



# **Mathematics Curriculum Framework**

# ALGEBRA I

## History

The Archdiocese of Louisville initiated an Algebra I program in 1987 to meet the needs of students with a high level of math ability and the motivation to work independently in respect to math instruction. A video program was developed and implemented from 1988 – 2000 as an option for schools. Other schools were able to include Algebra I in their curriculum by providing a certified instructor or by transporting students to a local Catholic high school for instruction.

In September 2000, the Algebra I program was restructured and the *Eighth Grade Honors Algebra I Handbook* was developed and distributed to direct and coordinate the program. Revised admission requirements, the core content and standards, new instructional resources, forms to assist with local administration, a timeline, and an entrance and exit exam were added to enhance the program.

During the 2008-2009 school year, elementary and high school teachers, a principal, university representatives, and archdiocesan representatives conducted an in-depth study of research and practices in the area of mathematics in order to make recommendations for the future of mathematics in the Archdiocese of Louisville. As a result of that intensive study, it was determined that beginning in September 2010, all eighth grade students in the Archdiocese of Louisville would participate in Algebra I instruction. All seventh grade students would participate in pre-Algebra instruction.

## Philosophy

The program is based on the belief that math literacy is a key component in preparing students for future success academically and in life situations. The local school is responsible for developing and maintaining a rigorous K-8 mathematics program that is based on national standards, has clearly stated core content and outcomes, aligns instruction and assessment, and culminates in a comprehensive and rigorous eighth grade Algebra I program.

# Mathematics Curriculum Framework

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### National Standards for Mathematics

According to *Principles and Standards for School Mathematics* from the National Council of Teachers of Mathematics, new knowledge, tools, and ways of doing and communicating mathematics continue to emerge and evolve in an ever-changing world. The need to understand and be able to use mathematics in everyday life and in the workplace has never been greater and will continue to increase.

-Adapted from *Principles and Standards for School Mathematics*

The first five standards describe mathematical content goals:

- Number and Operations
- Algebra
- Geometry
- Measurement
- Data Analysis and Probability

The next five standards address the processes:

- Problem Solving
- Reasoning and Proof
- Communication
- Representation
- Connections

In alignment with the *National Mathematics Standards* from the National Council of Teachers of Mathematics, the Archdiocese of Louisville Mathematics Curriculum Framework uses the content goals as organizers and embeds the five processes into all the components of the document.

In addition, the Archdiocese of Louisville Mathematics Curriculum Framework incorporates the work of the *Common Core State Standards for Mathematics*, stressing the importance of conceptual understanding of key ideas.

To view the *National Mathematics Standards* and/or *Common Core State Standards for Mathematics* or for further information and resources, contact: [www.nctm.org](http://www.nctm.org) and [www.corestandards.org/the-standards/mathematics](http://www.corestandards.org/the-standards/mathematics) respectively.

- *Mathematics Curriculum Committee, Archdiocese of Louisville*

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## **Common Core State Standards for Mathematics**

According to the *Common Core State Standards for Mathematics*, eight processes and proficiencies are essential to the mathematical development of all students. These “Standards for Mathematical Practice” represent the processes outlined by the National Council of Teachers of Mathematics and the proficiencies outlined by the National Research Council.

The NCTM processes include: “problem solving, reasoning and proof, communication, representation, and connections”. In the National Research Council’s report, *Adding it Up*, the proficiencies are described as: “adaptive reasoning, strategic competence, conceptual understanding, procedural fluency, and productive disposition”. Complete descriptions of the “Standards for Mathematical Practice” can be found in the introduction section of the *Common Core State Standards for Mathematics*.

### **Standards for Mathematical Practice**

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

In addition, emphasis is placed on the responsibility of all mathematics educators to connect these “Standards for Mathematical Practice” with the “Standards for Mathematical Content” in order to provide a balanced combination of procedure and understanding.

- Adapted from the *Common Core State Standards for Mathematics*  
[www.corestandards.org/the-standards/mathematics](http://www.corestandards.org/the-standards/mathematics)

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The Archdiocese of Louisville Mathematics Curriculum Framework provides teachers with guidelines that focus on a balance between conceptual understanding and procedural skills. In addition, mathematical skills are not intended to be taught in isolation. Connections should be made within the mathematics curriculum, as well as with other content areas, whenever appropriate.

**Problem Solving**

Problem solving should be a daily occurrence used to provide students with the opportunity to develop concepts and skills and apply them to real-world situations. Students will learn to determine and apply appropriate strategies for problem solving and explain their reasoning.

**Vocabulary and Communication**

Teachers and students will use the language of mathematics to express mathematical ideas precisely. This includes consistent and appropriate use of vocabulary throughout the curriculum in both written and oral expression.

**Spiral Review**

This curriculum guide focuses on concepts and skills to be learned at each grade level. However, new concepts always build upon previously learned concepts. Therefore, continuous review is essential in a spiraling format for retention, consistency, and continuity.



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	<ul style="list-style-type: none"><li>• Base Ten</li> <li>• Fractions</li></ul>	<p>addition and subtraction stories and number sentences</p> <ul style="list-style-type: none"><li>• write number sentences using symbols +, -, and =</li><li>• determine the number that makes ten when added to a given number (1-9)</li><li>• decompose numbers less than or equal to 10 into pairs in more than one way (e.g., <math>5 = 2 + 3</math>)</li><li>• fluently add and subtract within five</li> <li>• understand that numbers from 11 to 19 are composed of ten ones and from one to nine additional ones</li><li>• compose and decompose numbers from 11 to 19 into ten ones and some further ones</li> <li>• recognize equal parts of a whole</li><li>• identify simple fractions using pictures</li></ul>
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**Geometry – Kindergarten**

<b>Essential Understandings</b>	<b>Guided Questions -- What Students Need to Know</b>	
<ul style="list-style-type: none"> <li>• Geometric shapes and positions of objects are used to describe the world.</li>   <li>• Geometric shapes and relationships are used to design and create.</li> </ul>	<ul style="list-style-type: none"> <li>• How are geometric shapes used to describe things?</li> <li>• How is the location of an object described in relation to other things?</li>   <li>• What are examples of geometric shapes and relationships in architecture, art, and nature?</li> <li>• How can shapes and relationships be used to create things?</li> </ul>	
<b>Academic Expectations</b>	<b>Content</b>	<b>Performance Standards</b>
<p><b>Academic Expectation 2.9</b> Students understand space and dimensionality concepts and use them appropriately and accurately.</p>	<ul style="list-style-type: none"> <li>• Plane figures (two-dimensional)</li>   <li>• Solid figures (three-dimensional)</li>   <li>• Geometric and spatial relationship concepts</li> </ul>	<p>Students will:</p> <ul style="list-style-type: none"> <li>• <b>recognize and name the attributes of these plane figures: circle, square, rectangle, triangle, oval, and hexagon</b></li>   <li>• <b>recognize solid figures: cube, sphere, cone, and cylinder</b></li>   <li>• <b>locate and describe objects and pictures using spatial relationship concepts: inside, outside, right, left, above, below, beside, near, top, middle, bottom, front, behind, over, between, under, on</b></li> <li>• <b>distinguish between two-dimensional and three-dimensional shapes</b></li> <li>• <b>analyze and compare two- and three-dimensional shapes, in different sizes and orientations, using informal language to describe their similarities, differences, parts (e.g. sides, corners, curves)</b></li> <li>• <b>model shapes in the world by building shapes from components and drawing shapes</b></li> <li>• <b>combine simple shapes to form larger shapes (e.g., use two triangles to make a rectangle)</b></li> </ul>

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**Measurement – Kindergarten**

<b>Essential Understandings</b>	<b>Guided Questions -- What Students Need to Know</b>	
<ul style="list-style-type: none"> <li>Measurement is used to communicate about size and shape.</li> </ul>	<ul style="list-style-type: none"> <li>How are length, weight, time, and money used to describe and compare things?</li> <li>How are nonstandard and standard units used to compare things?</li> <li>When is it useful to estimate measurements?</li> <li>What kinds of tools are used to find measurements?</li> </ul>	
<b>Academic Expectations</b>	<b>Content</b>	<b>Performance Standards</b>
<p><b>Academic Expectation 2.10</b> Students understand measurement concepts and use measurements appropriately and accurately.</p>	<ul style="list-style-type: none"> <li>Nonstandard and standard measurement</li> <li>Money</li> <li>Time</li> <li>Calendar skills</li> </ul>	<p>Students will:</p> <ul style="list-style-type: none"> <li><b>use nonstandard and standard units to estimate, measure, and compare length and weight</b></li> <li><b>identify standard measuring tools</b></li> <li><b>describe measurable attributes of objects, such as length or weight</b></li> <li><b>directly compare two objects with a measurable attribute in common, to see which object has “more of” or “less of” the attribute, and describe the difference</b></li> <li><b>identify the name and value of a penny, nickel, dime, and quarter</b></li> <li><b>describe the features of an analog clock</b></li> <li><b>tell time to the hour and half-hour on an analog and digital clock</b></li> <li><b>name the days of the week and months of the year</b></li> <li><b>use a calendar</b></li> </ul>

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**Algebra – Kindergarten**

<b>Algebra – Kindergarten</b>		
<b>Essential Understandings</b>	<b>Guided Questions -- What Students Need to Know</b>	
<ul style="list-style-type: none"> <li>• Patterns are used to investigate, understand, and describe the world.</li>   <li>• Patterns and number relationships are used to understand and solve problems.</li> </ul>	<ul style="list-style-type: none"> <li>• What is a pattern?</li> <li>• What kinds of patterns can be found in natural and human-designed environments?</li> <li>• How are patterns in the environment represented by such things as number, color, and shape?</li> <li>• How can objects be classified?</li> <li>• How can patterns be extended or changed?</li>   <li>• How are number patterns used to solve problems?</li> </ul>	
<b>Academic Expectations</b>	<b>Content</b>	<b>Performance Standards</b>
<p><b>Academic Expectation 1.10</b> Students organize information through development and use of classification rules and systems.</p> <p><b>Academic Expectation 2.11</b> Students understand mathematical change concepts and use them appropriately and accurately.</p> <p><b>Academic Expectation 2.12</b> Students understand mathematical structure concepts including the properties and logic of various mathematical systems.</p>	<ul style="list-style-type: none"> <li>• Patterns</li>   <li>• Classification</li> </ul>	<p>Students will:</p> <ul style="list-style-type: none"> <li>• <b>extend, describe, and create patterns using pictures, objects, colors, sounds, and movement</b></li>   <li>• <b>sort and order objects by size, color, number, and other properties</b></li> </ul>

