2.2.4.A.4 Generate and analyze patterns using one rule.

### Place Value and Operations with Whole Numbers in Multiplication and Division
CC.2.1.4.B.2 Use place value understanding and properties of operations to perform multi-digit arithmetic.
CC.2.2.4.A.1 Represent and solve problems involving the four operations.
CC.2.2.4.A.2 Develop and/or apply number theory concepts to find factors and multiples.
CC.2.2.4.A.4 Generate and analyze patterns using one rule.

### Place Value with Decimals
CC.2.1.4.C.3 Connect decimal notation to fractions, compare decimal fractions (base 10 denominator, eg., 19/100).

### Numbers and Operations with Fractions
CC.2.1.4.C.3 Connect decimal notation to fractions, compare decimal fractions (base 10 denominator, eg., 19/100).
CC.2.1.4.C.1 Extend the understanding of fractions to show equivalence and ordering.
CC.2.1.4.C.2 Build fractions from unit fractions by applying and extending previous understanding of operations of whole numbers.

### Place Value with Decimals
CC.2.1.4.C.3 Connect decimal notation to fractions, compare decimal fractions (base 10 denominator, eg., 19/100).

### Data
CC.2.4.4.A.2 Translate information from one type of data display to another.
CC.2.4.4.A.4 Represent and interpret data involving fractions using information provided in a line plot.
Geometry
CC.2.3.4.A.1 Draw lines and angles and identify these in two-dimensional figures.
CC.2.3.4.A.2 Classify two-dimensional figures by properties of their lines and angles.
CC.2.3.4.A.3 Recognize symmetric shapes and draw lines of symmetry.
CC.2.4.4.A.6 Measure angles and use properties of adjacent angles to solve problems.

Measurement
CC.2.4.4.A.1 Solve problems involving measurement and conversions from a larger unit to a smaller unit.
**Grade 5 Math Course Description:**
In grade 5, instructional time will focus on three critical areas (1) developing fluency with addition and subtraction of fractions, and developing understanding of the multiplication of fractions and of division of fractions in limited cases (unit fractions divided by whole numbers and whole numbers divided by unit fractions); (2) extending division to two-digit divisors, integrating decimal fractions into the place value system and developing understanding of operations with decimals to hundredths, and developing fluency with whole number and decimal operations; and (3) developing understanding of volume. (PDE, Standards Aligned System)

**Standards for Mathematical Practice (Included in all units)**
- Make sense of problems and persevere in solving them.
- Attend to precision.
- Reason abstractly and quantitatively.
- Construct viable arguments and critique the reasoning of others.
- Model with mathematics.
- Use appropriate tools strategically.
- Look for and make use of structure.
- Look for and express regularity in repeated reasoning.

### Place Value and Operations with Whole Numbers in Multiplication and Division
- CC.2.1.5.B.1 Apply place value concepts to show an understanding of operations and rounding as they pertain to whole numbers and decimals.
- CC.2.1.5.B.2 Extend an understanding of operations with whole numbers to perform operations including decimals.

### Numbers and Operations with Fractions in Addition and Subtraction
- CC.2.1.5.C.1 Use the understanding of equivalency to add and subtract fractions.

### Numbers and Operations with Fractions in Multiplication and Division
- CC.2.1.5.C.2 Apply and extend previous understandings of multiplication and division to multiply and divide fractions.

### Place Value and Adding and Subtracting with Decimals
- CC.2.1.5.B.1 Apply place value concepts to show an understanding of operations and rounding as they pertain to whole numbers and decimals.
- CC.2.1.5.B.2 Extend an understanding of operations with whole numbers to perform operations including decimals.

### Place Value and Multiplying and Dividing with Decimals
- CC.2.1.5.B.1 Apply place value concepts to show an understanding of operations and rounding as they pertain to whole numbers and decimals.
- CC.2.1.5.B.2 Extend an understanding of operations with whole numbers to perform operations including decimals.

### Expressions and Equations
- CC.2.2.5.A.1 Interpret and evaluate numerical expressions using order of operations.

### Patterns
- CC.2.2.5.A.4 Analyze patterns and relationships using two rules.

### Measurement and Conversions
- CC.2.4.5.A.1 Solve problems using conversions within a given measurement system.

### Volume
<table>
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<th><strong>Data</strong></th>
<th><strong>Geometry</strong></th>
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<tr>
<td>CC.2.4.5.A.2 Represent and interpret data using appropriate scale.</td>
<td>C.2.3.5.A.1 Graph points in the first quadrant on the coordinate plane and interpret these points when solving real world mathematical problems.</td>
</tr>
<tr>
<td>CC.2.4.5.A.4 Solve problems involving computation of fractions using information provided in a line plot.</td>
<td>CC.2.3.5.A.2 Classify two-dimensional figures into categories based on an understanding of their properties.</td>
</tr>
</tbody>
</table>

**CC.2.4.5.A.5** Apply concepts of volume to solve problems and relate volume to multiplication and to addition.
**Grade 6 Math Course Description:**

This course will explore useful strategies for finding factors, multiples, prime and composite numbers, as well as learning how the distributive property connects multiplication and addition. Students will apply and extend previous understandings of rational numbers, and develop skills in using operations with fractions, decimals, ratios, and percents to measure and compare quantities. This course will help students solve mathematical problems involving area, surface area, and volume. Students will extend previous understandings of arithmetic to algebraic expressions including solving one-variable equations or inequalities and representing and analyzing relationships between dependent and independent variables. The course will explore statistical variability by displaying, analyzing, and summarizing data and distributions. Multiple strategies will be applied throughout this course so that students gain familiarity and solve real-life problems.

<table>
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<th>Factors and Multiples and the Distributive Property</th>
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<tbody>
<tr>
<td>CC.2.1.6.E.3 Develop and/or apply number theory concepts to find common factors and multiples.</td>
</tr>
<tr>
<td>CC.2.2.6.B.1 Apply and extend previous understandings of arithmetic to algebraic expressions.</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Ratios, Rational Numbers, and Equivalence</th>
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<tbody>
<tr>
<td>CC.2.1.6.D.1 Understand ratio concepts and use ratio reasoning to solve problems.</td>
</tr>
<tr>
<td>CC.2.1.6.E.4 Apply and extend previous understandings of numbers to the system of rational numbers.</td>
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<td>CC.2.1.5.C.2 Apply and extend previous understandings of multiplication and division to multiply and divide fractions.</td>
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<tr>
<td><strong>Teach</strong></td>
</tr>
<tr>
<td>CC.2.1.6.E.1 Apply and extend previous understandings of multiplication and division to divide fractions by fractions.</td>
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<th>Geometric Measurement</th>
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</thead>
<tbody>
<tr>
<td>CC.2.3.6.A.1 Apply appropriate tools to solve real-world and mathematical problems involving area, surface area, and volume.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Computing with Decimals and Percents</th>
</tr>
</thead>
<tbody>
<tr>
<td>CC.2.1.6.E.2 Identify and choose appropriate processes to compute fluently with multi-digit numbers.</td>
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<tr>
<td>CC.2.1.6.D.1 Understand ratio concepts and use ratio reasoning to solve problems.</td>
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<tr>
<th>Pre-Algebra</th>
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<tbody>
<tr>
<td>CC.2.1.6.E.4 Apply and extend previous understandings of numbers to the system of rational numbers.</td>
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<tr>
<td>CC.2.2.6.B.1 Apply and extend previous understandings of arithmetic to algebraic expressions</td>
</tr>
<tr>
<td>CC.2.2.6.B.2 Understand the process of solving a one-variable equation or inequality and apply it to real-world and mathematical problems.</td>
</tr>
<tr>
<td>CC.2.2.6.B.3 Represent and analyze quantitative relationships between dependent and independent variables.</td>
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<tr>
<th>Statistics and Data Analysis</th>
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<tbody>
<tr>
<td>CC.2.4.6.B.1 Demonstrate an understanding of statistical variability by displaying, analyzing, and summarizing distributions.</td>
</tr>
</tbody>
</table>
Grade 6 Advanced Math Course Description:
This course places a deep emphasis on abstract thinking and problem solving and moves at a fast academic pace. This course will explore useful strategies for finding factors, multiples, prime and composite numbers, as well as learning how the distributive property connects multiplication and addition. Students will apply and extend previous understandings of rational numbers, and develop skills in using operations with fractions, decimals, ratios, and percents to measure and compare quantities. This course will help students solve mathematical problems involving area, surface area, and volume. Students will extend previous understandings of arithmetic to algebraic expressions including solving one-variable equations or inequalities and representing and analyzing relationships between dependent and independent variables. The course will explore statistical variability by displaying, analyzing, and summarizing data & distributions. Students will also investigate probability including drawing inferences with random sampling, comparative sampling in addition to evaluating probability models. Multiple strategies will be applied throughout this course so that students gain familiarity and solve real-life problems.

Factors and Multiples and the Distributive Property
- CC.2.1.6.E.3 Develop and/or apply number theory concepts to find common factors and multiples.
- CC.2.2.6.B.1 Apply and extend previous understandings of arithmetic to algebraic expressions.

Ratios, Rational Numbers, and Equivalence
- CC.2.1.6.D.1 Understand ratio concepts and use ratio reasoning to solve problems.
- CC.2.1.6.E.4 Apply and extend previous understandings of numbers to the system of rational numbers.

Understanding Fraction Operations
**Review**
- CC.2.1.5.C.1 Use the understanding of equivalency to add and subtract fractions.
- CC.2.1.5.C.2 Apply and extend previous understandings of multiplication and division to multiply and divide fractions.

**Teach**
- CC.2.1.6.E.1 Apply and extend previous understandings of multiplication and division to divide fractions by fractions.

Geometric Measurement
- CC.2.3.6.A.1 Apply appropriate tools to solve real-world and mathematical problems involving area, surface area, and volume.

Computing with Decimals and Percents
- CC.2.1.6.E.2 Identify and choose appropriate processes to compute fluently with multi-digit numbers.
- CC.2.1.6.D.1 Understand ratio concepts and use ratio reasoning to solve problems.

Pre-Algebra
- CC.2.1.6.E.4 Apply and extend previous understandings of numbers to the system of rational numbers.
- CC.2.2.6.B.1 Apply and extend previous understandings of arithmetic to algebraic expressions
- CC.2.2.6.B.2 Understand the process of solving a one-variable equation or inequality and apply it to real-world and mathematical problems.
- CC.2.2.6.B.3 Represent and analyze quantitative relationships between dependent and independent variables.

Statistics and Data Analysis
- CC.2.4.6.B.1 Demonstrate an understanding of statistical variability by displaying, analyzing, and summarizing distributions.

Statistics and Probability
- CC.2.4.7.B.1 Draw inferences about populations based on random sampling concepts.
CC.2.4.7.B.2 Draw informal comparative inferences about two populations.
CC.2.4.7.B.3 Investigate chance processes and develop, use, and evaluate probability models.
Introduction to Algebra and Geometry 7:
This course will extend the number system to include negative numbers, develop algorithms to add, subtract, multiply, and divide integers and rational numbers. The course will explore polygons and angle properties, formulas for area, circumference, volume and surface area of two- and three-dimensional shapes will be used to solve problems. Students will also explore similarity between figures. Different strategies will be developed for comparing quantities, including ratios, fractions, percents, and proportions. Proportional reasoning strategies will be used to solve real-world consumer math application problems. Linear relationships will be explored with graphs, tables, and equations to solve real world problems, and connect rates and ratios. The Statistics and Data Analysis unit in 6th grade will be extended to make sense of population samples. This course includes analyzing and making predictions using experimental and theoretical probabilities of events.

Integers and Rational Numbers:
CC.2.1.7.E.1 Apply and extend previous understandings of operations with fractions to operations with rational numbers.

Geometry and Similarity:
CC.2.3.7.A.1 Solve real-world and mathematical problems involving angle measure, area, surface area, circumference, and volume
CC.2.3.7.A.2 Visualize and represent geometric figures and describe the relationships between them.