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<b>Data Analysis and Probability – Kindergarten</b>		
<b>Essential Understandings</b>	<b>Guided Questions -- What Students Need to Know</b>	
<ul style="list-style-type: none"> <li>Data can be used to predict outcomes and support conclusions.</li> </ul>	<ul style="list-style-type: none"> <li>What kinds of data can be collected?</li> <li>How can data be organized?</li> <li>How can data be used to draw conclusions and make decisions?</li> <li>What factors need to be considered in making a prediction?</li> </ul>	
<b>Academic Expectations</b>	<b>Content</b>	<b>Performance Standards</b>
<p><b>Academic Expectation 2.13</b> Students understand and appropriately use statistics and probability.</p>	<ul style="list-style-type: none"> <li>Graphing</li> </ul>	<p>Students will:</p> <ul style="list-style-type: none"> <li><b>collect and organize data to create tally charts, pictographs, and bar graphs</b></li> <li><b>use graphs to answer questions</b></li> </ul>

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<b>Number and Operations – Grade One</b>		
<b>Essential Understandings</b>	<b>Guided Questions -- What Students Need to Know</b>	
<ul style="list-style-type: none"> <li>• Numbers are used to name, count, and place objects in order.</li>   <li>• Estimation is used to approximate exact values.</li>   <li>• A variety of methods are used to develop understanding and skill in estimation and computation.</li> </ul>	<ul style="list-style-type: none"> <li>• How are numbers used to name, count, and place objects in order?</li> <li>• How do fractions describe parts of a whole?</li> <li>• How does position of a digit in a multi-digit number determine its value?</li> <li>• Why is it helpful to be able to count from a given number instead of from one?</li>   <li>• How do people know if an estimate is reasonable?</li>   <li>• When is it appropriate to use mental math, pencil and paper, calculators, or computers to do rounding and computation?</li> <li>• How are concrete materials used to model and solve mathematical problems?</li> </ul>	
<b>Academic Expectations</b>	<b>Content</b>	<b>Performance Standards</b>



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<b>Geometry – Grade One</b>		
<b>Essential Understandings</b>	<b>Guided Questions -- What Students Need to Know</b>	
<ul style="list-style-type: none"> <li>• Geometric shapes and positions of objects are used to describe the world.</li>   <li>• Geometric shapes and relationships are used to design and create.</li> </ul>	<ul style="list-style-type: none"> <li>• How are geometric shapes used to describe things?</li> <li>• How can three-dimensional shapes be combined to create a new shape?</li> <li>• How do plane figures differ from solid figures?</li> <li>• What distinguishes defining attributes from non-defining attributes?</li>   <li>• What are examples of geometric shapes and relationships in architecture, art, and nature?</li> <li>• How can shapes and relationships be used to create things?</li> </ul>	
<b>Academic Expectations</b>	<b>Content</b>	<b>Performance Standards</b>
<p><b>Academic Expectation 2.9</b> Students understand space and dimensionality concepts and use them appropriately and accurately.</p>	<ul style="list-style-type: none"> <li>• Plane and solid figures</li> </ul>	<p>Students will:</p> <ul style="list-style-type: none"> <li>• name and <b>classify</b> plane figures (rectangle, square, triangle, <b>trapezoid, and half-circle</b>) and solid figures (cone, sphere, cube, cylinder, <b>pyramid, and rectangular prism</b>)</li> <li>• <b>distinguish between defining attributes (e.g., closed, three-sided) and non-defining attributes (e.g., color, size)</b></li> <li>• <b>compose two- or three-dimensional shapes to create a composite shape and compose new shapes from the composite shapes</b></li> </ul>

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**Measurement – Grade One**

<b>Essential Understandings</b>		<b>Guided Questions -- What Students Need to Know</b>	
<ul style="list-style-type: none"> <li>Measurement is used to communicate about size and shape.</li> </ul>	<ul style="list-style-type: none"> <li>How are length, weight, time, and money used to describe and compare things?</li> <li>How are nonstandard and standard units used to compare things?</li> <li>When is it useful to estimate measurements?</li> <li>What kinds of tools are used to find measurements?</li> </ul>		
<b>Academic Expectations</b>		<b>Content</b>	<b>Performance Standards</b>
<p><b>Academic Expectation 2.10</b> Students understand measurement concepts and use measurements appropriately and accurately.</p>	<ul style="list-style-type: none"> <li>Length and weight</li>   <li>Time</li>   <li>Money</li> </ul>	<p>Students will:</p> <ul style="list-style-type: none"> <li><b>order three objects by length</b></li> <li><b>compare the lengths of two objects by using a third object</b></li> <li><b>understand that the length measurement of an object is the number of same-size length units that span it with no gaps or overlaps</b></li> <li>estimate and measure length in <b>inches and centimeters</b></li> <li><b>estimate and compare weight using a balance scale</b></li>   <li>tell and <b>write</b> time in hours and half-hours using analog and digital clocks</li> <li>name the days of the week and months of the year</li> <li>locate and identify days and <b>dates</b> on a calendar</li>   <li><b>trade coins to show the same money amount, using different coin combinations</b></li> </ul>	

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**Algebra – Grade One**

<b>Algebra – Grade One</b>		
<b>Essential Understandings</b>	<b>Guided Questions -- What Students Need to Know</b>	
<ul style="list-style-type: none"> <li>• Patterns are used to investigate, understand, and describe the world.</li>   <li>• Patterns and number relationships are used to understand and solve problems.</li>   <li>• Number operations are used to solve problems.</li> </ul>	<ul style="list-style-type: none"> <li>• What kinds of patterns can be found in natural and human-designed environments?</li> <li>• How are patterns in the environment represented by such things as number, color, and shape?</li> <li>• How can objects be classified?</li> <li>• How can patterns be extended or changed?</li>   <li>• How are number patterns used to solve problems?</li> <li>• In an open sentence, how can the unknown number be determined from the known numbers and the operation?</li>   <li>• How do characteristics of a problem lead to a choice of a number operation?</li> <li>• What rules/properties influence the ways operations can be used to solve problems?</li> <li>• In a number sentence, what does the equal sign mean?</li> <li>• How is subtraction related to addition?</li> </ul>	
<b>Academic Expectations</b>	<b>Content</b>	<b>Performance Standards</b>
<p><b>Academic Expectations 2.11</b> Students understand mathematical change concepts and use them appropriately and accurately.</p> <p><b>Academic Expectations 2.12</b> Students understand mathematical structure concepts including the properties and logic of various mathematical systems.</p>	<ul style="list-style-type: none"> <li>• Missing addends and subtrahends</li>   <li>• Properties of operations</li>   <li>• Patterns</li> </ul>	<p>Students will:</p> <ul style="list-style-type: none"> <li>• <b>understand the meaning of the equal sign, and determine if equations involving addition and subtraction are true or false</b></li> <li>• <b>determine the missing addend or subtrahend in a problem (<math>3 + \_ = 5</math> or <math>\_ - 2 = 3</math>)</b></li> <li>• <b>understand subtraction as an unknown addend problem</b></li>   <li>• <b>add and subtract using commutative and associative properties</b></li>   <li>• <b>identify and create complex patterns using more than one attribute</b></li> </ul>

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<b>Data Analysis and Probability – Grade One</b>		
<b>Essential Understandings</b>	<b>Guided Questions -- What Students Need to Know</b>	
<ul style="list-style-type: none"> <li>• Data can be used to predict outcomes and support conclusions.</li>   <li>• Probability describes the likelihood that an event will occur.</li> </ul>	<ul style="list-style-type: none"> <li>• How can data be organized?</li> <li>• How can data be used to draw conclusions and make decisions?</li> <li>• What factors need to be considered in making a prediction?</li>   <li>• Why are some events more likely to occur than others?</li> <li>• How is probability used to make predictions?</li> </ul>	
<b>Academic Expectations</b>	<b>Content</b>	<b>Performance Standards</b>
<p><b>Academic Expectations 2.13</b> Students understand and appropriately use statistics and probability.</p>	<ul style="list-style-type: none"> <li>• Graphs and charts</li>   <li>• Prediction</li> </ul>	<p>Students will:</p> <ul style="list-style-type: none"> <li>• organize, represent, and interpret data with up to three categories using <b>charts, tables, pictographs, and bar graphs</b></li> <li>• answer questions about the total number of data points, how many in each category, and how many more or less are in one category than in another</li>   <li>• predict the likelihood of an event happening</li> </ul>

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<b>Number and Operations – Grade Two</b>		
<b>Essential Understandings</b>	<b>Guided Questions -- What Students Need to Know</b>	
<ul style="list-style-type: none"> <li>• Place value is used to determine the value of each digit in the number.</li> <li>• Number operations are used to solve problems.</li> <li>• A variety of methods are used to develop understanding and skill in rounding and computation.</li> <li>• Whole figures can be divided into fractional parts.</li> </ul>	<ul style="list-style-type: none"> <li>• How does position of a digit in a multi-digit number determine its value?</li> <li>• When adding two- or three-digit numbers, what happens when the two digits in the ones column equal a number greater than 10?</li> <li>• How do characteristics of a word problem lead to a choice of a number operation?</li> <li>• What rules/properties influence the ways operations can be used to solve problems?</li> <li>• When is it appropriate to use mental math, pencil and paper, and calculators or computers to do estimation and computation?</li> <li>• How are concrete materials used to model and solve mathematical problems?</li> <li>• Why is it possible for equal shares of the same whole to have different shapes?</li> </ul>	
<b>Academic Expectations</b>	<b>Content</b>	<b>Performance Standards</b>
<p><b>Academic Expectation 2.7</b> Students understand number concepts and use numbers appropriately and accurately.</p> <p><b>Academic Expectation 2.8</b> Students understand various mathematical procedures and use them appropriately and accurately.</p>	<ul style="list-style-type: none"> <li>• Number sense</li> <li>• Place value</li> <li>• Addition and subtraction</li> </ul>	<p>Students will:</p> <ul style="list-style-type: none"> <li>• count by one, five, ten, and <b>one hundred to 1000</b></li> <li>• round and order numbers up to <b>1000</b></li> <li>• identify even and odd numbers</li> <li>• compare numbers, including equality and inequality up to <b>three-digit numbers</b> (&lt;, &gt;, or =)</li> <li>• <b>understand that 100 can be thought of as a bundles of ten tens</b></li> <li>• show place value in standard, word, and <b>expanded</b> forms to <b>1000</b></li> <li>• <b>understand that the three digits of a three-digit number represent amounts of hundreds, tens, and ones</b></li> <li>• <b>master</b> addition and subtraction facts to <b>20</b> using mental strategies</li> <li>• <b>mentally add or subtract 10 or 100 to or from a given number between 100 and 900</b></li> <li>• <b>use addition to find the total number of objects arranged in a rectangular array with up to 5 rows and up to 5 columns</b></li> <li>• <b>understand that when adding or subtracting three-digit numbers, add or subtract hundreds and hundreds, tens and tens, ones and ones, and sometimes it is necessary to compose or decompose tens or hundreds</b></li> <li>• use addition and subtraction <b>within 100</b> to solve one- and two-digit word problems involving situations of adding to, taking from, and comparing, with unknowns in all positions</li> </ul>

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	<ul style="list-style-type: none"> <li>• Multiplication</li> <li>• Fractions</li> </ul>	<ul style="list-style-type: none"> <li>• <b>fluently add and subtract within 100 using strategies based on place value, properties of operations, and/or the relationship between addition and subtraction</b></li> <li>• solve <b>two- and three-digit</b> addition and subtraction problems <b>with</b> and without <b>regrouping within 1000</b></li> <li>• <b>add up to four two-digit numbers using strategies based on place value and properties of operation</b></li> <li>• solve one- and two-step word problems involving addition and subtraction</li> <li>• explain why addition and subtraction strategies work, using place value and the properties of operations</li> <li>• <b>model basic multiplication concepts for 2, 5, and 10</b></li> <li>• draw and compare fractions using models and pictures</li> <li>• recognize and model parts of a whole or set using the words halves, thirds, half of, a third of, etc.</li> <li>• <b>recognize that equal shares of identical wholes need not have the same shape</b></li> </ul>
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**Geometry – Grade Two**

<b>Geometry – Grade Two</b>		
<b>Essential Understandings</b>	<b>Guided Questions -- What Students Need to Know</b>	
<ul style="list-style-type: none"> <li>• Geometric shapes are used to describe the world.</li>   <li>• Geometric shapes and relationships are used to design and create.</li> </ul>	<ul style="list-style-type: none"> <li>• How are geometric shapes used to describe things?</li> <li>• How are symmetry and congruence used to describe and compare things?</li>   <li>• What are examples of geometric shapes and relationships in architecture, art, and nature?</li> <li>• How can shapes and relationships be used to create things?</li> </ul>	
<b>Academic Expectations</b>	<b>Content</b>	<b>Performance Standards</b>
<p><b>Academic Expectation 2.9</b> Students understand space and dimensionality concepts and use them appropriately and accurately.</p>	<ul style="list-style-type: none"> <li>• Plane and solid figures</li> </ul>	<p>Students will:</p> <ul style="list-style-type: none"> <li>• identify triangles, hexagons, cubes, <b>quadrilaterals, and pentagons</b></li> <li>• identify patterns, <b>symmetry, and congruency</b></li> <li>• <b>recognize and draw shapes having specified attributes, such as a given number of angles or a given number of equal faces</b></li> </ul>



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**Algebra – Grade Two**

<b>Algebra – Grade Two</b>		
<b>Essential Understandings</b>	<b>Guided Questions -- What Students Need to Know</b>	
<ul style="list-style-type: none"> <li>• Patterns are used to investigate, understand, and describe the world.</li>   <li>• Patterns and number relationships are used to understand and solve problems.</li> </ul>	<ul style="list-style-type: none"> <li>• What is a pattern?</li> <li>• How are patterns in the environment represented by number, color, and shape?</li> <li>• How can patterns be extended or changed?</li>   <li>• How are number patterns used to solve problems?</li> <li>• In an open sentence, how can the unknown number be determined from the known numbers and the operation?</li> </ul>	
<b>Academic Expectations</b>	<b>Content</b>	<b>Performance Standards</b>
<p><b>Academic Expectation 2.11</b> Students understand mathematical change concepts and use them appropriately and accurately.</p> <p><b>Academic Expectation 2.12</b> Students understand mathematical structure concepts including the properties and logic of various mathematical systems.</p>	<ul style="list-style-type: none"> <li>• Algebraic equations</li>   <li>• Patterns</li> </ul>	<p>Students will:</p> <ul style="list-style-type: none"> <li>• calculate equations by finding missing addend and subtrahend with the unknown in all positions</li>   <li>• extend and create patterns with more than <b>two attributes</b></li> </ul>

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<b>Data Analysis and Probability – Grade Two</b>		
<b>Essential Understandings</b>	<b>Guided Questions -- What Students Need to Know</b>	
<ul style="list-style-type: none"> <li>• Data can be used to predict outcomes and support conclusions.</li>   <li>• Probability describes the likelihood that an event will occur.</li> </ul>	<ul style="list-style-type: none"> <li>• What kind of data can be collected?</li> <li>• How can data be organized?</li> <li>• How is data used to draw conclusions and make decisions?</li>   <li>• What factors need to be considered in making a prediction?</li> <li>• Why are some events more likely to occur than others?</li> <li>• How is probability used to make predictions?</li> </ul>	
<b>Academic Expectations</b>	<b>Content</b>	<b>Performance Standards</b>
<p><b>Academic Expectation 2.13</b> Students understand and appropriately use statistics and probability.</p>	<ul style="list-style-type: none"> <li>• Graphs and charts</li>   <li>• Probability</li> </ul>	<p>Students will:</p> <ul style="list-style-type: none"> <li>• collect, record, and interpret data (<b>up to four categories</b>) with bar graphs, pictographs, and tally charts</li>   <li>• <b>interpret data to predict probability</b></li> </ul>

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<b>Number and Operations – Grade Three</b>		
<b>Essential Understandings</b>	<b>Guided Questions -- What Students Need to Know</b>	
<ul style="list-style-type: none"> <li>• Mathematics can be used to describe, understand, and communicate about the world in order to solve problems and make decisions.</li>   <li>• Characteristics of a situation or problem influence the choice of numbers, operations, strategies, and tools.</li> </ul>	<ul style="list-style-type: none"> <li>• What does mathematics reveal about the world?</li> <li>• What situations require the use of mathematical understanding?</li> <li>• How can concrete materials model mathematical situations?</li> <li>• How can patterns and properties of operations be used when adding and subtracting?</li> <li>• What is the relationship between multiplication and division?</li>   <li>• How can strategies be used to determine the reasonableness of an answer?</li> <li>• How do the characteristics of a problem influence the choice of numbers, operations, strategies, and tools?</li> <li>• What strategies help determine if a solution is reasonable, accurate, and complete?</li> </ul>	
<b>Academic Expectations</b>	<b>Content</b>	<b>Performance Standards</b>
<p><b>Academic Expectation 2.7</b> Students understand number concepts and use numbers appropriately and accurately.</p> <p><b>Academic Expectation 2.8</b> Students understand various mathematical procedures and use them appropriately and accurately.</p>	<ul style="list-style-type: none"> <li>• Place value</li>   <li>• Addition and subtraction</li>   <li>• Multiplication and division</li> </ul>	<p>Students will:</p> <ul style="list-style-type: none"> <li>• interpret the value of whole numbers up to <b>100,000</b></li> <li>• order and compare whole numbers using <math>&gt;</math>, <math>&lt;</math>, or <math>=</math></li> <li>• apply place value concepts to round numbers (up to four digits) to the nearest 10 and 100</li> <li>• estimate by rounding for self-checking and approximation</li>   <li>• fluently add and subtract whole numbers with <b>three or more digits</b> (with and without regrouping) using strategies and algorithms</li> <li>• apply patterns and properties of operations as strategies to add and subtract including <b>commutative, associative, and distributive properties</b></li>   <li>• <b>apply properties of operations as strategies to multiply and divide including commutative, associative, and distributive properties</b></li> <li>• <b>master multiplication facts up to 10</b></li> <li>• <b>multiply one-digit numbers by a multiple of ten (10-90) using strategies based on place value and properties of operations</b></li> <li>• <b>interpret products of whole numbers (e.g., interpret <math>5 \times 7</math> as the total number of objects in 5 groups of 7 objects each)</b></li> <li>• <b>interpret whole number quotients (e.g., interpret <math>56 \div 8</math> as the number of objects in each share when 56 objects are partitioned equally into 8 shares)</b></li> <li>• <b>recognize that division is the inverse of multiplication and is an unknown factor problem</b></li> <li>• <b>fluently divide within 100</b></li> <li>• <b>use multiplication and division within 100 to solve word problems in</b></li> </ul>

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	<ul style="list-style-type: none"> <li>• Problem solving</li>   <li>• Fractions</li> </ul>	<p><b>situations involving equal groups, arrays, and measurement quantities</b></p> <ul style="list-style-type: none"> <li>• synthesize number and operation concepts to solve <b>complex, multi-step word problems using all four operations</b></li> <li>• assess the reasonableness of answers using mental computation and estimation strategies including rounding</li>   <li>• understand a fraction as a quantity formed when a whole is divided into equal parts</li> <li>• <b>understand two fractions as equivalent (equal) if they are the same size, or the same point on a number line</b></li> <li>• use models to compare and order <b>equivalent</b> fractions</li> <li>• <b>express whole numbers as fractions and recognize fractions that are equivalent to whole numbers</b></li> <li>• <b>use models to add and subtract fractions with like denominators</b></li> </ul>
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<b>Geometry – Grade Three</b>		
<b>Essential Understandings</b>	<b>Guided Questions -- What Students Need to Know</b>	
<ul style="list-style-type: none"> <li>• Attributes and relationships of shapes, objects, and patterns can be used to describe, understand, and communicate about the world.</li>   <li>• Geometry has many real-world applications including design, architecture, and art.</li> </ul>	<ul style="list-style-type: none"> <li>• How can objects in the natural and human-designed world be identified and described in geometric terms?</li> <li>• How do models and drawings enhance understanding?</li> <li>• How can shared attributes help to define categories of shapes?</li>   <li>• How do the attributes of geometric shapes and figures influence their use in aesthetic and functional designs?</li> <li>• How are geometric shapes and relationships manipulated to create different visual effects?</li> <li>• How are models and drawings used in problem solving and design?</li> </ul>	
<b>Academic Expectations</b>	<b>Content</b>	<b>Performance Standards</b>
<p><b>Academic Expectation 2.9</b> Students understand space and dimensionality concepts and use them appropriately and accurately.</p>	<ul style="list-style-type: none"> <li>• Plane and solid figures</li>   <li>• Symmetry</li>   <li>• Perimeter</li>   <li>• Area</li> </ul>	<p>Students will:</p> <ul style="list-style-type: none"> <li>• describe and build plane (two-dimensional) and solid (three-dimensional) figures</li> <li>• recognize and check figures for congruency and similarities</li> <li>• explain that shapes in different categories (e.g., rectangle, rhombus) may share attributes (e.g., having four sides) and that the shared attributes can define a larger category (e.g., quadrilaterals)</li> <li>• classify the subcategories of quadrilaterals (e.g., rectangle, rhombus, and square) as quadrilaterals and draw quadrilaterals that do not belong to any of these subcategories</li>   <li>• find symmetry in figures and create symmetrical drawings (line, flip, slide, rotational)</li>   <li>• recognize perimeter as an attribute of plane figures</li> <li>• calculate the perimeter of a plane figure by using whole number side lengths or finding an unknown side length</li> <li>• solve real-world problems involving perimeter</li>   <li>• recognize area as an attribute of plane figures</li> <li>• measure area by counting unit squares</li> <li>• relate area to the operations of multiplication and addition</li> <li>• <b>solve real-world problems about area</b></li> </ul>