Ratios, Rates, Percents, and Proportions:
CC.2.1.7.D.1 Analyze proportional relationships and use them to model and solve real-world and mathematical problems.

Linear Relationships:
CC.2.2.7.B.1 Apply properties of operations to generate equivalent expressions.
CC.2.2.7.B.3 Model and solve real-world and mathematical problems by using and connecting numerical, algebraic, and/or graphical representations.

Statistics and Probability:
CC.2.4.7.B.1 Draw inferences about populations based on random sampling concepts.
CC.2.4.7.B.2 Draw informal comparative inferences about two populations.
CC.2.4.7.B.3 Investigate chance processes and develop, use, and evaluate probability models.
Advanced Math 7:
This course places a deep emphasis on abstract thinking and problem solving and moves at a fast academic pace. The course will extend the number system to include negative numbers, develop algorithms to add, subtract, multiply, and divide integers and rational numbers. The course will explore polygons and angle properties. Also, formulas for area, circumference, volume and surface area of two- and three-dimensional shapes will be used to solve problems. Students will explore similarity between figures. Different strategies will be developed for comparing quantities, including ratios, fractions, percents, and proportions. Proportional reasoning strategies will be used to solve real-world consumer math application problems. Linear relationships will be explored with graphs, tables, and equations to solve real world problems, and connect rates and ratios. The course will conclude with an exploration of symmetry and transformations.

<table>
<thead>
<tr>
<th>Integers and Rational Numbers:</th>
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<tbody>
<tr>
<td>CC.2.1.7.E.1  Apply and extend previous understandings of operations with fractions to operations with rational numbers.</td>
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<th>Geometry and Similarity:</th>
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<tr>
<td>CC.2.3.7.A.1  Solve real-world and mathematical problems involving angle measure, area, surface area, circumference, and volume</td>
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<tr>
<td>CC. 2.3.7.A.2  Visualize and represent geometric figures and describe the relationships between them.</td>
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<tr>
<th>Ratios, Rates, Percents, and Proportions:</th>
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<tbody>
<tr>
<td>CC.2.1.7.D.1  Analyze proportional relationships and use them to model and solve real-world and mathematical problems.</td>
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<th>Linear Relationships:</th>
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<tr>
<td>CC.2.2.7.B.1  Apply properties of operations to generate equivalent expressions.</td>
</tr>
<tr>
<td>CC.2.2.7.B.3  Model and solve real-world and mathematical problems by using and connecting numerical, algebraic, and/or graphical representations.</td>
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<tr>
<th>Symmetry and Transformations:</th>
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<tbody>
<tr>
<td>CC.2.3.8.A.2  Understand and apply congruence, similarity, and geometric transformations using various tools.</td>
</tr>
</tbody>
</table>
**Introduction to Algebra and Geometry 8:**
This course focuses on linear and nonlinear relationships in various formats, including tables, equations, graphs, and real world situations. The Pythagorean Theorem is discovered and applied using both rational and irrational numbers. Applications of radicals and integer exponents will be used to generate equivalent expressions. Linear equations and systems of equations will be analyzed and solved. Additional geometric concepts included in this course are volume of spheres, cones, and cylinders and symmetry and transformations.

**Linear and Nonlinear Relationships:**
- **CC.2.2.8.B.2** Understand the connections between proportional relationships, lines, and linear equations.
- **CC.2.2.8.C.1** Define, evaluate, and compare functions.
- **CC.2.2.8.C.2** Use concepts of functions to model relationships between quantities.
- **CC.2.4.8.B.1** Analyze and/or Interpret bivariate data displayed in multiple representations.
- **CC.2.4.8.B.2** Understand that patterns of association can be seen in bivariate data utilizing frequencies.

**The Pythagorean Theorem & Real Numbers:**
- **CC.2.3.8.A.3** Understand and apply the Pythagorean Theorem to solve problems.
- **CC.2.2.8.B.1** Apply concepts of radicals and integer exponents to generate equivalent expressions.
- **CC.2.1.8.E.1** Distinguish between rational and irrational numbers using their properties.
- **CC.2.1.8.E.4** Estimate irrational numbers by comparing them to rational numbers.

**Properties of Exponents:**
- **CC.2.2.8.B.1** Apply concepts of radicals and integer exponents to generate equivalent expressions.

**Combining Expressions and Solving Equations:**
- **CC.2.3.8.A.1** Apply the concepts of volume of cylinders, cones, and spheres to solve real-world and mathematical problems.
- **CC.2.2.8.B.3** Analyze and solve linear equations. N

**Systems of Linear Equations:**
- **CC.2.2.8.B.3** Analyze and solve linear equations and pairs of simultaneous linear equations.

**Symmetry and Transformations:**
- **CC.2.3.8.A.2** Understand and apply congruence, similarity, and geometric transformations using various tools.
Advanced Algebra 1:
This course places a deep emphasis on abstract thinking and problem solving and moves at a fast academic pace. Linear equations, functions, and inequalities are the primary focus of the first half of the course, with emphasis on solving equations and inequalities graphically and algebraically. The concepts of linear equations and inequalities are extended to systems of linear equations and inequalities. A study of absolute value equations and inequalities extends conceptions and skills of linear equations and inequalities. Equivalent expressions involving exponents, polynomials, rationals, and radicals are the primary focus of the second half of the course, with an emphasis on creating simplified equivalent forms using properties of real numbers. The course includes a statistics unit on analyzing data using plots and graphs. The course also includes a study of quadratic functions including graphing, factoring, and problem solving.

Linear Equations & Functions:
CC.2.4.HS.B.2 Summarize, represent, and interpret data on two categorical and quantitative variables.
CC.2.4.HS.B.3 Analyze linear models to make interpretations based on the data.
CC.2.2.HS.C.1 Use the concept and notation of functions to interpret and apply them in terms of their context.
CC.2.2.HS.C.2 Graph and analyze functions and use their properties to make connections between the different representations.
CC.2.2.HS.C.3 Write functions or sequences that model relationships between two quantities.
CC.2.2.HS.C.5 Construct and compare linear models to solve problems.
CC.2.2.HS.C.6 Interpret functions in terms of the situations they model.
CC.2.2.HS.D.7 Create and graph equations to describe numbers or relationships.

CC.2.2.HS.D.9 Use reasoning to solve equations and justify the solution method.
CC.2.2.HS.D.10 Represent, solve, and interpret inequalities, algebraically and graphically.
CC.2.1.HS.F.3 Apply quantitative reasoning to choose and interpret units and scales in formulas, graphs, and data display.

One and Two Variable Linear Inequalities:
CC.2.2.HS.D.7 Create and graph equations or inequalities to describe numbers or relationships.
CC.2.2.HS.D.10 Represent, solve, and interpret inequalities, algebraically and graphically.

Systems of Equations & Inequalities:
CC.2.4.HS.B.2 Summarize, represent, and interpret data on two categorical and quantitative variables.
CC.2.4.HS.B.3 Analyze linear models to make interpretations based on the data.
CC.2.2.HS.C.2 Graph and analyze functions and use their properties to make connections between the different representations.
CC.2.2.HS.C.3 Write functions or sequences that model relationships between two quantities.
CC.2.2.HS.D.7 Create and graph equations or inequalities to describe numbers or relationships.
CC.2.2.HS.D.9 Use reasoning to solve equations and justify the solution method.
CC.2.2.HS.D.10 Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.

Absolute Value Equations & Inequalities:
CC.2.2.HS.D.9 Use reasoning to solve equations and justify the solution method.
CC.2.2.HS.D.10 Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.

Operations with Exponents:
CC.2.2.HS.D.2 Write expressions in equivalent forms to solve problems.
CC.2.1.HS.F.1 Apply and extend the properties of exponents to solve problems with rational exponents.
CC.2.1.HS.F.2 Apply properties of rational and irrational numbers to solve real world or mathematical problems.
<table>
<thead>
<tr>
<th>Section</th>
<th>Standards</th>
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</thead>
<tbody>
<tr>
<td><strong>Polynomials &amp; Rational Expressions and Equations:</strong></td>
<td>CC.2.2.HS.D.2 Write expressions in equivalent forms to solve problems.</td>
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<tr>
<td></td>
<td>CC.2.2.HS.D.3 Extend the knowledge of arithmetic operations and apply to polynomials.</td>
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<td>CC.2.2.HS.D.6 Extend the knowledge of rational functions to rewrite in equivalent forms.</td>
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<tr>
<td><strong>Radical Expressions and Equations:</strong></td>
<td>CC.2.2.HS.D.2 Write expressions in equivalent forms to solve problems.</td>
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<td>CC.2.1.HS.F.2 Apply properties of rational and irrational numbers to solve real world or mathematical problems.</td>
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<tr>
<td><strong>Data Analysis &amp; Probability:</strong></td>
<td>CC.2.4.HS.B.1 Summarize, represent, and interpret data on a single count or measurement variable.</td>
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<td>CC.2.4.HS.B.3 Analyze linear models to make interpretations based on the data.</td>
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<td>CC.2.4.HS.B.5 Make inferences and justify conclusions based on sample surveys, experiments, and observational studies.</td>
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<td>CC.2.4.HS.B.7 Apply the rules of probability to compute probabilities of compound events in a uniform probability model.</td>
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<tr>
<td><strong>Quadratic Functions and Equations:</strong></td>
<td>CC.2.2.HS.C.2 Graph and analyze functions and use their properties to make connections between the different representations.</td>
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<td>CC.2.2.HS.C.3 Write functions or sequences that model relationships between two quantities.</td>
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<td>CC.2.2.HS.C.4 Interpret the effects transformations have on functions and find the inverses of functions.</td>
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<td></td>
<td>CC.2.2.HS.C.5 Construct and compare linear, quadratic, and exponential models to solve problems.</td>
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<td>CC.2.2.HS.D.2 Write expressions in equivalent forms to solve problems.</td>
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<td>CC.2.2.HS.D.3 Extend the knowledge of arithmetic operations and apply to polynomials.</td>
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<td></td>
<td>CC.2.2.HS.D.4 Understand the relationship between zeros and factors of polynomials to make generalizations about functions and their graphs.</td>
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<tr>
<td></td>
<td>CC.2.2.HS.D.5 Use polynomial identities to solve problems.</td>
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<td>CC.2.2.HS.D.7 Create and graph equations or inequalities to describe numbers or relationships.</td>
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<tr>
<td></td>
<td>CC.2.2.HS.D.8 Apply inverse operations to solve equations or formulas for a given variable.</td>
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<tr>
<td></td>
<td>CC.2.2.HS.D.9 Use reasoning to solve equations and justify the solution method.</td>
</tr>
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<td></td>
<td>CC.2.2.HS.D.10 Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.</td>
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</table>
**College-Prep Algebra 1A:**
Linear equations, functions, and inequalities are the primary focus of this course, with emphasis on solving equations and inequalities graphically and algebraically. The concepts of linear equations and inequalities are extended to systems of linear equations and inequalities. A study of absolute value equations and inequalities extends conceptions and skills of linear equations and inequalities.

### Linear Equations & Functions:
- CC.2.4.HS.B.2 Summarize, represent, and interpret data on two categorical and quantitative variables.
- CC.2.4.HS.B.3 Analyze linear models to make interpretations based on the data.
- CC.2.2.HS.C.1 Use the concept and notation of functions to interpret and apply them in terms of their context.
- CC.2.2.HS.C.2 Graph and analyze functions and use their properties to make connections between the different representations.
- CC.2.2.HS.C.3 Write functions or sequences that model relationships between two quantities.
- CC.2.2.HS.C.5 Construct and compare linear models to solve problems.
- CC.2.2.HS.C.6 Interpret functions in terms of the situations they model.
- CC.2.2.HS.D.7 Create and graph equations to describe numbers or relationships.
- CC.2.2.HS.D.9 Use reasoning to solve equations and justify the solution method.
- CC.2.2.HS.D.10 Represent, solve, and interpret inequalities, algebraically and graphically.