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<b>Measurement – Grade Three</b>		
<b>Essential Understandings</b>	<b>Guided Questions -- What Students Need to Know</b>	
<ul style="list-style-type: none"> <li>Measurement allows description, understanding, and communication about the world.</li> </ul>	<ul style="list-style-type: none"> <li>How is measurement used to quantify information about objects and events?</li> <li>How do characteristics of objects and events influence the choice of measurement strategies and tools?</li> <li>How does the precision required for a measurement influence the choice of strategies and tools?</li> <li>How is understanding and communication about measurement used to solve problems and make decisions?</li> </ul>	
<b>Academic Expectations</b>	<b>Content</b>	<b>Performance Standards</b>
<p><b>Academic Expectation 2.10</b> Students understand measurement concepts and use measurements appropriately and accurately.</p>	<ul style="list-style-type: none"> <li>Linear measurement</li> <li>Customary and metric weight and capacity</li> <li>Temperature</li> <li>Time</li> <li>Money</li> </ul>	<p>Students will:</p> <ul style="list-style-type: none"> <li>measure using customary and metric linear units to nearest <b>1/2</b> or <b>1/4</b> or whole inch or whole centimeter</li> <li><b>measure mass of an object using customary and metric capacity units (ounces, pounds, grams, and kilograms)</b></li> <li><b>measure and estimate liquid volume using customary and metric capacity units (cups, pints, quarts, gallons, milliliters, liters)</b></li> <li><b>add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units</b></li> <li><b>read and interpret temperature using Fahrenheit scale</b></li> <li>tell and write time to the <b>nearest minute</b> using analog and digital clocks</li> <li><b>solve word problems involving addition and subtraction of elapsed time</b></li> <li>calculate the value of coins and bills and apply to real-world situations</li> <li><b>determine equivalency among coins and bills</b></li> <li><b>add and subtract decimals with money</b></li> </ul>

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<b>Algebra – Grade Three</b>		
<b>Essential Understandings</b>	<b>Guided Questions -- What Students Need to Know</b>	
<ul style="list-style-type: none"> <li>• Patterns aid description, understanding, and communication about the world.</li>   <li>• Patterns and number relationships can be used to investigate, understand, and solve problems.</li> </ul>	<ul style="list-style-type: none"> <li>• How and why are patterns used?</li> <li>• How are patterns and number relationships represented with symbols?</li> <li>• How are tables and equations used to represent, analyze, and extend patterns?</li>   <li>• How do patterns help to solve problems and communicate information?</li> <li>• What kinds of strategies help to reveal patterns and number relationships?</li> <li>• How are tables, graphs, and equations used to discover, analyze, and extend patterns and number relationships?</li> </ul>	
<b>Academic Expectations</b>	<b>Content</b>	<b>Performance Standards</b>
<p><b>Academic Expectation 2.11</b> Students understand mathematical change concepts and use them appropriately and accurately.</p> <p><b>Academic Expectation 2.12</b> Students understand mathematical structure concepts including the properties and logic of various mathematical systems.</p>	<ul style="list-style-type: none"> <li>• Fact families</li>   <li>• Variables</li>         <li>• Equality and inequality</li> </ul>	<p>Students will:</p> <ul style="list-style-type: none"> <li>• use fact families <b>to relate the four operations</b></li>   <li>• solve for one variable in addition, subtraction, <b>multiplication, and division (<math>a + 4 = 12</math>)</b></li> <li>• <b>solve real-world problems involving one variable</b></li> <li>• represent word problems using equations with a letter standing for the unknown quantity</li> <li>• <b>solve simple function tables (input/output)</b></li>   <li>• <b>recognize that the equal sign means that both sides of the equation are balanced (<math>6 + 2 = 5 + 3</math>, <math>8 = 6 + 2</math>)</b></li> <li>• <b>determine the unknown number in multiplication and division equations (e.g., <math>8 \times \square = 48</math>, <math>5 = \square \div 3</math>, <math>6 \times 6 = \square</math>)</b></li> </ul>

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<b>Data Analysis and Probability – Grade Three</b>		
<b>Essential Understandings</b>	<b>Guided Questions -- What Students Need to Know</b>	
<ul style="list-style-type: none"> <li>• Data collection and analysis can be used to predict outcomes, solve problems, and make decisions.</li>   <li>• Probability supports making predictions, drawing conclusions, and solving problems.</li> </ul>	<ul style="list-style-type: none"> <li>• What factors influence the way data is collected and organized?</li> <li>• How is the reliability of data affected by the source, quantity, and method of collection?</li> <li>• How is the analysis of data used to solve problems?</li> <li>• How is the presentation used to support different kinds of data?</li> <li>• Why would one style of graph, chart, or table be more appropriate than another when depicting data?</li>   <li>• How is the probability of an event determined and expressed?</li> <li>• What factors influence the certainty of uncertainty?</li> <li>• How is probability used to make predictions and draw conclusions?</li> </ul>	
<b>Academic Expectations</b>	<b>Content</b>	<b>Performance Standards</b>
<p><b>Academic Expectation 2.13</b> Students understand and appropriately use statistics and probability.</p>	<ul style="list-style-type: none"> <li>• Data Analysis</li>   <li>• Probability</li> </ul>	<p>Students will:</p> <ul style="list-style-type: none"> <li>• collect, record, and interpret data</li> <li>• build and interpret scaled graphs (pictograph, bar, <b>line, circle</b>), charts, and tables with <b>several categories</b></li>   <li>• investigate outcomes (<b>likely / unlikely, certain / impossible</b>)</li> </ul>

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<b>Number and Operations – Grade Four</b>		
<b>Essential Understandings</b>	<b>Guided Questions -- What Students Need to Know</b>	
<ul style="list-style-type: none"> <li>• Mathematics can be used to describe, understand, and communicate about the world in order to solve problems and make decisions.</li>   <li>• Characteristics of a situation or problem influence the choice of numbers, operations, strategies, and tools.</li> </ul>	<ul style="list-style-type: none"> <li>• What does mathematics reveal about the world?</li> <li>• How is mathematics used in the everyday world?</li> <li>• What situations require the use of mathematical understanding?</li> <li>• How can concrete materials model mathematical situations?</li> <li>• Using place value, what does the position of each digit reveal about its value?</li>   <li>• How do the characteristics of a problem influence the choice of numbers, operations, strategies, and tools?</li> <li>• What strategies help determine if a solution is reasonable, accurate, and complete?</li> </ul>	
<b>Academic Expectations</b>	<b>Content</b>	<b>Performance Standards</b>
<p><b>Academic Expectation 2.7</b> Students understand number concepts and use numbers appropriately and accurately.</p> <p><b>Academic Expectation 2.8</b> Students understand various mathematical procedures and use them appropriately and accurately.</p>	<ul style="list-style-type: none"> <li>• Whole numbers</li>   <li>• Place value</li>     <li>• Multiplication</li>       <li>• Division</li> </ul>	<p>Students will:</p> <ul style="list-style-type: none"> <li>• use place value understanding to identify, order, round, read, and write (in all forms) numbers through <b>one million</b></li> <li>• recognize that in a multi-digit whole number, the digit in one place represents ten times what it represents in the place to its right</li> <li>• read and write multi-digit whole numbers using base-ten numerals, number names, and expanded form</li> <li>• compare two multi-digit numbers based on meanings of the digits in each place, using <math>&gt;</math>, <math>&lt;</math>, or <math>=</math> symbols</li> <li>• fluently add and subtract <b>multi-digit</b> whole numbers using place value understanding and properties of operations</li>   <li>• calculate and explain products multiplying 2-, <b>3-</b>, and <b>4-</b> digit numbers by 1-digit numbers with regrouping, using strategies based on place value and the properties of operations</li> <li>• master multiplication facts of <b>11 and 12</b></li> <li>• <b>find all factor pairs for a whole number in the range 1-100</b></li> <li>• <b>recognize that a whole number is a multiple of each of its factors</b></li> <li>• <b>determine whether a given whole number in the range 1-100 is a multiple of a given one-digit number</b></li> <li>• <b>determine whether a given whole number in the range 1-100 is prime or composite</b></li> <li>• apply problem solving skills in multi-step word problems, using the four operations</li>   <li>• <b>name the divisibility rules for 2, 3, 5, and 10</b></li> </ul>



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<b>Geometry – Grade Four</b>		
<b>Essential Understandings</b>	<b>Guided Questions -- What Students Need to Know</b>	
<ul style="list-style-type: none"> <li>Geometry has many real-world applications including design, architecture, and art.</li> </ul>	<ul style="list-style-type: none"> <li>How do the characteristics of geometric figures influence their use in designs?</li> <li>How are models and drawings used in problem solving and design?</li> <li>How can attributes be used to classify figures?</li> </ul>	
<b>Academic Expectations</b>	<b>Content</b>	<b>Performance Standards</b>
<p><b>Academic Expectation 2.9</b> Students understand space and dimensionality concepts and use them appropriately and accurately.</p> <p><b>Academic Expectation 2.10</b> Students understand measurement concepts and use measurements appropriately and accurately</p>	<ul style="list-style-type: none"> <li>Plane and solid figures</li>   <li>Triangles</li>   <li>Angles</li>           <li>Symmetry</li> </ul>	<p>Students will:</p> <ul style="list-style-type: none"> <li><b>classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines, or the presence or absence of angles of a specified size</b></li> <li><b>draw and identify points, lines, line segments, rays, angles (right, acute, obtuse) and perpendicular and parallel lines</b></li>   <li><b>recognize right triangles as a category and identify right triangles</b></li>   <li><b>measure angles in whole number degrees using a protractor</b></li> <li><b>sketch angles of specified measures</b></li> <li><b>recognize angles as geometric shapes that are formed wherever two rays share a common endpoint</b></li> <li><b>understand that an angle is measured with reference to a circle with its center at the common endpoint of the rays</b></li> <li><b>understand that an angle that turns through <math>n</math> one-degree angles is said to have an angle measure of <math>n</math> degrees</b></li> <li><b>solve unknown angle measurements</b></li> <li><b>recognize that angle measure is additive and is the sum of the angle measures of the parts</b></li>   <li>recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded along the line into two matching parts</li> <li>identify line-symmetric figures and draw lines of symmetry</li> </ul>