### One and Two Variable Linear Inequalities:
- CC.2.2.HS.D.7 Create and graph equations or inequalities to describe numbers or relationships.
- CC.2.2.HS.D.10 Represent, solve, and interpret inequalities, algebraically and graphically.

### Systems of Equations & Inequalities:
- CC.2.4.HS.B.2 Summarize, represent, and interpret data on two categorical and quantitative variables.
- CC.2.4.HS.B.3 Analyze linear models to make interpretations based on the data.
- CC.2.2.HS.C.2 Graph and analyze functions and use their properties to make connections between the different representations.
- CC.2.2.HS.C.3 Write functions or sequences that model relationships between two quantities.
- CC.2.2.HS.D.7 Create and graph equations or inequalities to describe numbers or relationships.
- CC.2.2.HS.D.9 Use reasoning to solve equations and justify the solution method.
- CC.2.2.HS.D.10 Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.

### Absolute Value Equations & Inequalities:
- CC.2.2.HS.D.9 Use reasoning to solve equations and justify the solution method.
- CC.2.2.HS.D.10 Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.
### College-Prep Algebra 1B:
Equivalent expressions involving exponents, polynomials, rationals, and radicals are the primary focus of this course, with an emphasis on creating simplified equivalent forms using properties of real numbers. The course concludes with a statistical unit focused on analyzing data using plots and graphs.

### Operations with Exponents:
- **CC.2.2.HS.D.2** Write expressions in equivalent forms to solve problems.
- **CC.2.1.HS.F.1** Apply and extend the properties of exponents to solve problems with rational exponents.
- **CC.2.1.HS.F.2** Apply properties of rational and irrational numbers to solve real world or mathematical problems.

### Polynomials & Rational Expressions:
- **CC.2.2.HS.D.2** Write expressions in equivalent forms to solve problems.
- **CC.2.2.HS.D.3** Extend the knowledge of arithmetic operations and apply to polynomials.
- **CC.2.2.HS.D.6** Extend the knowledge of rational functions to rewrite in equivalent forms.
- **CC.2.2.HS.C.2** Graph and analyze functions and use their properties to make connections between the different representations.
- **CC.2.2.HS.C.4** Interpret the effects transformations have on functions and find the inverses of functions.

### Radical Expressions:
- **CC.2.2.HS.D.2** Write expressions in equivalent forms to solve problems.
- **CC.2.1.HS.F.2** Apply properties of rational and irrational numbers to solve real world or mathematical problems.

### Data Analysis & Probability:
- **CC.2.4.HS.B.1** Summarize, represent, and interpret data on a single count or measurement variable.
- **CC.2.4.HS.B.3** Analyze linear models to make interpretations based on the data.
- **CC.2.4.HS.B.5** Make inferences and justify conclusions based on sample surveys, experiments, and observational studies.
- **CC.2.4.HS.B.7** Apply the rules of probability to compute probabilities of compound events in a uniform probability model.
**College-Prep Algebra 1:**
Linear equations, functions, and inequalities are the primary focus of the first half of the course, with emphasis on solving equations and inequalities graphically and algebraically. The concepts of linear equations and inequalities are extended to systems of linear equations and inequalities. A study of absolute value equations and inequalities extends conceptions and skills of linear equations and inequalities. Equivalent expressions involving exponents, polynomials, rationals, and radicals are the primary focus of the second half of the course, with an emphasis on creating simplified equivalent forms using properties of real numbers. The course concludes with a statistical unit focused on analyzing data using plots and graphs.

**Linear Equations & Functions:**
- CC.2.4.HS.B.2 Summarize, represent, and interpret data on two categorical and quantitative variables.
- CC.2.4.HS.B.3 Analyze linear models to make interpretations based on the data.
- CC.2.2.HS.C.1 Use the concept and notation of functions to interpret and apply them in terms of their context.
- CC.2.2.HS.C.2 Graph and analyze functions and use their properties to make connections between the different representations.
- CC.2.2.HS.C.3 Write functions or sequences that model relationships between two quantities.
- CC.2.2.HS.C.5 Construct and compare linear models to solve problems.
- CC.2.2.HS.C.6 Interpret functions in terms of the situations they model.
- CC.2.2.HS.D.7 Create and graph equations to describe numbers or relationships.
- CC.2.2.HS.D.9 Use reasoning to solve equations and justify the solution method.
- CC.2.2.HS.D.10 Represent, solve, and interpret equations algebraically and graphically.

**One and Two Variable Linear Inequalities:**
- CC.2.2.HS.D.7 Create and graph equations or inequalities to describe numbers or relationships.
- CC.2.2.HS.D.10 Represent, solve, and interpret inequalities, algebraically and graphically.

**Systems of Equations & Inequalities:**
- CC.2.4.HS.B.2 Summarize, represent, and interpret data on two categorical and quantitative variables.
- CC.2.4.HS.B.3 Analyze linear models to make interpretations based on the data.
- CC.2.2.HS.C.2 Graph and analyze functions and use their properties to make connections between the different representations.
- CC.2.2.HS.C.3 Write functions or sequences that model relationships between two quantities.
- CC.2.2.HS.D.7 Create and graph equations or inequalities to describe numbers or relationships.
- CC.2.2.HS.D.9 Use reasoning to solve equations and justify the solution method.
- CC.2.2.HS.D.10 Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.

**Absolute Value Equations & Inequalities:**
- CC.2.2.HS.D.9 Use reasoning to solve equations and justify the solution method.
- CC.2.2.HS.D.10 Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.

**Operations with Exponents:**
- CC.2.2.HS.D.2 Write expressions in equivalent forms to solve problems.
- CC.2.1.HS.F.1 Apply and extend the properties of exponents to solve problems with rational exponents.
- CC.2.1.HS.F.2 Apply properties of rational and irrational numbers to solve real world or mathematical problems.

**Polynomials & Rational Expressions:**
- CC.2.2.HS.D.2 Write expressions in equivalent forms to solve problems.
| CC.2.2.HS.D.3 Extend the knowledge of arithmetic operations and apply to polynomials. |
| CC.2.2.HS.D.6 Extend the knowledge of rational functions to rewrite in equivalent forms. |
| CC.2.2.HS.C.2 Graph and analyze functions and use their properties to make connections between the different representations. |
| CC.2.2.HS.C.4 Interpret the effects transformations have on functions and find the inverses of functions. |

**Radical Expressions:**
- CC.2.2.HS.D.2 Write expressions in equivalent forms to solve problems.
- CC.2.1.HS.F.2 Apply properties of rational and irrational numbers to solve real world or mathematical problems.

**Data Analysis & Probability:**
- CC.2.4.HS.B.1 Summarize, represent, and interpret data on a single count or measurement variable.
- CC.2.4.HS.B.3 Analyze linear models to make interpretations based on the data.
- CC.2.4.HS.B.5 Make inferences and justify conclusions based on sample surveys, experiments, and observational studies.
- CC.2.4.HS.B.7 Apply the rules of probability to compute probabilities of compound events in a uniform probability model.
Geometry:
The general goal of this course is to develop a working knowledge of geometric principles and logical thinking skills necessary to use these principles. This course is designed for students to be actively engaged through the use of hands on activities. Students will work in cooperative groups frequently to develop an understanding of geometric principles and to develop the ability to create a plan to find solutions to problems. The topics to be covered include properties of angles, lines, polygons and congruence, similarity, coordinate geometry, justification and proof, right triangles, circles, two-dimensional and three-dimensional shapes and figures.

Properties of Angles and Lines:
CC.2.3.HS.A.3 Verify and apply geometric theorems as they relate to geometric figures.

Polygons and Congruence:
CC.2.3.HS.A.3 Verify and apply geometric theorems as they relate to geometric figures.
CC.2.3.HS.A.13 Analyze relationships between two-dimensional and three-dimensional objects.

Similarity:
CC.2.3.HS.A.5 Create justifications based on transformations to establish similarity of plane figures.
CC.2.3.HS.A.6 Verify and apply theorems involving similarity as they relate to plane figures.

Coordinate Geometry:
CC.2.3.HS.A.3 Verify and apply geometric theorems as they relate to geometric figures.
CC.2.3.HS.A.11 Apply coordinate geometry to prove simple geometric theorems algebraically.

Right Triangles:
CC.2.3.HS.A.3 Verify and apply geometric theorems as they relate to geometric figures.
CC.2.3.HS.A.11 Apply coordinate geometry to prove simple geometric theorems algebraically.

Circles:
CC.2.3.HS.A.8 Apply geometric theorems to verify properties of circles.
CC.2.3.HS.A.9 Extend the concept of similarity to determine arc lengths and areas of sectors of circles.

Two Dimensional Shapes and Figures:
CC.2.3.HS.A.3 Verify and apply geometric theorems as they relate to geometric figures.
CC.2.3.HS.A.8 Apply geometric theorems to verify properties of circles.
CC.2.3.HS.A.14 Apply geometric concepts to model and solve real world problems.

Three Dimensional Shapes and Figures:
CC.2.3.HS.A.12 Explain volume formulas and use them to solve problems.
CC.2.3.HS.A.13 Analyze relationships between two-dimensional and three-dimensional objects.
CC.2.3.HS.A.14 Apply geometric concepts to model and solve real world problems.
## College-Prep Geometry:
The general goals of this course are to develop an understanding of geometric concepts and use logical reasoning skills. The topics to be covered include properties of angles, lines, polygons and congruence, similarity, coordinate geometry, justification and proof, right triangles, circles, two-dimensional and three-dimensional shapes and figures.

### Properties of Angles and Lines:
- **CC.2.3.HS.A.3** Verify and apply geometric theorems as they relate to geometric figures.

### Polygons and Congruence:
- **CC.2.3.HS.A.3** Verify and apply geometric theorems as they relate to geometric figures.
- **CC.2.3.HS.A.13** Analyze relationships between two-dimensional and three-dimensional objects.

### Similarity:
- **CC.2.3.HS.A.5** Createjustifications based on transformations to establish similarity of plane figures.
- **CC.2.3.HS.A.6** Verify and apply theorems involving similarity as they relate to plane figures.

### Coordinate Geometry:
- **CC.2.3.HS.A.3** Verify and apply geometric theorems as they relate to geometric figures.
- **CC.2.3.HS.A.11** Apply coordinate geometry to prove simple geometric theorems algebraically.

### Right Triangles:
- **CC.2.3.HS.A.3** Verify and apply geometric theorems as they relate to geometric figures.
- **CC.2.3.HS.A.7** Apply trigonometric ratios to solve problems involving right triangles.
- **CC.2.3.HS.A.11** Apply coordinate geometry to prove simple geometric theorems algebraically.

### Circles:
- **CC.2.3.HS.A.8** Apply geometric theorems to verify properties of circles.
- **CC.2.3.HS.A.9** Extend the concept of similarity to determine arc lengths and areas of sectors of circles.

### Two Dimensional Shapes and Figures:
- **CC.2.3.HS.A.3** Verify and apply geometric theorems as they relate to geometric figures.
- **CC.2.3.HS.A.8** Apply geometric theorems to verify properties of circles.
- **CC.2.3.HS.A.14** Apply geometric concepts to model and solve real world problems.

### Three Dimensional Shapes and Figures:
- **CC.2.3.HS.A.12** Explain volume formulas and use them to solve problems.
- **CC.2.3.HS.A.13** Analyze relationships between two-dimensional and three-dimensional objects.
- **CC.2.3.HS.A.14** Apply geometric concepts to model and solve real world problems.
Advanced Geometry:
The general goals of this course are to develop an in-depth understanding of geometric concepts and use logical reasoning skills. The topics to be covered include properties of angles, lines, polygons and congruence, similarity, coordinate geometry, justification and proof, right triangles, vectors, circles, two-dimensional and three-dimensional shapes and figures. There is a substantial emphasis on independent proof writing. Problems often require prerequisite algebra skills including: factoring quadratic equations, systems of equations and literal equations.