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<b>Measurement– Grade Four</b>		
<b>Essential Understandings</b>	<b>Guided Questions -- What Students Need to Know</b>	
<ul style="list-style-type: none"> <li>Measurement allows description, understanding, and communication about the world.</li> </ul>	<ul style="list-style-type: none"> <li>How do the characteristics of objects and events influence the choice of measurement strategies and tools?</li> <li>How does the precision required for a measurement influence the choice of strategies and tools?</li> <li>How is the understanding and communication about measurement used to solve problems and make decisions?</li> </ul>	
<b>Academic Expectations</b>	<b>Content</b>	<b>Performance Standards</b>
<p><b>Academic Expectation 2.9</b> Students understand space and dimensionality concepts and use them appropriately and accurately.</p> <p><b>Academic Expectation 2.10</b> Students understand measurement concepts and use measurements appropriately and accurately</p>	<ul style="list-style-type: none"> <li>Linear measurement</li> <li>Units of measure</li> <li>Perimeter</li> </ul>	<p>Students will:</p> <ul style="list-style-type: none"> <li><b>make a line plot to display a data set of measurements in fractions of a unit (<math>\frac{1}{2}, \frac{1}{4}, \frac{1}{8}</math>)</b></li> <li><b>express measurements in a larger unit in terms of a smaller unit within a single system of units</b></li> <li><b>record measurement equivalents in a conversion table</b></li> <li>use the four operations to solve word problems involving distances, <b>intervals of time</b>, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals</li> <li><b>apply the perimeter and area formulas for rectangles in real-world and mathematical problems</b></li> <li>calculate perimeter of <b>polygons</b></li> </ul>

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<b>Algebra – Grade Four</b>		
<b>Essential Understandings</b>	<b>Guided Questions -- What Students Need to Know</b>	
<ul style="list-style-type: none"> <li>• Patterns aid description, understanding, and communication about the world.</li>   <li>• Patterns and number relationships can be used to investigate, understand, and solve problems.</li> </ul>	<ul style="list-style-type: none"> <li>• How and why are patterns used?</li> <li>• How are patterns and number relationships represented symbolically?</li> <li>• How are tables and equations used to represent, analyze, and extend patterns?</li> <li>• Why do the components of a pattern continue to alternate in a particular way?</li>   <li>• How do patterns help to solve problems and communicate information?</li> <li>• What kinds of strategies help to reveal patterns and number relationships?</li> <li>• What is the meaning of a variable in an equation or number expression?</li> <li>• How are strategies used to assess the reasonableness of an answer?</li> </ul>	
<b>Academic Expectations</b>	<b>Content</b>	<b>Performance Standards</b>
<p><b>Academic Expectation 2.11</b> Students understand mathematical change concepts and use them appropriately and accurately.</p> <p><b>Academic Expectation 2.12</b> Students understand mathematical structure concepts including the properties and logic of various mathematical systems.</p>	<ul style="list-style-type: none"> <li>• Variables</li>   <li>• Patterns</li>   <li>• Order of operations</li>   <li>• Mental computation and estimation</li> </ul>	<p>Students will:</p> <ul style="list-style-type: none"> <li>• <b>differentiate between algebraic expressions and equations</b></li> <li>• use fact families to determine the value of a variable in multiplication and division equations (<math>6x = 36</math>, <math>x \div 3 = 9</math>)</li> <li>• use a letter to represent the unknown quantity in an equation</li>   <li>• <b>generate number or shape patterns that follow a given rule</b></li> <li>• <b>identify features of the pattern that are not explicit in the rule</b></li> <li>• <b>explain informally why the components of a pattern will continue to alternate in a particular way</b></li> <li>• <b>identify rules to complete function tables and understand two variable relationships</b></li>   <li>• <b>solve equations beginning with the operations inside the parentheses</b></li>   <li>• assess the reasonableness of answers using mental computation and estimation strategies, including rounding</li> </ul>

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<b>Data Analysis and Probability – Grade Four</b>		
<b>Essential Understandings</b>	<b>Guided Questions -- What Students Need to Know</b>	
<ul style="list-style-type: none"> <li>Data collection and analysis can be used to predict outcomes, solve problems, and make decisions.</li> </ul>	<ul style="list-style-type: none"> <li>How is the analysis of data used to solve problems?</li> <li>How is the presentation of data used or misused to support an outcome or decision?</li> </ul>	
<b>Academic Expectations</b>	<b>Content</b>	<b>Performance Standards</b>
<p><b>Academic Expectation 2.13</b> Students understand and appropriately use statistics and probability.</p>	<ul style="list-style-type: none"> <li>Measures of central tendency</li> </ul>	<p>Students will:</p> <ul style="list-style-type: none"> <li><b>define and find the mean (average), median, and mode of a set of data</b></li> </ul>

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<b>Number and Operations – Grade Five</b>		
<b>Essential Understandings</b>	<b>Guided Questions -- What Students Need to Know</b>	
<ul style="list-style-type: none"> <li>• Mathematics can be used to describe, understand, and communicate about the world in order to solve problems and make decisions.</li> <li>• Characteristics of a situation or problem influence the choice of numbers, operations, strategies, and tools.</li> </ul>	<ul style="list-style-type: none"> <li>• What does mathematics reveal about the world?</li> <li>• What situations require the use of mathematical understandings?</li> <li>• How does mathematics enable people to work with things they cannot see?</li> <li>• How do concrete materials model mathematical situations?</li> <li>• What does the position in a multi-digit number reveal about its value?</li> <li>• How do the characteristics of a situation influence the choice of numbers, operations, strategies, and tools?</li> <li>• How is a solution determined to be reasonable, accurate, and complete?</li> <li>• Why are comparisons of two fractions only valid when they refer to the same whole?</li> </ul>	
<b>Academic Expectations</b>	<b>Content</b>	<b>Performance Standards</b>
<p><b>Academic Expectation 2.7</b> Students understand number concepts and use numbers appropriately and accurately.</p> <p><b>Academic Expectation 2.8</b> Students understand various mathematical procedures and use them appropriately and accurately.</p>	<ul style="list-style-type: none"> <li>• Whole numbers</li> <li>• Place value</li> <li>• Decimals</li> </ul>	<p>Students will:</p> <ul style="list-style-type: none"> <li>• <b>fluently multiply multi-digit whole numbers using the standard algorithm</b></li> <li>• find whole number quotients with <b>2-digit divisors (4-digit by 2-digit)</b> using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division</li> <li>• show remainders as <b>fractions and decimals</b></li> <li>• <b>recognize and determine the greatest common factor (GCF) and least common multiple (LCM) and interpret remainders in problem solving</b></li> <li>• estimate quotients using compatible numbers</li> <li>• <b>apply divisibility rules for 2, 3, 4, 5, 6, 9, 10</b></li> <li>• recognize that in a multi-digit number, a digit in one place represents ten times as much as it represents in the place to its right and <b>1/10 of what it represents in the place to its left</b></li> <li>• <b>explain patterns in the number of zeros of the product when multiplying a number by powers of 10</b></li> <li>• <b>explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10</b></li> <li>• read, write, compare, and order decimals to the <b>ten-thousandths place</b> using base-ten numerals, number names, and expanded form</li> <li>• compare decimals using <b>&gt;, &lt;, or =</b> and symbols</li> <li>• round decimals to the indicated place value position</li> <li>• <b>add, subtract, and multiply, and divide decimals through the</b></li> </ul>

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	<ul style="list-style-type: none"> <li>• Fractions</li> </ul>	<p><b>hundredths place</b> using concrete models or drawings and strategies based on place value, properties of operations, rounding, and/or the relationship between addition and subtraction and explain the reasoning</p> <ul style="list-style-type: none"> <li>• add and subtract fractions and mixed numbers with <b>unlike denominators, by replacing given fractions with equivalent fractions in order to produce an equivalent sum or difference of fractions with like denominators</b></li> <li>• <b>apply greatest common factor (GCF) to express sums and differences in simplest form</b> <ul style="list-style-type: none"> <li>• recognize that comparisons are valid only when the two fractions refer to the same whole</li> </ul> </li> <li>• solve real-world problems involving addition and subtraction of fractions, <b>including cases of unlike denominators</b>, (e.g., by using visual fraction models or equations)</li> <li>• <b>solve real-world problems involving multiplication of fractions and mixed numbers, (e.g., by using visual fraction models or equations)</b></li> <li>• <b>use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers</b></li> <li>• <b>interpret a fraction as division of the numerator by the denominator</b></li> <li>• <b>interpret multiplication of fractions as scaling (resizing) by comparing the size of a product to the size of one factor on the basis of the size of the other factor, without performing the indicated multiplication</b></li> <li>• <b>explain why multiplying a given number by a fraction greater than 1 results in a product greater than the given number</b></li> <li>• <b>explain why multiplying a given number by a fraction less than 1 results in a product smaller than the given number</b></li> <li>• <b>interpret division of a whole number by a unit fraction (e.g., <math>4 \div \frac{1}{5} = 20</math> because <math>20 \times \frac{1}{5} = 4</math>) and a unit fraction by a whole number or non-zero number, compute, and apply to real-world problem solving</b></li> </ul>
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<b>Geometry – Grade Five</b>		
<b>Essential Understandings</b>	<b>Guided Questions -- What Students Need to Know</b>	
<ul style="list-style-type: none"> <li>• Attributes and relationships of shapes, objects, and patterns can be used to describe, understand, and communicate about the world.</li>   <li>• Geometry has many real-world applications including design, architecture, and art.</li> </ul>	<ul style="list-style-type: none"> <li>• How can objects in the natural and human-designed world be identified and described in geometric terms?</li> <li>• How are distance, direction, and coordinates used to understand and explain the arrangement of objects and locations?</li> <li>• How do models and drawings enhance understanding?</li>   <li>• How do the characteristics of geometric shapes and figures influence their use in aesthetic and functional designs?</li> <li>• How are geometric shapes and relationships manipulated to create a visual or emotional effect?</li> <li>• How are models and drawings used in problem solving and design?</li> </ul>	
<b>Academic Expectations</b>	<b>Content</b>	<b>Performance Standards</b>
<p><b>Academic Expectation 2.9</b> Students understand space and dimensionality concepts and use them appropriately and accurately</p>	<ul style="list-style-type: none"> <li>• Plane and solid figures</li> </ul>	<p>Students will:</p> <ul style="list-style-type: none"> <li>• <b>identify the following attributes: sides, vertices, faces, edges, and angles (obtuse, acute, right, or straight)</b></li> <li>• <b>understand that attributes belonging to a category of two-dimensional figures also belong to all subcategories of that category (e.g., all squares are rectangles but not all rectangles are squares)</b></li> <li>• <b>classify two-dimensional figures in a hierarchy based on properties</b></li> </ul>

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<b>Measurement – Grade Five</b>	
<b>Essential Understandings</b>	<b>Guided Questions -- What Students Need to Know</b>
<ul style="list-style-type: none"> <li>Measurement allows description, understanding, and communication about the world.</li> </ul>	<ul style="list-style-type: none"> <li>How is measurement used to quantify information about objects and events?</li> <li>How do the characteristics of objects and events influence the choice of measurement strategies and tools?</li> <li>How does the precision required for a measurement influence the choice of strategies and tools?</li> <li>How is the understanding and communication about measurement used to solve problems and make decisions?</li> </ul>
<p><b>Academic Expectation 2.10</b> Students understand measurement concepts and use measurements appropriately and accurately.</p>	<p>Students will:</p> <ul style="list-style-type: none"> <li>apply conversion of linear units from inches through miles</li> <li>apply conversion of mass units from ounces through tons</li> <li>apply conversion of capacity units from fluid ounces through gallons</li> <li>use conversions to solve multi-step real-world problems</li> </ul> <ul style="list-style-type: none"> <li>apply conversion of linear units from millimeters through kilometers, excluding decimals</li> <li>apply conversion of mass units from milligrams through kilograms, excluding decimals</li> <li>apply conversion of capacity units from milliliters through liters, excluding decimals</li> <li>use conversions to solve multi-step real-world problems</li> </ul> <ul style="list-style-type: none"> <li>find the area of a rectangle with fractional side lengths by tiling it with unit squares of the appropriate unit fraction side lengths, and show that the area is the same as would be found by multiplying the side lengths</li> <li>multiply fractional side lengths to find areas of rectangles, and represent fraction products as rectangular areas</li> </ul> <ul style="list-style-type: none"> <li>recognize volume as an attribute of solid figures and understand concepts of volume measurement</li> <li>find the volume of a right rectangular prism with whole-number side lengths by packing it with unit cubes, and show that the volume is the same as it would be by multiplying the edge lengths</li> <li>develop and apply formula for volume of a rectangular prism (<math>V = l \times w</math> and <math>V = b \times h</math>) to find volumes of right rectangular prisms, using whole numbers and decimals to solve real-world and mathematical problems</li> <li>measure volume by counting unit cubes, using cubic cm., cubic in., cubic ft., and improvised units</li> <li>recognize volume as additive in three-dimensional figures</li> <li>determine volume of solid figures composed of two non-overlapping right rectangular prisms by adding the volume of the non-overlapping parts, and apply to real-world problems</li> </ul>

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<b>Algebra – Grade Five</b>		
<b>Essential Understandings</b>	<b>Guided Questions -- What Students Need to Know</b>	
<ul style="list-style-type: none"> <li>• Patterns aid description, understanding, and communication about the world.</li>   <li>• Patterns and number relationships can be used to investigate, understand, and solve problems.</li> </ul>	<ul style="list-style-type: none"> <li>• How and why are patterns used?</li> <li>• How are patterns and number relationships represented symbolically?</li> <li>• What kinds of patterns can be found in natural and human-designed environments?</li> <li>• How are tables and equations used to represent, analyze, and extend patterns?</li>   <li>• How do patterns help people to solve problems and communicate information?</li> <li>• What kinds of strategies help to reveal patterns and number relationships?</li> <li>• How are function tables and equations used to discover, analyze, and extend patterns and number relationships?</li> </ul>	
<b>Academic Expectations</b>	<b>Content</b>	<b>Performance Standards</b>
<p><b>Academic Expectation 2.11</b> Students understand mathematical change concepts and use them appropriately and accurately.</p> <p><b>Academic Expectation 2.12</b> Students understand mathematical structure concepts including the properties and logic of various mathematical systems.</p>	<ul style="list-style-type: none"> <li>• Expressions and equations</li>   <li>• Coordinate system</li>   <li>• Patterns and relationships</li> </ul>	<p>Students will:</p> <ul style="list-style-type: none"> <li>• differentiate between numeric and algebraic expressions and equations</li> <li>• translate word problems into algebraic expressions</li> <li>• <b>use parentheses, brackets, or braces in numerical expressions, and evaluate expressions with these symbols using order of operations</b></li> <li>• write and interpret simple numerical expressions</li>   <li>• <b>understand that the first number in an ordered pair indicates how far to travel from the origin along the x-axis, and the second number indicates how far to travel along the y-axis</b></li> <li>• <b>form ordered pairs consisting of corresponding terms from two patterns and graph on a coordinate plane</b></li> <li>• <b>represent real-world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation</b></li>   <li>• <b>generate two numerical patterns using two given rules</b></li> <li>• identify the apparent relationships between two corresponding terms</li> </ul>

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<b>Data Analysis and Probability – Grade Five</b>		
<b>Essential Understandings</b>	<b>Guided Questions -- What Students Need to Know</b>	
<ul style="list-style-type: none"> <li>Data collection and analysis can be used to predict outcomes, solve problems, and make decisions.</li> </ul>	<ul style="list-style-type: none"> <li>What factors influence the way data is collected and organized?</li> <li>How is the reliability of data affected by the source, quantity, and method of collection?</li> <li>How is the analysis of data used to solve problems?</li> <li>How is the presentation of data used or misused to support different points of view?</li> </ul>	
<b>Academic Expectations</b>	<b>Content</b>	<b>Performance Standards</b>
<p><b>Academic Expectation 2.13</b> Students understand and appropriately use statistics and probability.</p>	<ul style="list-style-type: none"> <li>Data analysis</li> </ul>	<p>Students will:</p> <ul style="list-style-type: none"> <li>collect, organize, and interpret data for the creation and interpretation of <b>stem and leaf plots</b></li> <li>make a line plot to display a data set of measurements in fractions of a unit (<math>1/2, 1/4, 1/8</math>)</li> <li><b>use operations on fractions to solve problems involving information presented in line plots</b></li> <li>calculate and apply <b>range</b>, median, mode, and mean with whole numbers</li> </ul>

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<b>Number and Operations – Grade Six</b>		
<b>Essential Understandings</b>	<b>Guided Questions -- What Students Need to Know</b>	
<ul style="list-style-type: none"> <li>• Mathematics can be used to describe, understand, and communicate about the world in order to solve problems and make decisions.</li>   <li>• Characteristics of a situation or problem influence the choice of numbers, operations, strategies, and tools.</li> </ul>	<ul style="list-style-type: none"> <li>• What does mathematics reveal about the world?</li> <li>• What situations require the use of mathematical understandings?</li> <li>• How do concrete materials model mathematical situations?</li>   <li>• How do the characteristics of a situation influence the choice of numbers, operations, strategies, and tools?</li> <li>• How is a solution determined to be reasonable, accurate, and complete?</li> </ul>	
<b>Academic Expectations</b>	<b>Content</b>	<b>Performance Standards</b>

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<p><b>Academic Expectation 2.7</b> Students understand number concepts and use numbers appropriately and accurately.</p> <p><b>Academic Expectation 2.8</b> Students understand various mathematical procedures and use them appropriately and accurately.</p>	<ul style="list-style-type: none"> <li>• Whole numbers</li>   <li>• Decimals</li>   <li>• Fractions</li>   <li>• Ratios</li>   <li>• Integers and rational numbers</li> </ul>	<p>Student will:</p> <ul style="list-style-type: none"> <li>• <b>determine the prime factorization of any whole number</b></li> <li>• determine the greatest common factor and least common multiple <b>using prime factorization</b></li>   <li>• compare and order decimals</li> <li>• multiply a whole number by a decimal or multiply two decimals using the standard algorithm</li> <li>• divide a whole number by a decimal or divide two decimals using the standard algorithm</li> <li>• <b>convert decimals to fractions</b></li>   <li>• compare and order fractions</li> <li>• multiply and divide fractions (proper, improper, mixed numbers)</li> <li>• <b>convert fractions to decimals</b></li>   <li>• <b>understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities</b></li> <li>• <b>understand and solve real-world and mathematical ratio and rate problems</b></li> <li>• <b>make tables of equivalent ratios relating quantities and use tables to compare ratios</b></li> <li>• <b>solve unit rate problems including those involving unit pricing and constant speed</b></li> <li>• <b>find a percent of a quantity as a rate per 100</b></li> <li>• <b>solve problems involving finding the whole, given a part and the percent</b></li> <li>• <b>use ratio reasoning to convert measurement units</b></li>   <li>• <b>understand that positive and negative numbers are used together to describe quantities having opposite directions or values</b></li> <li>• <b>use positive and negative numbers to represent quantities in real-world context</b></li> <li>• <b>understand the absolute value of a rational number as its distance from 0 on the number line</b></li> <li>• <b>understand ordering and absolute value of rational numbers</b></li> <li>• <b>write, interpret, and explain statements of order for rational numbers in real-world contexts</b></li> </ul>
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<b>Geometry and Measurement – Grade Six</b>		
<b>Essential Understandings</b>	<b>Guided Questions -- What Students Need to Know</b>	
<ul style="list-style-type: none"> <li>• Attributes and relationships of plane and solid figures, objects, and patterns can be used to describe, understand, and communicate about the world.</li>   <li>• Geometry has many real-world applications including design, architecture, and art.</li>   <li>• Measurement allows description, understanding, and communication about the world.</li> </ul>	<ul style="list-style-type: none"> <li>• How can geometry be seen in the natural and human-designed world?</li> <li>• How are distance, direction, coordinates, and scale used to understand and explain the arrangement of objects and locations?</li>   <li>• How do the characteristics of plane and solid figures influence their use in aesthetic and functional designs?</li> <li>• How can one shape be used to calculate the area of another?</li>   <li>• How is measurement used to quantify information about objects and events?</li> <li>• How do the characteristics of objects and events influence the choice of measurement strategies and tools?</li> <li>• How does the precision required for a measurement influence the choice of strategies and tools?</li> <li>• How is the understanding and communication about measurement used to solve problems and make decisions?</li> </ul>	
<b>Academic Expectations</b>	<b>Content</b>	<b>Performance Standards</b>
<p><b>Academic Expectation 2.9</b> Students understand space and dimensionality concepts and use them appropriately and accurately.</p> <p><b>Academic Expectation 2.10</b> Students understand measurement concepts and use measurements appropriately and accurately.</p>	<ul style="list-style-type: none"> <li>• Coordinate system</li>   <li>• Plane figures</li>   <li>• Solid figures</li> </ul>	<p>Student will:</p> <ul style="list-style-type: none"> <li>• locate, plot, and name ordered pairs in <b>all four quadrants</b> on the coordinate grid</li> <li>• <b>use coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate</b></li> <li>• <b>draw polygons in the coordinate plane given coordinates for the vertices</b></li>   <li>• draw angles using protractors</li> <li>• <b>calculate the sum of angle measures in triangles</b></li> <li>• <b>estimate angle measurement</b></li> <li>• <b>identify, describe, classify, name, and draw pairs of angles (adjacent, vertical, complementary, supplementary, and alternate interior and alternate exterior angles)</b></li> <li>• <b>calculate area of a right triangle, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes</b></li>   <li>• <b>calculate surface area and volume of simple geometric solids as they apply to real-world and mathematical problems</b></li> <li>• find the volume of a right rectangular prism <b>with fractional edge lengths</b> by</li> </ul>