Properties of Angles and Lines:
CC.2.3.HS.A.3 Verify and apply geometric theorems as they relate to geometric figures.

Polygons and Congruence:
CC.2.3.HS.A.3 Verify and apply geometric theorems as they relate to geometric figures.
CC.2.3.HS.A.13 Analyze relationships between two-dimensional and three-dimensional objects.

Similarity:
CC.2.3.HS.A.5 Create justifications based on transformations to establish similarity of plane figures.
CC.2.3.HS.A.6 Verify and apply theorems involving similarity as they relate to plane figures.

Coordinate Geometry:
CC.2.3.HS.A.3 Verify and apply geometric theorems as they relate to geometric figures.
CC.2.3.HS.A.11 Apply coordinate geometry to prove simple geometric theorems algebraically.

Right Triangles:
CC.2.3.HS.A.3 Verify and apply geometric theorems as they relate to geometric figures.
CC.2.3.HS.A.7 Apply trigonometric ratios to solve problems involving right triangles.
CC.2.3.HS.A.11 Apply coordinate geometry to prove simple geometric theorems algebraically.

Circles:
CC.2.3.HS.A.8 Apply geometric theorems to verify properties of circles.
CC.2.3.HS.A.9 Extend the concept of similarity to determine arc lengths and areas of sectors of circles.

Two Dimensional Shapes and Figures:
CC.2.3.HS.A.3 Verify and apply geometric theorems as they relate to geometric figures.
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Three Dimensional Shapes and Figures:
CC.2.3.HS.A.12 Explain volume formulas and use them to solve problems.
CC.2.3.HS.A.13 Analyze relationships between two-dimensional and three-dimensional objects.
CC.2.3.HS.A.14 Apply geometric concepts to model and solve real world problems.
### Algebra 2:
The primary focus of this course is to further develop algebraic skills and apply them to contextual problems. This course extends Algebra 1 concepts through the use of experiments and explorations. The course includes a study of the following topics: linear functions in context, quadratic functions, polynomial functions, radical functions and rational exponents, exponential functions, and probability. This course emphasizes a graphical understanding of concepts utilizing available technology.

### Linear Equations and Functions in One & Two Variables:
- **CC.2.4.HS.B.2** Summarize, represent, and interpret data on two categorical and quantitative variables.
- **CC.2.4.HS.B.3** Analyze linear models to make interpretations based on the data.
- **CC.2.2.HS.C.2** Graph and analyze functions and use their properties to make connections between the different representations.
- **CC.2.2.HS.C.3** Write functions or sequences that model relationships between two quantities.
- **CC.2.2.HS.D.7** Create and graph equations or inequalities to describe numbers or relationships.
- **CC.2.2.HS.D.10** Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.

### Polynomial Functions:
- **CC.2.2.HS.C.2** Graph and analyze functions, and use their properties to make connections between the different representations.
- **CC.2.2.HS.C.4** Interpret the effects transformations have on functions
- **CC.2.2.HS.D.3** Extend the knowledge of arithmetic operations and apply to polynomials.
- **CC.2.2.HS.D.4** Understand the relationship between zeros and factors of polynomials to make generalization about functions and their graphs.
- **CC.2.2.HS.D.5** Understand polynomial identities to solve problems.
- **CC.2.2.HS.D.7** Create and graph equations or inequalities to describe numbers or relationships.

### Radical Functions and Rational Exponents:
- **CC.2.2.HS.D.8** Apply inverse operations to solve equations or formulas for a given variable
- **CC.2.2.HS.D.9** Use reasoning to solve equations, and justify the solution method.
- **CC.2.1.HS.F.1** Apply and extend the properties of exponents to solve problems with rational exponents.
- **CC.2.2.HS.D.2** Write expressions in equivalent forms to solve problems.
- **CC.2.2.HS.D.6** Extend the knowledge of rational functions to rewrite in equivalent forms.

### Quadratic Functions:
- **CC.2.2.HS.C.1** Use the concept and notation of functions to interpret and apply them in terms of their context.
- **CC.2.2.HS.C.4** Interpret the effects transformations have on functions
- **CC.2.2.HS.C.6** Interpret functions in terms of the situations they model.
- **CC.2.2.HS.D.2** Write expressions in equivalent forms to solve problems.
- **CC.2.2.HS.D.7** Create and graph equations or inequalities to describe numbers or relationships.

### Exponential and Logarithmic Functions:
- **CC.2.2.HS.C.1** Use the concept and notation of functions to interpret and apply them in terms of their context.
- **CC.2.2.HS.C.2** Graph and analyze functions, and use their properties to make connections between the different representations.
- **CC.2.2.HS.C.3** Write functions or sequences that model relationships between two quantities.
- **CC.2.2.HS.C.4** Interpret the effects transformations have on functions.
- **CC.2.2.HS.C.6** Interpret functions in terms of the situations they model.
- **CC.2.2.HS.D.2** Write expressions in equivalent forms to solve problems.
- **CC.2.2.HS.D.7** Create and graph equations or inequalities to describe numbers or relationships.
- **CC.2.2.HS.D.8** Apply inverse operations to solve equations or formulas for a given variable.
**Probability:**
CC.2.4.HS.B.6 Use the concepts of independence and conditional probability to interpret data.
CC.2.4.HS.B.7 Apply the rules of probability to compute probabilities of compound events in a uniform probability model.
**College-Prep Algebra 2:**
The primary focus of this course is to further develop algebraic skills and apply them to contextual problems. This course extends Algebra 1 concepts and includes a study of the following topics: quadratic functions, polynomial functions, radical functions and rational exponents, exponential and logarithmic functions, rational functions, and probability.

### Linear Equations and Functions in One & Two Variables:
- CC.2.4.HS.B.2 Summarize, represent, and interpret data on two categorical and quantitative variables.
- CC.2.4.HS.B.3 Analyze linear models to make interpretations based on the data.
- CC.2.2.HS.C.2 Graph and analyze functions and use their properties to make connections between the different representations.
- CC.2.2.HS.C.3 Write functions or sequences that model relationships between two quantities.
- CC.2.2.HS.D.10 Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.

### Polynomial Functions:
- CC.2.2.HS.C.2 Graph and analyze functions, and use their properties to make connections between the different representations.
- CC.2.2.HS.C.4 Interpret the effects transformations have on functions.
- CC.2.2.HS.D.4 Understand the relationship between zeros and factors of polynomials to make generalization about functions and their graphs.
- CC.2.2.HS.D.5 Understand polynomial identities to solve problems.
- CC.2.2.HS.D.7 Create and graph equations or inequalities to describe numbers or relationships.

### Rational Functions:
- CC.2.2.HS.D.6 Extend the knowledge of rational functions to rewrite in equivalent forms.
- CC.2.2.HS.D.2 Write expressions in equivalent forms to solve problems.

### Radical Functions and Rational Exponents:
- CC.2.2.HS.D.8 Apply inverse operations to solve equations or formulas for a given variable.
- CC.2.2.HS.D.9 Use reasoning to solve equations, and justify the solution method.
- CC.2.1.HS.F.1 Apply and extend the properties of exponents to solve problems with rational exponents.
- CC.2.2.HS.D.2 Write expressions in equivalent forms to solve problems.
- CC.2.2.HS.D.6 Extend the knowledge of rational functions to rewrite in equivalent forms.

### Quadratic Functions:
- CC.2.2.HS.C.1 Use the concept and notation of functions to interpret and apply them in terms of their context.
- CC.2.2.HS.C.4 Interpret the effects transformations have on functions.
- CC.2.2.HS.C.6 Interpret functions in terms of the situations they model.
- CC.2.2.HS.D.2 Write expressions in equivalent forms to solve problems.
- CC.2.2.HS.D.7 Create and graph equations or inequalities to describe numbers or relationships.
- CC.2.1.HS.F.6 Extend the knowledge of arithmetic operations and apply to complex numbers.

### Exponential and Logarithmic Functions:
- CC.2.2.HS.C.1 Use the concept and notation of functions to interpret and apply them in terms of their context.
- CC.2.2.HS.C.2 Graph and analyze functions, and use their properties to make connections between the different representations.
- CC.2.2.HS.C.3 Write functions or sequences that model relationships between two quantities.
- CC.2.2.HS.C.4 Interpret the effects transformations have on functions.
<table>
<thead>
<tr>
<th>CC.2.2.HS.C.6</th>
<th>Interpret functions in terms of the situations they model.</th>
</tr>
</thead>
<tbody>
<tr>
<td>CC.2.2.HS.D.2</td>
<td>Write expressions in equivalent forms to solve problems.</td>
</tr>
<tr>
<td>CC.2.2.HS.D.7</td>
<td>Create and graph equations or inequalities to describe numbers or relationships.</td>
</tr>
<tr>
<td>CC.2.2.HS.D.8</td>
<td>Apply inverse operations to solve equations or formulas for a given variable.</td>
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**Probability:**

<table>
<thead>
<tr>
<th>CC.2.4.HS.B.6</th>
<th>Use the concepts of independence and conditional probability to interpret data.</th>
</tr>
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<tbody>
<tr>
<td>CC.2.4.HS.B.7</td>
<td>Apply the rules of probability to compute probabilities of compound events in a uniform probability model.</td>
</tr>
</tbody>
</table>
**Advanced Algebra 2:**
The primary focus of this course is to develop algebraic skills and apply them to non-linear contextual problems. This course is an in-depth study of the properties and sets of real numbers through abstract algebra, linear equations of one and two variables, matrices and systems of equations, polynomial, rational, quadratic, exponential, logarithmic, and radical functions, radicals and rational exponents, conic sections and probability.

### Sets and Field Axioms:
- **CC.2.1.HS.F.2** Apply properties of rational and irrational numbers to solve real world or mathematical problems.
- **CC.2.1.HS.F.6** Extend the knowledge of arithmetic operations.
- **CC.2.2.HS.D.1** Interpret the structure of expressions to represent a quantity in terms of its context.
- **CC.2.2.HS.D.2** Write expressions in equivalent forms to solve problems.

### Linear Equations and Functions in One & Two Variables:
- **CC.2.4.HS.B.2** Summarize, represent, and interpret data on two categorical and quantitative variables.
- **CC.2.4.HS.B.3** Analyze linear models to make interpretations based on the data.
- **CC.2.2.HS.C.2** Graph and analyze functions and use their properties to make connections between the different representations.
- **CC.2.2.HS.C.3** Write functions or sequences that model relationships between two quantities.
- **CC.2.2.HS.D.7** Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.

### Systems and Matrix Operations:
- **CC.2.2.HS.D.10** Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.

### Polynomial Functions:
- **CC.2.2.HS.C.2** Graph and analyze functions, and use their properties to make connections between the different representations.
- **CC.2.2.HS.C.4** Interpret the effects transformations have on functions.
- **CC.2.2.HS.D.3** Extend the knowledge of arithmetic operations and apply to polynomials.
- **CC.2.2.HS.D.4** Understand the relationship between zeros and factors of polynomials to make generalization about functions and their graphs.
- **CC.2.2.HS.D.5** Understand polynomial identities to solve problems.
- **CC.2.2.HS.D.7** Create and graph equations or inequalities to describe numbers or relationships.

### Rational Functions:
- **CC.2.2.HS.D.6** Extend the knowledge of rational functions to rewrite in equivalent forms.
- **CC.2.2.HS.D.2** Write expressions in equivalent forms to solve problems.

### Radical Functions and Rational Exponents:
- **CC.2.2.HS.D.8** Apply inverse operations to solve equations or formulas for a given variable.
- **CC.2.2.HS.D.9** Use reasoning to solve equations, and justify the solution method.
- **CC.2.1.HS.F.1** Apply and extend the properties of exponents to solve problems with rational exponents.
- **CC.2.2.HS.D.2** Write expressions in equivalent forms to solve problems.
- **CC.2.2.HS.D.6** Extend the knowledge of rational functions to rewrite in equivalent forms.