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		<p>packing it with unit cubes of the appropriate unit fraction edge lengths, and show that the volume is the same as it would be by multiplying the edge lengths of the prism</p> <ul style="list-style-type: none"><li>• apply formula for volume of a rectangular prism (<math>V = l \times w</math> and <math>V = b \times h</math>) to find volumes of right rectangular prisms <b>with fractional edge lengths</b> to solve real-world and mathematical problems</li></ul>
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<b>Algebra – Grade Six</b>		
<b>Essential Understandings</b>	<b>Guided Questions -- What Students Need to Know</b>	
<ul style="list-style-type: none"> <li>• Patterns aid description, understanding, and communication about the world.</li>   <li>• Patterns and number relationships can be used to investigate, understand, and solve problems.</li> </ul>	<ul style="list-style-type: none"> <li>• How and why are patterns used and where can they be found in human-designed environments?</li> <li>• How are patterns and number relationships represented symbolically (such as consecutive odd numbers)?</li> <li>• How are tables, graphs, and equations used to represent, analyze, and extend patterns?</li>   <li>• How are patterns used to solve problems and communicate information?</li> <li>• What kinds of strategies help reveal patterns and number relationships?</li> </ul>	
<b>Academic Expectations</b>	<b>Content</b>	<b>Performance Standards</b>
<p><b>Academic Expectation 2.11</b> Students understand mathematical change concepts and use them appropriately and accurately.</p> <p><b>Academic Expectation 2.12</b> Students understand mathematical structure concepts including the properties and logic of various mathematical systems.</p>	<ul style="list-style-type: none"> <li>• Order of operations</li>   <li>• Expressions</li>     <li>• Exponents</li>     <li>• One-variable linear equations</li> </ul>	<p>Student will:</p> <ul style="list-style-type: none"> <li>• apply the <b>complete order</b> of operations in evaluating expressions</li>   <li>• <b>simplify and evaluate expressions using substitution, following the order of operations</b></li> <li>• translate and evaluate written and verbal expressions to algebraic expressions</li> <li>• <b>identify parts of an expression using mathematical terms (sum, term, product, factor, quotient, and coefficient)</b></li> <li>• <b>understand that a variable can represent an unknown number</b></li> <li>• <b>evaluate expressions at specific values of their variables in formulas (<math>2x + 7</math> when <math>x = 3</math>)</b></li> <li>• <b>recognize two expressions as equivalent (e.g., <math>y + y + y</math> and <math>3y</math> are equivalent expressions)</b></li>   <li>• <b>write and evaluate numerical expressions involving whole-number exponents</b></li> <li>• <b>write in exponential format</b></li> <li>• <b>evaluate an exponential expression</b></li>   <li>• <b>apply the addition, subtraction, multiplication, and division properties of equality to solve and check one-step algebraic equations (<math>2x = 4</math>; <math>x + 5 = 8</math>)</b></li> <li>• solve real-world and mathematical problems by writing and solving equations</li> <li>• <b>recognize that inequalities of the form <math>x &gt; c</math> or <math>x &lt; c</math> have infinitely many solutions</b></li> <li>• <b>represent solutions of inequalities on number line diagrams</b></li> <li>• <b>represent and analyze quantitative relationships between dependent</b></li> </ul>

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	<ul style="list-style-type: none"><li>• Properties</li></ul>	<p style="text-align: center;"><b>and independent variables</b></p> <ul style="list-style-type: none"><li>• recognize, identify, and apply the inverse property of addition and multiplication</li><li>• recognize, identify, and apply the addition, subtraction, multiplication, and division properties of equality</li><li>• recognize, identify, and apply the identity properties of addition and multiplication</li><li>• identify and apply the distributive property of addition and multiplication</li></ul>
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<b>Data Analysis and Probability – Grade Six</b>		
<b>Essential Understandings</b>	<b>Guided Questions -- What Students Need to Know</b>	
<ul style="list-style-type: none"> <li>Data collection and analysis can be used to predict outcomes, solve problems, and make decisions.</li> </ul>	<ul style="list-style-type: none"> <li>What factors influence the way data is collected and organized?</li> <li>How is the analysis of data used to solve problems?</li> <li>How is the reliability of data affected by the source, quantity, and method of collection?</li> <li>How is the presentation of data used or misused to support different points of view?</li> </ul>	
<b>Academic Expectations</b>	<b>Content Guidelines</b>	<b>Performance Standards</b>
<p><b>Academic Expectation 2.13</b> Students understand and appropriately use statistics and probability.</p>	<ul style="list-style-type: none"> <li>Graphs</li>   <li>Measures of central tendency</li> </ul>	<p>Student will:</p> <ul style="list-style-type: none"> <li>determine the appropriate or best use of bar, line, and circle graphs</li> <li>summarize, describe, and answer questions with regard to data in <b>histograms</b>, bar, line, circle, stem and leaf, <b>dot plots</b>, and <b>box and whisker graphs</b></li> <li>construct <b>complex</b> bar, line, or circle graphs on gathered or given data sets</li>   <li><b>develop an understanding of statistical variability</b></li> <li>calculate mean, median, mode, and range and <b>interpret and explain their meaning</b></li> <li><b>determine the appropriate or best use of mean, median, mode, and range</b></li> <li><b>interpret the meaning of fractional and decimal values as related to mean</b></li> </ul>

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<b>Number and Operations – Grade Seven</b>		
<b>Essential Understandings</b>	<b>Guided Questions -- What Students Need to Know</b>	
<ul style="list-style-type: none"> <li>• Mathematics can be used to describe, understand, and communicate about the world in order to solve problems and make decisions.</li>   <li>• Characteristics of a situation or problem influence the choice of numbers, operations, strategies, and tools.</li> </ul>	<ul style="list-style-type: none"> <li>• What does mathematics reveal about the world?</li> <li>• What situations require the use of mathematical understandings?</li> <li>• How does mathematics enable people to work with intangible phenomena (such as distance, space, and nanosecond)?</li> <li>• How do concrete materials model mathematical situations?</li>   <li>• How do the characteristics of a situation influence the choice of operations, strategies, and tools?</li> <li>• How is a solution determined to be reasonable, accurate, and complete?</li> </ul>	
<b>Academic Expectations</b>	<b>Content</b>	<b>Performance Standards</b>

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<p><b>Academic Expectation 2.7</b> Students understand number concepts and use numbers appropriately and accurately.</p> <p><b>Academic Expectation 2.8</b> Students understand various mathematical procedures and use them appropriately and accurately.</p>	<ul style="list-style-type: none"> <li>• Integers</li>   <li>• Rational numbers</li>   <li>• Real numbers</li> <li>• Percents</li>   <li>• Ratios</li>   <li>• Exponents and roots</li> </ul>	<p>Student will:</p> <ul style="list-style-type: none"> <li>• identify, order, and compare integers</li> <li>• <b>graph integers on a number line</b></li> <li>• <b>add, subtract, multiply, and divide integers and explain their operational processes</b></li>   <li>• identify, order, and compare rational numbers</li> <li>• <b>graph rational numbers on a number line</b></li> <li>• <b>apply properties of operations as strategies to add, subtract, multiply, and divide rational numbers and explain their operational processes</b></li> <li>• <b>describe situations in which opposite quantities combine to make 0</b></li> <li>• <b>understand subtraction of rational numbers as adding the additive inverse</b></li> <li>• <b>convert rational numbers to decimals and classify as terminating, non-terminating, and repeating</b></li> <li>• <b>solve real-world and mathematical problems involving the four operations of rational numbers</b></li>   <li>• <b>classify real numbers as rational, irrational, whole, integer, or natural</b></li>   <li>• <b>convert between decimal, fraction, and percent formats</b></li> <li>• <b>compare and order percents (including those less than one and greater than 100)</b></li> <li>• <b>calculate the percent of a number (20% of 50) including applications to</b> <ul style="list-style-type: none"> <li>○ <b>tax and discount</b></li> <li>○ <b>simple interest</b></li> <li>○ <b>commissions</b></li> <li>○ <b>gratuities</b></li> <li>○ <b>percent of change</b></li> </ul> </li>   <li>• recognize and represent proportional relationships between quantities</li> <li>• identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships</li> <li>• solve ratio equations <b>using cross-multiplication</b></li> <li>• solve word problems involving <b>ratios and proportions, including the percent proportion</b> (16 is what percent of 90)</li> <li>• <b>apply ratios and solve problems involving scale, models, and unit rates</b></li>   <li>• <b>calculate perfect square roots</b></li> <li>• <b>estimate the value of a non-perfect square root to a given decimal point value</b></li> </ul>
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<b>Geometry and Measurement – Grade Seven</b>		
<b>Essential Understandings</b>	<b>Guided Questions -- What Students Need to Know</b>	
<ul style="list-style-type: none"> <li>• Attributes and relationships of plane and solid figures, objects, and patterns can be used to describe, understand, and communicate about the world.</li>   <li>• Geometry has many real-world applications including design, architecture, and art.</li>   <li>• Measurement allows description, understanding, and communication about the world.</li> </ul>	<ul style="list-style-type: none"> <li>• How can geometry be seen in the natural and human-designed environments?</li> <li>• How are distance, direction, coordinates, and scale used to understand and explain the arrangement of objects and locations?</li> <li>• How do models and scale drawings enhance understanding used in problem-solving and design?</li>   <li>• How do the characteristics of geometric shapes and figures influence their use in aesthetic and functional designs?</li>   <li>• How is measurement used to quantify information about objects and events?</li> <li>• How do the characteristics of objects and events influence the choice of measurement strategies and tools?</li> <li>• How does the precision required for a measurement influence the choice of strategies and tools?</li> <li>• How is the understanding and communication about measurement used to solve problems and make decisions?</li> </ul>	
<b>Academic Expectations</b>	<b>Content</b>	<b>Performance Standards</b>
<p><b>Academic Expectation 2.9</b> Students understand space and dimensionality concepts and use them appropriately and accurately.</p> <p><b>Academic Expectation 2.10</b> Students understand measurement concepts and use measurements appropriately and accurately.</p>	<ul style="list-style-type: none"> <li>• Plane figures</li>   <li>• Solid figures</li>   <li>• Formulas</li> </ul>	<p>Student will:</p> <ul style="list-style-type: none"> <li>• prove the similarity of plane figures <b>by identifying congruent angles and proportional sides</b></li> <li>• <b>solve problems involving scale drawings</b></li> <li>• calculate the lengths of sides of similar plane figures</li> <li>• <b>sketch, draw, and construct geometric shapes with given conditions using ruler, protractor, compass, and technology</b></li> <li>• <b>construct triangles from three measures of angles or sides</b></li> <li>• <b>verify the properties of dilations, rotations, reflections, and translations and use these properties to compare two-dimensional figures</b></li>   <li>• <b>describe the two-dimensional figures that result from slicing three-dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids</b></li>   <li>• <b>develop and/or use formulas</b> to calculate surface area and volume for solid figures (cone, sphere, pyramid, prism, cylinders)</li> <li>• <b>develop and/or use formulas to calculate the area and circumference of circles</b></li> <li>• <b>develop and/or use formulas</b> to calculate the area and perimeter of plane figures</li> </ul>