### Quadratic Functions:
- **CC.2.2.HS.C.1** Use the concept and notation of functions to interpret and apply them in terms of their context.
- **CC.2.2.HS.C.4** Interpret the effects transformations have on functions.
- **CC.2.2.HS.C.6** Interpret functions in terms of the situations they model.
Exponential and Logarithmic Functions:
CC.2.2.HS.C.1 Use the concept and notation of functions to interpret and apply them in terms of their context.
CC.2.2.HS.C.2 Graph and analyze functions, and use their properties to make connections between the different representations.
CC.2.2.HS.C.3 Write functions or sequences that model relationships between two quantities.
CC.2.2.HS.C.4 Interpret the effects transformations have on functions, and find the inverses of functions.
CC.2.2.HS.C.6 Interpret functions in terms of the situations they model.
CC.2.2.HS.D.2 Write expressions in equivalent forms to solve problems.
CC.2.2.HS.D.7 Create and graph equations or inequalities to describe numbers or relationships.
CC.2.2.HS.D.8 Apply inverse operations to solve equations or formulas for a given variable.

Conic Sections:
CC.2.2.HS.D.10 Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.
CC.2.3.HS.A.10 Translate between the geometric description and the equation for a conic section.
Derive the equations of ellipses and hyperbolas given the foci, using the fact that the sum or difference of distances from the foci is constant; find the equations for the asymptotes of a hyperbola.
Complete the square in order to generate an equivalent form of an equation for a conic section; use that equivalent form to identify key characteristics of the conic section.
Identify, graph, write, and analyze equations of each type of conic section, using properties such as symmetry, intercepts, foci, asymptotes and eccentricity, and using technology when appropriate.
Solve systems of equations and inequalities involving conics and other types of equations, with and without appropriate technology.

Probability:
CC.2.4.HS.B.6 Use the concepts of independence and conditional probability to interpret data.
CC.2.4.HS.B.7 Apply the rules of probability to compute probabilities of compound events in a uniform probability model.
Functions and Trigonometry:
This course focuses on applying and expanding upon previously acquired knowledge of functions to analyze data, make predictions and solve contextual problems. The analysis of linear, quadratic, exponential, logarithmic and trigonometric functions connects symbolic and graphical representations to applied problems. Emphasis is placed on using technology to create, use and analyze results from models.

Additionally, the course will extend previous trigonometry concepts from geometry to radian measure and the unit circle. Problems involving the use of both right and oblique triangle trigonometry will be explored in context.

Analyzing Data:
CC.2.4.HS.B.1 Summarize, represent, and interpret data on a single count or measurement variable.
CC.2.4.6.B.1 Demonstrate an understanding of statistical variability by displaying, analyzing, and summarizing distributions.
CC.2.4.HS.B.5 Make inferences and justify conclusions based on sample surveys, experiments, and observational studies.

Functions and Modeling:
CC.2.4.HS.B.3 Analyze linear models to make interpretations based on the data.
CC.2.2.HS.D.7 Create and graph equations or inequalities to describe numbers or relationships.
CC.2.2.HS.D.8 Apply inverse operations to solve equations or formulas for a given variable.
CC.2.2.HS.D.10 Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.
CC.2.2.HS.C.1 Use the concept and notation of functions to interpret and apply them in terms of their context.
CC.2.2.HS.C.5 Construct and compare linear, quadratic, and exponential models to solve problems.

Functions and Graphing:
CC.2.2.HS.C.2 Graph and analyze functions and use their properties to make connections between the different representations.
CC.2.2.HS.C.4 Interpret the effects transformations have on functions and find the inverses of functions.

Exponential and Logarithmic Functions:
CC.2.1.HS.F.1 Apply and extend the properties of exponents to solve problems with rational exponents.
CC.2.2.HS.D.2 Write expressions in equivalent forms to solve problems.
CC.2.2.HS.D.7 Create and graph equations or inequalities to describe numbers or relationships.
CC.2.2.HS.D.8 Apply inverse operations to solve equations or formulas for a given variable.
CC.2.2.HS.D.10 Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.
CC.2.2.HS.C.2 Graph and analyze functions and use their properties to make connections between the different representations.
CC.2.2.HS.C.4 Interpret the effects transformations have on functions and find the inverses of functions.

Trigonometric Function Properties:
CC.2.2.HS.D.7 Create and graph equations or inequalities to describe numbers or relationships.
CC.2.2.HS.D.10 Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.
CC.2.2.HS.C.2 Graph and analyze functions and use their properties to make connections between the different representations.
CC.2.2.HS.C.4 Interpret the effects transformations have on functions and find the inverses of functions.
CC.2.2.HS.C.7 Apply radian measure of an angle and the unit circle to analyze the trigonometric functions.
CC.2.2.HS.C.8 Choose trigonometric functions to model periodic phenomena and describe the properties of the graphs.
Applications of Trigonometric Functions:
CC.2.2.HS.D.7 Create and graph equations or inequalities to describe numbers or relationships.
CC.2.2.HS.D.8 Apply inverse operations to solve equations or formulas for a given variable.
CC.2.2.HS.D.10 Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.
CC.2.3.HS.A.7 Apply trigonometric ratios to solve problems involving right triangles.
Precalculus:
This course consists of the study of topics in mathematics that prepare students for Calculus. These topics include: families of functions, discrete math, and trigonometry. The analysis of quadratic, polynomial, rational, exponential, logarithmic, and trigonometric functions connects symbolic, graphical, and contextualized representations of functions. Discrete math topics to be explored are sequences and series. An abstract and contextual understanding of right and oblique triangle trigonometry, radian measure, and the unit circle will be developed. Identities and properties of trigonometric functions will be explored and applied to solve problems.

Functions and Graphing:
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<thead>
<tr>
<th>Standard</th>
<th>Description</th>
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<tr>
<td>CC.2.2.HS.D.7</td>
<td>Create and graph equations or inequalities to describe numbers or relationships.</td>
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<td>CC.2.2.HS.D.10</td>
<td>Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.</td>
</tr>
<tr>
<td>CC.2.2.HS.C.1</td>
<td>Use the concept and notation of functions to interpret and apply them in terms of their context.</td>
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<tr>
<td>CC.2.2.HS.C.4</td>
<td>Interpret the effects transformations have on functions and find the inverses of functions.</td>
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Quadratic Functions:
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<td>CC.2.2.HS.C.2</td>
<td>Graph and analyze functions and use their properties to make connections between the different representations.</td>
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Polynomial Functions:
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<tbody>
<tr>
<td>CC.2.1.HS.F.6</td>
<td>Extend the knowledge of arithmetic operations and apply to complex numbers.</td>
</tr>
<tr>
<td>CC.2.2.HS.D.3</td>
<td>Extend the knowledge of arithmetic operations and apply to polynomials.</td>
</tr>
<tr>
<td>CC.2.2.HS.D.4</td>
<td>Understand the relationship between zeros and factors of polynomials to make generalizations about functions and their graphs.</td>
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<td>Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.</td>
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<td>CC.2.2.HS.C.2</td>
<td>Graph and analyze functions and use their properties to make connections between the different representations.</td>
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Rational Functions:
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<tr>
<td>CC.2.2.HS.D.6</td>
<td>Extend the knowledge of rational functions to rewrite in equivalent forms.</td>
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<td>CC.2.2.HS.D.10</td>
<td>Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.</td>
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Exponential and Logarithmic Functions:
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<tr>
<td>CC.2.1.HS.F.1</td>
<td>Apply and extend the properties of exponents to solve problems with rational exponents.</td>
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<td>CC.2.2.HS.D.2</td>
<td>Write expressions in equivalent forms to solve problems.</td>
</tr>
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<td>Create and graph equations or inequalities to describe numbers or relationships.</td>
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<td>Sequence and Series:</td>
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<tr>
<td>---------------------</td>
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<tr>
<td>CC.2.2.HS.C.3 Write functions or sequences that model relationships between two quantities.</td>
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<tr>
<th>Trigonometric Function Properties:</th>
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<tr>
<td>CC.2.2.HS.D.7 Create and graph equations or inequalities to describe numbers or relationships.</td>
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<td>CC.2.2.HS.D.10 Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.</td>
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<td>CC.2.2.HS.C.2 Graph and analyze functions and use their properties to make connections between the different representations.</td>
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<td>CC.2.2.HS.C.7 Apply radian measure of an angle and the unit circle to analyze the trigonometric functions.</td>
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<td>CC.2.2.HS.C.8 Choose trigonometric functions to model periodic phenomena and describe the properties of the graphs.</td>
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<tr>
<td>CC.2.2.HS.C.9 Prove the Pythagorean identity and use it to calculate trigonometric ratios.</td>
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<th>Applications of Trigonometric Functions:</th>
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<td>CC.2.2.HS.D.8 Apply inverse operations to solve equations or formulas for a given variable.</td>
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<td>CC.2.2.HS.D.10 Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.</td>
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<td>CC.2.3.HS.A.7 Apply trigonometric ratios to solve problems involving right triangles.</td>
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<tr>
<td>CC.2.2.HS.C.9 Prove the Pythagorean identity and use it to calculate trigonometric ratios.</td>
</tr>
<tr>
<td>CC.2.2.HS.D.5 Use polynomial identities to solve problems.</td>
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</table>
Advanced Precalculus:
This course consists of the study of topics in mathematics that prepare students for Calculus. These topics include: families of functions, discrete math, and trigonometry. The analysis of quadratic, polynomial, rational, exponential, logarithmic, and trigonometric functions connects symbolic, graphical, and contextualized representations of functions. Discrete math topics to be explored are counting, probability, sequences, and series. An abstract and contextual understanding of right and oblique triangle trigonometry, radian measure, the unit circle, and polar coordinates will be developed. Identities and properties of trigonometric functions will be explored and applied to solve problems. In addition to an algorithmic understanding of concepts, there is an emphasis on analysis and synthesis of learned concepts.

Functions and Graphing:
CC.2.2.HS.D.7 Create and graph equations or inequalities to describe numbers or relationships.
CC.2.2.HS.D.10 Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.
CC.2.2.HS.C.1 Use the concept and notation of functions to interpret and apply them in terms of their context.
CC.2.2.HS.C.4 Interpret the effects transformations have on functions and find the inverses of functions.
CC.2.2.HS.C.6 Interpret functions in terms of the situations they model.
CC.2.2.HS.C.2 Graph and analyze functions and use their properties to make connections between the different representations.

Quadratic Functions:
CC.2.2.HS.D.7 Create and graph equations or inequalities to describe numbers or relationships.
CC.2.2.HS.D.10 Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.
CC.2.2.HS.C.2 Graph and analyze functions and use their properties to make connections between the different representations.
CC.2.2.HS.C.4 Interpret the effects transformations have on functions and find the inverses of functions.

Polynomial Functions:
CC.2.1.HS.F.6 Extend the knowledge of arithmetic operations and apply to complex numbers.
CC.2.2.HS.D.3 Extend the knowledge of arithmetic operations and apply to polynomials.
CC.2.2.HS.D.4 Understand the relationship between zeros and factors of polynomials to make generalizations about functions and their graphs.
CC.2.2.HS.D.10 Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.
CC.2.2.HS.C.2 Graph and analyze functions and use their properties to make connections between the different representations.

Rational Functions:
CC.2.2.HS.D.6 Extend the knowledge of rational functions to rewrite in equivalent forms.
CC.2.2.HS.D.10 Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.
CC.2.2.HS.C.2 Graph and analyze functions and use their properties to make connections between the different representations.
CC.2.2.HS.C.4 Interpret the effects transformations have on functions and find the inverses of functions.

Exponential and Logarithmic Functions:
CC.2.1.HS.F.1 Apply and extend the properties of exponents to solve problems with rational exponents.
CC.2.2.HS.D.2 Write expressions in equivalent forms to solve problems.
CC.2.2.HS.D.7 Create and graph equations or inequalities to describe numbers or relationships.
CC.2.2.HS.D.8 Apply inverse operations to solve equations or formulas for a given variable.
CC.2.2.HS.D.10 Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.
CC.2.2.HS.C.2 Graph and analyze functions and use their properties to make connections between the
different representations.
CC.2.2.HS.C.4 Interpret the effects transformations have on functions and find the inverses of functions.
CC.2.2.HS.C.6 Interpret functions in terms of the situations they model.
CC.2.2.HS.C.3 Write functions or sequences that model relationships between two quantities.

**Sequence and Series:**
CC.2.2.HS.C.3 Write functions or sequences that model relationships between two quantities.

**Counting and Probability:**
CC.2.4.HS.B.6 Use the concepts of independence and conditional probability to interpret data.
CC.2.4.HS.B.7 Apply the rules of probability to compute probabilities of compound events in a uniform probability model.

**Trigonometric Function Properties:**
CC.2.1.HS.F.4 Use units as a way to understand problems and to guide the solution of multi-step problems.
CC.2.2.HS.D.7 Create and graph equations or inequalities to describe numbers or relationships.
CC.2.2.HS.D.10 Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.
CC.2.2.HS.C.2 Graph and analyze functions and use their properties to make connections between the different representations.
CC.2.2.HS.C.4 Interpret the effects transformations have on functions and find the inverses of functions.
CC.2.2.HS.C.7 Apply radian measure of an angle and the unit circle to analyze the trigonometric functions.
CC.2.2.HS.C.8 Choose trigonometric functions to model periodic phenomena and describe the properties of the graphs.
CC.2.2.HS.C.9 Prove the Pythagorean identity and use it to calculate trigonometric ratios.
CC.2.3.HS.A.9 Extend the concept of similarity to determine arc lengths and areas of sectors of circles.

**Applications of Trigonometric Functions:**
CC.2.2.HS.D.2 Write expressions in equivalent forms to solve problems.
CC.2.2.HS.D.7 Create and graph equations or inequalities to describe numbers or relationships.
CC.2.2.HS.D.8 Apply inverse operations to solve equations or formulas for a given variable.
CC.2.2.HS.D.10 Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.
CC.2.3.HS.A.7 Apply trigonometric ratios to solve problems involving right triangles.

**Analytic Trigonometry:**
CC.2.2.HS.D.2 Write expressions in equivalent forms to solve problems.
CC.2.2.HS.D.8 Apply inverse operations to solve equations or formulas for a given variable.
CC.2.2.HS.C.9 Prove the Pythagorean identity and use it to calculate trigonometric ratios.
CC.2.2.HS.D.5 Use polynomial identities to solve problems.

**Polar Coordinates, Complex Numbers, and Vectors:**
CC.2.1.HS.F.6 Extend the knowledge of arithmetic operations and apply to complex numbers.
CC.2.2.HS.D.7 Create and graph equations or inequalities to describe numbers or relationships.
CC.2.2.HS.C.7 Apply radian measure of an angle and the unit circle to analyze the trigonometric functions.
**Advanced Honors Precalculus:**
A rigorous treatment of different families of functions forms the basis of study for the course. An in-depth study of polynomial, rational, exponential, logarithmic, and trigonometric functions consists of connecting symbolic, graphical, and contextualized representations of functions. The concept of function is extended to sequences and series, and counting and probability. The second half of the course focuses on trigonometric functions, including the unit circle, triangle trigonometry, and analytical trigonometric identities. Trigonometric functions are conceptualized in the rectangular coordinate system, polar coordinate system, and complex coordinate system. Trigonometric functions are extended and applied to a study of parametric equations. Properties of functions and expressions will be derived and proved throughout the course.

**Functions and Graphing:**
- CC.2.2.HS.D.7 Create and graph equations or inequalities to describe numbers or relationships.
- CC.2.2.HS.D.10 Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.
- CC.2.2.HS.C.1 Use the concept and notation of functions to interpret and apply them in terms of their context.
- CC.2.2.HS.C.4 Interpret the effects transformations have on functions and find the inverses of functions.
- CC.2.2.HS.C.6 Interpret functions in terms of the situations they model.
- CC.2.2.HS.C.2 Graph and analyze functions and use their properties to make connections between the different representations.

**Polynomial Functions:**
- CC.2.1.HS.F.6 Extend the knowledge of arithmetic operations and apply to complex numbers.
- CC.2.2.HS.D.6 Extend the knowledge of arithmetic operations and apply to polynomials.
- CC.2.2.HS.D.4 Understand the relationship between zeros and factors of polynomials to make generalizations about functions and their graphs.
- CC.2.2.HS.D.10 Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.
- CC.2.2.HS.C.2 Graph and analyze functions and use their properties to make connections between the different representations.
- CC.2.2.HS.C.4 Interpret the effects transformations have on functions and find the inverses of functions.
- CC.2.2.HS.C.3 Write functions or sequences that model relationships between two quantities.

**Rational Functions:**
- CC.2.2.HS.D.6 Extend the knowledge of rational functions to rewrite in equivalent forms.
- CC.2.2.HS.D.10 Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.
- CC.2.2.HS.C.2 Graph and analyze functions and use their properties to make connections between the different representations.
- CC.2.2.HS.C.4 Interpret the effects transformations have on functions and find the inverses of functions.

**Exponential and Logarithmic Functions:**
- CC.2.1.HS.F.1 Apply and extend the properties of exponents to solve problems with rational exponents.
- CC.2.2.HS.D.2 Write expressions in equivalent forms to solve problems.
- CC.2.2.HS.D.7 Create and graph equations or inequalities to describe numbers or relationships.
- CC.2.2.HS.D.8 Apply inverse operations to solve equations or formulas for a given variable.
- CC.2.2.HS.D.10 Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.
- CC.2.2.HS.C.2 Graph and analyze functions and use their properties to make connections between the different representations.
- CC.2.2.HS.C.4 Interpret the effects transformations have on functions and find the inverses of functions.
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| **Sequence and Series:**       | CC.2.2.HS.C.3 Write functions or sequences that model relationships between two quantities.  
|                                | CC.2.2.HS.C.6 Interpret functions in terms of the situations they model.   |
| **Counting and Probability:**  | CC.2.4.HS.B.6 Use the concepts of independence and conditional probability to interpret data.  
|                                | CC.2.4.HS.B.7 Apply the rules of probability to compute probabilities of compound events in a uniform probability model. |
| **Trigonometric Function Properties:** | CC.2.1.HS.F.4 Use units as a way to understand problems and to guide the solution of multi-step problems.  
|                                | CC.2.2.HS.D.7 Create and graph equations or inequalities to describe numbers or relationships.  
|                                | CC.2.2.HS.D.10 Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.  
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|                                | CC.2.2.HS.C.7 Apply radian measure of an angle and the unit circle to analyze the trigonometric functions.  
|                                | CC.2.2.HS.C.8 Choose trigonometric functions to model periodic phenomena and describe the properties of the graphs.  
|                                | CC.2.2.HS.C.9 Prove the Pythagorean identity and use it to calculate trigonometric ratios.  
|                                | CC.2.3.HS.A.9 Extend the concept of similarity to determine arc lengths and areas of sectors of circles. |
| **Applications of Trigonometric Functions:** | CC.2.2.HS.D.2 Write expressions in equivalent forms to solve problems.  
|                                | CC.2.2.HS.D.7 Create and graph equations or inequalities to describe numbers or relationships.  
|                                | CC.2.2.HS.D.8 Apply inverse operations to solve equations or formulas for a given variable.  
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|                                | CC.2.3.HS.A.9 Extend the concept of similarity to determine arc lengths and areas of sectors of circles.  
|                                | CC.2.2.HS.C.6 Interpret functions in terms of the situations they model.  
|                                | CC.2.1.HS.F.5 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.  
|                                | CC.2.1.HS.F.2 Apply properties of rational and irrational numbers to solve real world or mathematical problems. |
| **Analytic Trigonometry:**     | CC.2.2.HS.D.2 Write expressions in equivalent forms to solve problems.  
|                                | CC.2.2.HS.D.8 Apply inverse operations to solve equations or formulas for a given variable.  
|                                | CC.2.2.HS.C.9 Prove the Pythagorean identity and use it to calculate trigonometric ratios.  
|                                | CC.2.2.HS.D.5 Use polynomial identities to solve problems. |
| **Polar Coordinates, Complex Numbers, and Vectors:** | CC.2.1.HS.F.1 Apply and extend the properties of exponents to solve problems with rational exponents.  
|                                | CC.2.1.HS.F.7 Apply concepts of complex numbers in polynomial identities and quadratic equations to solve problems.  
|                                | CC.2.1.HS.F.6 Extend the knowledge of arithmetic operations and apply to complex numbers.  
|                                | CC.2.2.HS.D.7 Create and graph equations or inequalities to describe numbers or relationships.  
|                                | CC.2.2.HS.C.7 Apply radian measure of an angle and the unit circle to analyze the trigonometric functions. |
| **Parametric Equations:**      |                                                                           |
CC.2.2.HS.D.1 Interpret the structure of expressions to represent a quantity in terms of its context.
CC.2.2.HS.D.7 Create and graph equations or inequalities to describe numbers or relationships.
CC.2.2.HS.D.9 Use reasoning to solve equations and justify the solution method.
CC.2.2.HS.D.10 Represent, solve, and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.
CC.2.2.HS.C.2 Graph and analyze functions and use their properties to make connections between the different representations.
CC.2.2.HS.C.3 Write functions or sequences that model relationships between two quantities.
CC.2.2.HS.C.6 Interpret functions in terms of the situations they model.
CC.2.2.HS.C.8 Choose trigonometric functions to model periodic phenomena and describe the properties of the graphs.
**Introductory Calculus:**
Introductory Calculus is a full-year course covering differentiation and integration of functions of a single variable, with applications. The concept of a limit will be introduced as a means for evaluating derivatives and integrals. Students will apply skills of differentiation to measure instantaneous rates of change and determine optimal solutions to contextual problems. Students will evaluate integrals using both Riemann Sums and antiderivative techniques and apply these skills in calculating total change. Students will create and solve differential equations to model real-world change. A graphing approach to the subject will be employed and graphing calculators will be used for various topics in the class.

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<tr>
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<tr>
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<tr>
<td>LO 1.1D: Deduce and interpret behavior of functions using limits.</td>
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<tr>
<td>LO 1.2A: Analyze functions for intervals of continuity or points of discontinuity.</td>
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<tr>
<td>LO 2.1A: Identify the derivative of a function as the limit of a difference quotient.</td>
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<tr>
<td>LO 2.1B: Estimate derivatives.</td>
</tr>
<tr>
<td>LO 2.2B: Recognize the connection between differentiability and continuity.</td>
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<tr>
<td>LO 2.3A: Interpret the meaning of a derivative within a problem.</td>
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<tr>
<td>LO 2.3B: Solve problems involving the slope of a tangent line.</td>
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(“LO” standards are learning objectives taken from The College Board - AP Calculus Course Description)

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<tr>
<td>LO 2.1D: Determine higher order derivatives.</td>
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<td>LO 2.3D: Solve problems involving rates of change in applied contexts.</td>
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<td>LO 3.1A: Recognize antiderivatives of basic functions.</td>
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<td>LO 3.3B(b)</td>
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<td>LO 3.4A</td>
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<tr>
<td>LO 2.3A</td>
<td>Interpret the meaning of a derivative within a problem.</td>
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<tr>
<td>LO 2.3D</td>
<td>Solve problems involving rates of change in applied contexts.</td>
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<tr>
<td>LO 2.3E</td>
<td>Verify solutions to differential equations.</td>
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<tr>
<td>LO 2.3F</td>
<td>Estimate solutions to differential equations.</td>
</tr>
<tr>
<td>LO 3.5A</td>
<td>Analyze differential equations to obtain general and specific solutions.</td>
</tr>
<tr>
<td>LO 3.5B</td>
<td>Interpret, create, and solve differential equations from problems in context.</td>
</tr>
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**AP Calculus AB:**
The AB Calculus course is a full-year course in the calculus of functions of a single variable. It is a college-level mathematics course for which many colleges grant advanced placement credit. All students will be encouraged to take the Advanced Placement Mathematics examination in May. The course includes the study of limits using multiple approaches, how to apply limits to graphs, and the study of rates of change in context. The course also includes the study of differentiation including the derivative rules, approximating a derivative, and applying the derivative in real-world problem situations. The course also includes integration including accumulated change as well as application problems with area, volume and motion. Lastly, the course includes some elementary differential equations. A graphics approach to the subject will be employed, and graphics calculators will be used for various topics in the class.