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<b>Algebra – Grade Seven</b>		
<b>Essential Understandings</b>	<b>Guided Questions -- What Students Need to Know</b>	
<ul style="list-style-type: none"> <li>• Patterns aid description, understanding, and communication about the world.</li>   <li>• Patterns and number relationships can be used to investigate, understand, and solve problems.</li> </ul>	<ul style="list-style-type: none"> <li>• How and why are patterns used and where can they be found in human-designed environments?</li> <li>• How are patterns and number relationships represented symbolically (such as consecutive odd numbers)?</li> <li>• How are tables, graphs, and equations used to represent, analyze, and extend patterns?</li>   <li>• How are patterns used to solve problems and communicate information?</li> <li>• What kinds of strategies help to reveal patterns and number relationships?</li> </ul>	
<b>Academic Expectations</b>	<b>Content</b>	<b>Performance Standards</b>
<p><b>Academic Expectation 2.11</b> Students understand mathematical change concepts and use them appropriately and accurately.</p> <p><b>Academic Expectation 2.12</b> Students understand mathematical structure concepts including the properties and logic of various mathematical systems.</p>	<ul style="list-style-type: none"> <li>• Expressions</li>   <li>• One-variable linear equations and inequalities</li> </ul>	<p>Student will:</p> <ul style="list-style-type: none"> <li>• <b>apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients</b></li> <li>• <b>translate an expression from written to algebraic form and from algebraic to written form</b></li> <li>• <b>identify and combine like terms</b> (<math>2x + 3x = 5x</math>)</li>   <li>• solve and check <b>two-step equations</b> (<math>2x + 3 = 5</math>) <b>using rational numbers and the distributive property</b> [<math>2(x + 3) = 8</math>]</li> <li>• <b>solve, check, and graph the solution to one- and two-step one-variable linear inequalities excluding multiplication or division by a negative</b> [<math>2x &gt; 8</math>; <math>x - 5 &lt; -9</math>]</li> <li>• solve <b>multi-step</b> real-life mathematical problems posed with positive and negative rational numbers in any form by constructing simple equations and inequalities</li> <li>• evaluate solutions for reasonableness, accuracy, and completeness</li> </ul>



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<b>Algebra – Grade Eight</b>		
<b>Essential Understandings</b>	<b>Guided Questions -- What Students Need to Know</b>	
<ul style="list-style-type: none"> <li>• Mathematics can be used to describe, understand, and communicate about the world in order to solve problems and make decisions.</li>   <li>• Characteristics of a situation or problem influence the choice of numbers, operations, strategies, and tools.</li> </ul>	<ul style="list-style-type: none"> <li>• What does mathematics reveal about the world?</li> <li>• What situations require the use of mathematical understandings?</li> <li>• How does mathematics enable people to work with intangible phenomena (such as distance, space, and nanosecond)?</li> <li>• How do concrete materials model mathematical situations?</li>   <li>• How do the characteristics of a situation influence the choice of numbers, operations, strategies, and tools?</li> <li>• How is it determined that a solution is reasonable, accurate, and complete?</li> </ul>	
<b>Academic Expectations</b>	<b>Content Guidelines</b>	<b>Performance Standards</b>



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		<p>linear equations and inequalities including absolute value</p> <ul style="list-style-type: none"> <li>• understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously</li> <li>• solve, graph, and check the solution to two-variable systems of linear equations and inequalities using:             <ul style="list-style-type: none"> <li>• substitution</li> <li>• graphing</li> <li>• linear combination (elimination)</li> </ul> </li> <li>• write the equation of a line using:             <ul style="list-style-type: none"> <li>• data table</li> <li>• linear graph</li> <li>• point-slope form</li> <li>• slope-intercept form</li> <li>• standard form</li> <li>• slope formula</li> <li>• x-intercept and y-intercept</li> <li>• parallel and perpendicular slopes</li> </ul> </li> <li>• construct a viable argument to justify a solution method</li> </ul> <ul style="list-style-type: none"> <li>• solve quadratic equations             <ul style="list-style-type: none"> <li>○ understand that solutions to a quadratic equation correspond to the x-intercepts of their graphs</li> <li>○ interpret the solution to identify the number of acceptable solutions (e.g., zero, one, and two)</li> <li>○ solve and check the solution to any quadratic equation and inequality using:                 <ul style="list-style-type: none"> <li>• graphing – intercepts, vertex, maxima, minima, and line of symmetry</li> <li>• quadratic formula: <math>x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}</math></li> <li>• factoring</li> <li>• formula for the line of symmetry: <math>x = -b/2a</math></li> <li>• completing the square</li> <li>• standard graphing form: <math>y = a(x-h)^2 + k</math></li> <li>• standard form: <math>y = ax^2 + bx + c</math></li> </ul> </li> <li>○ construct a viable argument to justify a solution method</li> <li>○ write a quadratic equation given a graph of a parabola or set of values</li> </ul> </li> <li>• radical equations             <ul style="list-style-type: none"> <li>○ interpret the solution to identify the number of acceptable</li> </ul> </li> </ul>
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<b>Examples of Formative and Summative Assessments</b>		
<b>Primary</b>	<b>Intermediate</b>	<b>Middle School</b>
<p>Observations Anecdotal records Pre- and post-assessments Multiple choice assessments Open response questions Drawing software Oral presentations Graphic organizers K-W-L chart Summaries Entry / exit tickets Models Video productions Dramatizations Mobiles Brochures Diagrams Groups projects Art, dance, and music performances Math portfolio entries Math talks PowerPoint presentations Math centers Collages and posters</p>	<p>Pre- and post-assessments Simple Solutions (or similar type of daily spiral review) Problem solving Word problems Student generated questions "Where's the Math?" Math-related current events Estimation jars Math centers Group projects Anchor activities Open response questions Brochures Art, dance, and music performances Textbook and teacher created tests and quizzes Diagrams Persuasive, informative, and descriptive essays File folder games Concept mapping Real-life applications Function machines Problems or number of the day WebPages PowerPoint presentations Oral presentations Graphic organizers Models K-W-L charts Debates Interviews Poetry Entry / exit tickets Video productions Multiple choice assessments</p>	<p>Teacher created / book generated tests and quizzes Posters / graphic organizers / brochures Student created tests and quizzes Student written word problems Speeches ("How does the real world use order of operations?") Songs related to mathematical topics Real-life task performances related to taxes, cooking, sports, investments, etc. Geometric models / mobiles Essays Error analysis Student taught lessons Oral response Scale maps / drawings Cumulative exams / tests K-W-L chart Pre-assessment of prior knowledge Slide show presentation Cooperative group presentations Self-evaluation Informal observation Homework Student response system Warm-up activities Data gathered to model function rules</p>

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**Examples of Applications for Technology/Library Media – Primary**

**General Applications**

- Use applicable software and web pages for problem solving and skills practice.
- Create multimedia presentations and web pages on topics in mathematics.
- Use alternate technologies to reinforce content curriculum (e.g. scanners, interactive whiteboards, projectors, computers, calculators, cameras, videos, and microphones).
- Use student response systems to assess student understanding.

**Number and Operations**

- Use books to expand on skills (e.g. counting books, pattern books, and shape books).
- Relate place value and ordering with call numbers.

**Geometry**

- Use content appropriate electronic tools (e.g. use camera to photograph shapes around learning environment).

**Measurement**

- Use applicable computer drawing tools (e.g. paint and graphics).

**Algebra**

- Use graphic applications (e.g. use clip art to make patterns).

**Data Analysis**

- Use database, templates, and spreadsheets (e.g. record information from class graphs, surveys, and daily observations).

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**Examples of Applications for Technology/Library Media – Intermediate**

**General Applications**

- Use grade appropriate problem solving and skills practice software.
- Create multimedia presentations on topics in mathematics.
- Use alternate technologies to reinforce content curriculum (e.g. electronic white boards, scanners, projectors, calculators, etc.).

**Number and Operations**

- Create a spreadsheet to demonstrate knowledge of operations (+, -,  $\times$ ,  $\div$ ).
- Use calculator to search for numerical patterns.
- Relate call numbers/Dewey Decimal System to ordering and place value.

**Geometry**

- Create geometric figures using a drawing program.
- Use camera to find examples of geometric shapes in the world.

**Measurement**

- Use encyclopedias, almanacs, and other reference tools to find real world measurements (e.g. perimeter, volume, area).
- Use drawing program to demonstrate knowledge of measurement (e.g. area of a room).

**Algebra**

- Use spreadsheet to create a function machine.
- Use a drawing program to design arrays to demonstrate multiplicative properties.

**Data Analysis and Probability**

- Use grade appropriate software to create different graphs/charts and compare/interpret data in multiple layouts.

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**Examples of Applications for Technology/Library Media – Middle School**

**General Applications**

- Use applicable software and online resources for problem solving, skill practice, supplemental lessons, and simple programming.
- Research mathematics topics using library media or Internet resources.
- Create multimedia presentation or web pages on topics in mathematics.
- Reinforce content using alternate technologies (e.g. scanners, electronic white boards, projection devices, computers, calculators, cameras, videos).

**Number and Operations**

- Use spreadsheet software to solve real-world or simulated real-world problems (e.g. balancing a check book, calculating credit card or loan payments with interest).

**Geometry**

- Use geometry web sites or software to demonstrate geometric principles or theorems.
- Use software to create tessellations.

**Algebra**

- Use a spreadsheet to demonstrate functional relationships.
- Use a graphing calculator for graphing equations and exploring algebraic concepts.

**Measurement**

- Use a spreadsheet to create a conversion table for different units of measurement.
- Use CAD or home design software to design a room or house and calculate area, volume, and costs.

**Data Analysis and Probability**

- Use Internet resources to gather real-world data for statistical analysis.
- Use spreadsheet software to collect and represent data in a variety of forms (e.g. compile survey results and display information in appropriate graph format).