**Limits and Derivatives:**

| LO 1.1A(a): | Express limits symbolically using correct notation. |
| LO 1.1A(b): | Interpret limits expressed symbolically. |
| LO 1.1B: | Estimate limits of functions. |
| LO 1.1C: | Determine limits of functions. |
| LO 1.1D: | Deduce and interpret behavior of functions using limits. |
| LO 1.2A: | Analyze functions for intervals of continuity or points of discontinuity. |
| LO 1.2B: | Determine the applicability of important calculus theorems using continuity. |
| LO 2.1A: | Identify the derivative of a function as the limit of a difference quotient. |
| LO 2.1B: | Estimate derivatives. |
| LO 2.2B: | Recognize the connection between differentiability and continuity. |
| LO 2.3A: | Interpret the meaning of a derivative within a problem. |
| LO 2.3B: | Solve problems involving the slope of a tangent line. |

("LO" standards are learning objectives taken from The College Board - AP Calculus Course Description)

**Differentiation Rules:**

| LO 2.1C: | Calculate derivatives. |
| LO 2.1D: | Determine higher order derivatives. |
| LO 2.3B: | Solve problems involving the slope of a tangent line. |

**Applications of Differentiation:**

| LO 2.1C: | Calculate derivatives. |
| LO 2.1D: | Determine higher order derivatives. |
| LO 2.2A: | Use derivatives to analyze properties of a function. |
| LO 2.3A: | Interpret the meaning of a derivative within a problem. |
| LO 2.3B: | Solve problems involving the slope of a tangent line. |
| LO 2.3C: | Solve problems involving related rates, optimization, rectilinear motion. |
| LO 2.3D: | Solve problems involving rates of change in applied contexts. |
| LO 2.4A: | Apply the Mean Value Theorem to describe the behavior of a function over an interval. |

**Integrals and Applications of Integration:**

| LO 2.3D: | Solve problems involving rates of change in applied contexts. |
| LO 3.1A: | Recognize antiderivatives of basic functions. |
| LO 3.2A(a): | Interpret the definite integral as the limit of a Riemann sum. |
| LO 3.2A(b): | Express the limit of a Riemann sum in integral notation. |
| LO 3.2B: | Approximate a definite integral. |
| LO 3.2C: | Calculate a definite integral using areas and properties of definite integrals. |
| LO 3.3A: | Analyze functions defined by an integral. |
| LO 3.3B(a): | Calculate antiderivatives. |
| LO 3.3B(b): | Evaluate definite integrals. |
| LO 3.4A: | Interpret the meaning of a definite integral within a problem. |
**Techniques of Integration:**
- LO 3.3A: Analyze functions defined by an integral.
- LO 3.3B(a): Calculate antiderivatives.
- LO 3.3B(b): Evaluate definite integrals.
- LO 3.4A: Interpret the meaning of a definite integral within a problem.
- LO 3.4B: Apply definite integrals to problems involving the average value of a function.
- LO 3.4D: Apply definite integrals to problems involving volume.
- LO 3.4E: Use the definite integral to solve problems in various contexts.
- LO 3.2A(a): Interpret the definite integral as the limit of a Riemann sum.
- LO 3.2A(b): Express the limit of a Riemann sum in integral notation.
- LO 3.2B: Approximate a definite integral.
- LO 3.2C: Calculate a definite integral using areas and properties of definite integrals.

**Differential Equations:**
- LO 2.1C: Calculate derivatives.
- LO 2.1D: Determine higher order derivatives.
- LO 2.2A: Use derivatives to analyze properties of a function.
- LO 2.3A: Interpret the meaning of a derivative within a problem.
- LO 2.3D: Solve problems involving rates of change in applied contexts.
- LO 2.3E: Verify solutions to differential equations.
- LO 2.3F: Estimate solutions to differential equations.
- LO 3.5A: Analyze differential equations to obtain general and specific solutions.
- LO 3.5B: Interpret, create, and solve differential equations from problems in context.
AP Calculus BC:
The BC Calculus course is an intensive full-year course in the differential and integral calculus of functions of a single variable. It is a college-level mathematics course for which most colleges grant advanced placement and as many as eight credits. All students will be encouraged to take the Advanced Placement Mathematics examination in May. The course includes the study of limits using multiple approaches, how to apply limits to graphs, and the study of rates of change in context. The course also includes the study of differentiation including the derivative rules, approximating a derivative, and applying the derivative in real-world problem situations. The course also includes integration including accumulated change as well as application problems with area, volume and motion. The course also includes infinite series including convergence, divergence, Maclaurin and Taylor series and using series to make approximations. Lastly, the course includes vectors, parametrics, polar graphs and some elementary differential equations. A graphics approach to the subject will be employed, and graphics calculators will be used for various topics in the class.

Limits and the Derivative:
LO 1.1A(a): Express limits symbolically using correct notation.
LO 1.1A(b): Interpret limits expressed symbolically.
LO 1.1B: Estimate limits of functions.
LO 1.1C: Determine limits of functions.
LO 1.1D: Deduce and interpret behavior of functions using limits.
LO 1.2A: Analyze functions for intervals of continuity or points of discontinuity.
LO 1.2B: Determine the applicability of important calculus theorems using continuity.
LO 2.1A: Identify the derivative of a function as the limit of a difference quotient.
LO 2.1B: Estimate derivatives.
LO 2.2B: Recognize the connection between differentiability and continuity.
LO 2.3A: Interpret the meaning of a derivative within a problem.
LO 2.3B: Solve problems involving the slope of a tangent line.

(“LO” standards are learning objectives taken from The College Board - AP Calculus Course Description)

Differentiation Rules:
LO 2.1C: Calculate derivatives.
LO 2.1D: Determine higher order derivatives.
LO 2.3B: Solve problems involving the slope of a tangent line.

Applications of Differentiation:
LO 2.1C: Calculate derivatives.
LO 2.1D: Determine higher order derivatives.
LO 2.2A: Use derivatives to analyze properties of a function.
LO 2.3A: Interpret the meaning of a derivative within a problem.
LO 2.3B: Solve problems involving the slope of a tangent line.
LO 2.3C: Solve problems involving related rates, optimization, rectilinear motion, and planar motion.
LO 2.3D: Solve problems involving rates of change in applied contexts.
LO 2.4A: Apply the Mean Value Theorem to describe the behavior of a function over an interval.

Integrals and Applications of Integration:
LO 2.3D: Solve problems involving rates of change in applied contexts.
LO 3.1A: Recognize antiderivatives of basic functions.
LO 3.2A(a): Interpret the definite integral as the limit of a Riemann sum.
LO 3.2A(b): Express the limit of a Riemann sum in integral notation.
LO 3.2B: Approximate a definite integral.
LO 3.2C: Calculate a definite integral using areas and properties of definite integrals.
LO 3.3A: Analyze functions defined by an integral.
LO 3.3B(a): Calculate antiderivatives.
LO 3.3B(b): Evaluate definite integrals.
LO 3.4A: Interpret the meaning of a definite integral within a problem.
LO 3.4B: Apply definite integrals to problems involving the average value of a function.
LO 3.4C: Apply definite integrals to problems involving motion.
LO 3.4D: Apply definite integrals to problems involving area, volume, and length of a curve.
LO 3.4E: Use the definite integral to solve problems in various contexts.

Techniques of Integration:
LO 3.3A: Analyze functions defined by an integral.
LO 3.3B(a): Calculate antiderivatives.
LO 3.3B(b): Evaluate definite integrals.
LO 3.4A: Interpret the meaning of a definite integral within a problem.
LO 3.4B: Apply definite integrals to problems involving the average value of a function.
LO 3.4D: Apply definite integrals to problems involving area and volume.
LO 3.4E: Use the definite integral to solve problems in various contexts.
LO 3.2A(a): Interpret the definite integral as the limit of a Riemann sum.
LO 3.2A(b): Express the limit of a Riemann sum in integral notation.
LO 3.2B: Approximate a definite integral.
LO 3.2C: Calculate a definite integral using areas and properties of definite integrals.

Differential Equations:
LO 2.1C: Calculate derivatives.
LO 2.1D: Determine higher order derivatives.
LO 2.2A: Use derivatives to analyze properties of a function.
LO 2.3A: Interpret the meaning of a derivative within a problem.
LO 2.3D: Solve problems involving rates of change in applied contexts.
LO 2.3E: Verify solutions to differential equations.
LO 2.3F: Estimate solutions to differential equations.
LO 3.5A: Analyze differential equations to obtain general and specific solutions.
LO 3.5B: Interpret, create, and solve differential equations from problems in context.

Curves in Parametric, Polar, and Vector Form:
LO 2.1C: Calculate derivatives.
LO 2.1D: Determine higher order derivatives.
LO 2.2A: Use derivatives to analyze properties of a function.
LO 2.3A: Interpret the meaning of a derivative within a problem.
LO 2.3B: Solve problems involving the slope of a tangent line.
LO 2.3C: Solve problems involving related rates, optimization, rectilinear motion, and planar motion.
LO 2.3D: Solve problems involving rates of change in applied contexts.
LO 3.3A: Analyze functions defined by an integral.
LO 3.3B(a): Calculate antiderivatives.
LO 3.3B(b): Evaluate definite integrals.
LO 3.4A: Interpret the meaning of a definite integral within a problem.
LO 3.4B: Apply definite integrals to problems involving the average value of a function.
LO 3.4C: Apply definite integrals to problems involving motion.

Infinite Sequence and Series:
LO 2.1C: Calculate derivatives.
LO 2.1D: Determine higher order derivatives.
LO 2.3A: Interpret the meaning of a derivative within a problem.
LO 2.3B: Solve problems involving the slope of a tangent line.
LO 3.3A: Analyze functions defined by an integral.
LO 3.3B(a): Calculate antiderivatives.
LO 3.3B(b): Evaluate definite integrals.
LO 4.1A: Determine whether a series converges or diverges
LO 4.1B: Determine or estimate the sum of a series.
LO 4.2A: Construct and use Taylor polynomials.
LO 4.2B: Write a power series representing a given function.
LO 4.2C: Determine the radius and interval of convergence of a power series.
Statistics:
The topics of this course will include exploration of categorical and quantitative data and comparison of data distributions. Students will learn to produce meaningful data by sample, surveys and experiment. Probability, normal distributions and sampling distributions of random variables are included. Students will learn to use confidence intervals and significance tests for means and proportions. This is not a lecture course, but rather one of active learning with an investigative approach to statistics.

Exploring Categorical & Quantitative Data:
CC.2.4.HS.B.1 Summarize, represent, and interpret data on a single count or measurement variable.
CC.2.4.HS.B.2 Summarize, represent, and interpret data on two categorical or quantitative variables.
CCSS.Math.Content.HSS.ID.A.1 Represent data with plots on the real number line (dot plots, histograms, and box plots).
CCSS.Math.Content.HSS.ID.A.2 Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.
CCSS.Math.Content.HSS.ID.A.3 Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).

Producing Meaningful Data: Samples & Surveys:
CCSS.Math.Content.HSS.IC.A.1 Understand statistics as a process for making inferences about population parameters based on a random sample from that population.

Producing Meaningful Data: Designing Experiments:
CC.2.4.HS.B4 Recognize and evaluate random processes underlying statistical experiments.
CCSS.Math.Content.HSS.IC.B.3 Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.

Probability:
CC 2.4.HS.B.6 Use the concepts of independence and conditional probability to interpret data.

Normal Distributions:
Recognize that the probability required for statistical inference is oriented towards using probability distributions to describe data. (from the AP Statistics Course Description)

Sampling Distributions:
Recognize that random phenomena are not haphazard: they display an order that emerges only in the long run and is described by a distribution. (from the AP Statistics Course Description)

Inference For One Proportion:
CC.2.4.HS.B.5 Make inferences and justify conclusions based on sample surveys, experiments, and observational studies.
CCSS.Math.Content.HSS.IC.B.4 Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling.
CCSS.Math.Content.HSS.IC.B.6 Evaluate Reports Based On Data

Comparing Two Proportions:
CC.2.4.HS.B.5 Make inferences and justify conclusions based on sample surveys, experiments, and observational studies.
CCSS.Math.Content.HSS.IC.B.5 Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.
CCSS.Math.Content.HSS.IC.B.6 Evaluate Reports Based On Data

Inference For One Mean:
CC.2.4.HS.B.5 Make inferences and justify conclusions based on sample surveys, experiments, and observational studies.
CCSS.Math.Content.HSS.IC.B.5 Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.

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The purpose of Advanced Placement Statistics is to introduce students to the major concepts and tools for collecting, analyzing and drawing conclusions from data. Students are exposed to four broad conceptual themes:
1. Exploring data: exploring patterns and departures from patterns.
2. Planning a study: deciding what and how to measure.
3. Anticipating patterns: predicting models using probability and simulation.

Students who successfully complete the course and the Advanced Placement examination may receive credit and/or advanced placement for a one-semester introductory college statistics course. At least one statistics course is typically required for majors such as engineering, psychology, sociology, health science and business.

Exploring Data:
CC.2.4.HS.B.1 Summarize, represent, and interpret data on a single count or measurement variable.
CC.2.4.HS.B.2 Summarize, represent, and interpret data on two categorical or quantitative variables.
CCSS.Math.Content.HSS.ID.A.1 Represent data with plots on the real number line (dot plots, histograms, and box plots).
CCSS.Math.Content.HSS.ID.A.2 Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.
CCSS.Math.Content.HSS.ID.A.3 Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).

Modeling Distributions of Data:
Recognize that the probability required for statistical inference is oriented towards using probability distributions to describe data. (from the AP Statistics Course Description)

Describing Relationships:
CC.2.4.HS.B.2 Summarize, represent, and interpret data on two categorical and quantitative variables.
CC.2.4.HS.B.3 Analyze linear models to make interpretations based on the data.
CC.2.2.HS.C.3 Write functions that model relationships between two quantities.
CC.2.2.HS.C.6 Interpret functions in terms of the situations they model.
CC.2.2.HS.D.7 Create and graph equations to describe numbers or relationships.

Designing Studies:
CCSS.Math.Content.HSS.IC.A.1 Understand statistics as a process for making inferences about population parameters based on a random sample from that population.
CCSS.Math.Content.HSS.IC.B.3 Recognize the purposes of and differences among sample surveys, experiments, and observational studies; explain how randomization relates to each.

Probability:
CCSS.Math.Content.HSS.CP.A.1 Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or," "and," "not").
CCSS.Math.Content.HSS.CP.A.2 Understand that two events A and B are independent if the probability of A and B occurring together is the product of their probabilities, and use this characterization to determine if they are independent.
CCSS.Math.Content.HSS.CP.A.3 Understand the conditional probability of A given B as P(A and B)/P(B), and interpret independence of A and B as saying that the conditional probability of A given B is the same as the probability of A, and the conditional probability of B given A is the same as the probability of B.
CCSS.Math.Content.HSS.CP.A.4 Construct and interpret two-way frequency tables of data when two categories are associated with each object being classified. Use the two-way table as a sample space to decide if events are independent and to approximate conditional probabilities.
CCSS.Math.Content.HSS.CP.A.5 Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations.
CCSS.Math.Content.HSS.CP.B.6 Find the conditional probability of A given B as the fraction of B’s outcomes that also belong to A, and interpret the answer in terms of the model.
CCSS.Math.Content.HSS.CP.B.7 Apply the Addition Rule, \( P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B) \), and interpret the answer in terms of the model.
CCSS.Math.Content.HSS.CP.B.8 Apply the general Multiplication Rule in a uniform probability model, \( P(A \text{ and } B) = P(A)P(B|A) = P(B)P(A|B) \), and interpret the answer in terms of the model.

**Random Variables:**
CCSS.Math.Content.HSS.MD.A.1 Define a random variable for a quantity of interest by assigning a numerical value to each event in a sample space; graph the corresponding probability distribution using the same graphical displays as for data distributions.
CCSS.Math.Content.HSS.MD.A.2 Calculate the expected value of a random variable; interpret it as the mean of the probability distribution.
CCSS.Math.Content.HSS.MD.A.3 Develop a probability distribution for a random variable defined for a sample space in which theoretical probabilities can be calculated; find the expected value.
CCSS.Math.Content.HSS.MD.A.4 Develop a probability distribution for a random variable defined for a sample space in which probabilities are assigned empirically; find the expected value.
CCSS.Math.Content.HSS.MD.B.5.a Find the expected payoff for a game of chance.

**Sampling Distributions:**
Recognize that random phenomena are not haphazard: they display an order that emerges only in the long run and is described by a distribution. (from the AP Statistics Course Description)

**Confidence Intervals For One Mean or Proportion:**
CC.2.4.HS.B.5 Make inferences and justify conclusions based on sample surveys, experiments, and observational studies.
CCSS.Math.Content.HSS.IC.B.4 Use data from a sample survey to estimate a population mean or proportion; develop a margin of error through the use of simulation models for random sampling.

**Significance Tests For One Mean or Proportion:**
CC.2.4.HS.B.5 Make inferences and justify conclusions based on sample surveys, experiments, and observational studies.

**Comparing Two Populations or Groups:**
CC.2.4.HS.B.5 Make inferences and justify conclusions based on sample surveys, experiments, and observational studies.
CCSS.Math.Content.HSS.IC.B.5 Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.

**Inference For Distributions of Categorical Data:**
CC.2.4.HS.B.5 Make inferences and justify conclusions based on sample surveys, experiments, and observational studies.
CCSS.Math.Content.HSS.IC.B.5 Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.

**Inference For Regression:**
CC.2.4.HS.B.5 Make inferences and justify conclusions based on sample surveys, experiments, and observational studies.

**ANOVA:**
CC.2.4.HS.B.5 Make inferences and justify conclusions based on sample surveys, experiments, and observational studies.
CCSS.Math.Content.HSS.IC.B.5 Use data from a randomized experiment to compare two treatments; use simulations to decide if differences between parameters are significant.
**AP Computer Science:**
AP Computer Science is a full-year programming course using the Java language. It is a college-level course for which many universities grant advanced placement credit dependent on the results of an AP Exam given in May. The course will begin with an introduction to Java syntax and style conventions and basic programming constructs such as data types, variables, control statements, iteration, and recursion. Well known algorithms will be applied to solve problems, especially when working with structures like Strings and Arrays. Object Oriented Programming Design will be employed throughout the course. The use of classes, hierarchies, and interfaces will be fundamental. Searching and sorting algorithms and their efficiencies will be discussed. At the end of the course, students will explore components that make programs more viable. Topics include streams and files, graphics, GUI components, mouse, keyboard, sound, and images. A culminating final project will give students the opportunity to showcase learned skills and concepts and to research new skills to create and present a program of their choice.

**Introduction to Java:**
APCS Goal 1: design, implement, and analyze solutions to problems.
APCS Goal 3: use standard data structures.
APCS Goal 6: write, run, test, and debug solutions in the Java programming language, utilizing standard Java library classes and interfaces from the AP Java subset.
APCS Goal 7: read and understand programs consisting of several classes and interacting objects.

*(Each of these goals comes from the College Board AP Computer Science A Course Description Guide)*

**Java Programming Basics:**
APCS Goal 1: design, implement, and analyze solutions to problems.
APCS Goal 3: use standard data structures.
APCS Goal 4: develop and select appropriate algorithms and data structures to solve new problems.
APCS Goal 6: write, run, test, and debug solutions in the Java programming language, utilizing standard Java library classes and interfaces from the AP Java subset.

**Strings and Arrays:**
APCS Goal 1: design, implement, and analyze solutions to problems.
APCS Goal 2: use and implement commonly used algorithms.
APCS Goal 3: use standard data structures.
APCS Goal 4: develop and select appropriate algorithms and data structures to solve new problems.
APCS Goal 6: write, run, test, and debug solutions in the Java programming language, utilizing standard Java library classes and interfaces from the AP Java subset.
APCS Goal 8: read and understand a description of the design and development process leading to such a program. (Examples of such solutions can be found in the AP Computer Science Labs.)

**Classes:**
APCS Goal 1: design, implement, and analyze solutions to problems.
APCS Goal 2: use and implement commonly used algorithms.
APCS Goal 3: use standard data structures.
APCS Goal 4: develop and select appropriate algorithms and data structures to solve new problems.
APCS Goal 5: write solutions fluently in an object-oriented paradigm.
APCS Goal 6: write, run, test, and debug solutions in the Java programming language, utilizing standard Java library classes and interfaces from the AP Java subset.
APCS Goal 7: read and understand programs consisting of several classes and interacting objects.
APCS Goal 8: read and understand a description of the design and development process leading to such a program. (Examples of such solutions can be found in the AP Computer Science Labs.)
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<tr>
<td>APCS Goal 9: understand the ethical and social implications of computer use.</td>
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### Advanced Topics in Mathematics:
Advanced Topics in Mathematics focuses on multivariable and vector calculus with an introduction to differential equations. Additionally, students will be expected to explore other mathematical concepts not typically found in a high school curriculum. The course begins with vectors in space and the appropriate operations, lines, planes, cylinders, and quadric surfaces. It continues with Vector-Valued Functions, the unit tangent vector, the unit normal vector, curvature, torsion, and the TNB frame. We will examine multivariable functions, limits and continuity, partial derivatives, gradient vectors, Lagrange Multipliers, and Taylor’s Formula. Students will investigate double and triple integrals in various coordinate systems along with masses and moments. The vector calculus portion of the course finishes with the study of vector fields, line integrals, surface integrals, Green’s theorem, Stoke’s Theorem, and the Divergence (Gauss) Theorem. The course continues with the study of differential equations. Throughout the course, students will be expected to explore additional topics not typically found in a high school mathematics course.

### Vectors and Analytic Geometry in Space:
Students will investigate the relationship between points, lines, and planes in three-dimensions.

### Vector-Valued Functions and Motion in Space:
Students will investigate the shape of vector-valued functions in the plane and in space. Students will investigate motion along vector-valued functions in the plane and in space.

### Multivariable Functions and Partial Derivatives:
Students will explore functions of two independent variables of the form $z = f(x, y)$ and implicit functions of the form $f(x, y, z) = 0$. Students will explore the continuity of functions of two independent variables in terms of the limits of such functions as $(x, y)$ approaches a given point in the plane. Students will explore, find, use, and apply partial differentiation of functions of two independent variables of the form $z = f(x, y)$ and implicit functions of the form $f(x, y, z) = 0$.

### Multiple Integrals:
Students will integrate functions of the form $z = f(x, y)$ or $w = f(x, y, z)$.

### Integration in Vector Fields:
Students will apply and interpret the theorems of Green, Stokes, and Gauss.

### Differential Equations:
Students will use, apply, and solve linear first-order differential equations.