

## Comparison of Common Core Standards to Michigan K-8 Grade Level Content Expectations (GLCE)

### Kindergarten

Common Core Critical Areas	Common Core Standards	Michigan Focal Point	Michigan GLCE Topics & Expectations
<p><b>Representing, comparing, and ordering whole numbers, initially with sets of objects</b></p>	<p><a href="#">Counting and Cardinality K-CC</a>  <b>Know number names and the count sequence.</b>                      1. Count to 100 by ones and by tens.                      2. Count forward beginning from a given number within the known sequence (instead of having to begin at 1).                      3. Write numbers from 0 to 20. Represent a number of objects with a written numeral 0-20 (with 0 representing a count of no objects).</p> <p><b>Count to tell the number of objects.</b>                      4. Understand the relationship between numbers and quantities; connect counting to cardinality.                      a. When counting objects, say the number names in the standard order, pairing each object with one and only one number name and each number name with one and only one object.                      b. Understand that the last number name said tells the number of objects counted. The number of objects is the same regardless of their arrangement or the order in which they were counted.                      c. Understand that each successive number name refers to a quantity that is one larger.</p> <p>5. Count to answer "how many?" questions about as many as 20 things arranged in a line, a rectangular array, or a circle; or as many as 10 things in a scattered configuration; given a number from 1-20, count out that many objects.</p> <p><b>Compare numbers.</b>                      6. Identify whether the number of objects in one group is greater than, less than, or equal to the number of objects in another group, e.g., by using matching and counting strategies.                      7. Compare two numbers between 1 and 10 presented as written numerals.</p> <p><a href="#">Operations and Algebraic Thinking K.OA</a>  <b>Understand addition as putting together and adding to, and understand subtraction as taking apart and taking from.</b>                      1. Represent addition and subtraction with objects, fingers, mental images, drawings, sounds (e.g., claps), acting out situations, verbal explanations, expressions, or equations.</p>	<p><b>Representing, comparing, and ordering whole numbers and joining and separating sets</b></p>	<p><b>Count, write, and order numbers.</b>                      N.ME.00.05 Count orally to 100 by ones. Count to 30 by 2's, 5's and 10's using grouped objects as needed.</p> <p>N.ME.00.04 Read and write numbers to 30 and connect them to the quantities they represent.</p> <p>N.ME.00.02 Use one-to-one correspondence to compare and order sets of objects to 30 using phrases such as "same number", "more than", or "less than"; use counting and matching.</p> <p>[4c is in 1<sup>st</sup> grade GLCE]</p> <p>N.ME.00.01 Count objects in sets up to 30.</p> <p>N.ME.00.03 Compare and order numbers to 30 using phrases such as "more than" or "less than."</p> <p><b>Compose and decompose numbers.</b>                      N.MR.00.08 Describe and make drawings to represent situations/stories involving putting together and taking apart for totals up to 10; use finger and object counting.</p>

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	<p>2. Solve addition and subtraction word problems, and add and subtract within 10, e.g., by using objects or drawings to represent the problem.</p> <p>3. Decompose numbers less than or equal to 10 into pairs in more than one way, e.g., by using objects or drawings, and record each decomposition by a drawing or equation (e.g., <math>5 = 2 + 3</math> and <math>5 = 4 + 1</math>).</p> <p>4. For any number from 1 to 9, find the number that makes 10 when added to the given number, e.g., by using objects or drawings, and record the answer with a drawing or equation.</p> <p>5. Fluently add and subtract within 5.</p> <p><a href="#">Number and Operations in Base Ten K.NBT</a>  <b>Work with numbers 11-19 to gain foundations for place value.</b></p> <p>1. Compose and decompose numbers from 11 to 19 into ten ones and some further ones, e.g., by using objects or drawings, and record each composition or decomposition by a drawing or equation (such as <math>18 = 10 + 8</math>); understand that these numbers are composed of ten ones and one, two, three, four, five, six, seven, eight, or nine ones.</p>		<p>N.MR.00.07 Compose and decompose numbers from 2 to 10, e.g., <math>5 = 4 + 1 = 2 + 3</math>, with attention to the additive structure of number systems, e.g., 6 is one more than 5, 7 is one more than 6.*</p> <p>N.ME.00.06 Understand the numbers 1 to 30 as having one, or two, or three groups of ten and some ones. Also count by tens with objects in ten-groups to 100.</p> <p><b>Add and subtract numbers.</b></p> <p>N.MR.00.09 Record mathematical thinking by writing simple addition and subtraction sentences.</p> <p><b>Explore number patterns.</b></p> <p>N.MR.00.10 Create, describe, and extend simple number patterns.</p>
	<p><a href="#">Measurement and Data K.MD</a>  <b>Describe and compare measurable attributes.</b></p> <p>1. Describe measurable attributes of objects, such as length or weight. Describe several measurable attributes of a single object.</p> <p>2. Directly compare two objects with a measurable attribute in common to see which object has "more of"/"less of" the attribute, and describe the difference. <i>For example, directly compare the heights of two children and describe one child as taller/shorter.</i></p> <p><b>Classify objects and count the number of objects in each category.</b></p> <p>3. Classify objects into given categories; count the numbers of objects in each category and sort the categories by count.</p> <p>[indirect measurement in 1<sup>st</sup> grade CCSS]</p>	<p><b>Ordering objects by measurable attribute</b></p>	<p><b>Explore other measurement attributes.</b></p> <p>M.UN.00.04 Compare two or more objects by length, weight and capacity.</p> <p><b>Create, explore, and describe shapes.</b></p> <p>G.GS.00.02 Identify, sort, and classify objects by attribute and identify objects that do not belong in a particular group.</p> <p><b>Explore other measurement attributes.</b></p> <p>M.PS.00.05 Compare length and weight of objects by comparing to reference objects, and use terms such as <i>shorter, longer, taller, lighter, heavier.</i></p> <p><b>Explore concepts of time.</b></p> <p>M.UN.00.01 Know and use the common words for the parts of the day (<i>morning, afternoon, evening, night</i>) and relative</p>

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			time ( <i>yesterday, today, tomorrow, last week, next year</i> ). M.TE.00.02 Identify tools that measure time. M.UN.00.03 Identify daily landmark times to the nearest hour.
Describing shapes and space	<p><a href="#">Geometry K-G</a>  <b>Identify and describe shapes (such as squares, circles, triangles, rectangles, hexagons, cubes, cones, cylinders, and spheres).</b>  1. Describe objects in the environment using names of shapes, and describe the relative positions of these objects using terms such as <i>above, below, beside, in front of, behind, and next to</i>.  2. Correctly name shapes regardless of their orientations or overall size.  3. Identify shapes as two-dimensional (lying in a plane, "flat") or three-dimensional ("solid").</p> <p><b>Analyze, compare, create, and compose shapes.</b>  4. Analyze and compare a variety of two- and three-dimensional shapes, in different sizes and orientations, using informal language to describe their similarities, differences, parts (e.g., number of sides and vertices/"corners") and other attributes (e.g., having sides of equal length).  5. Model shapes in the world by building shapes from components (e.g., sticks and clay balls) and drawing shapes.  6. Compose simple shapes to form larger shapes.</p>	Describing shapes and space	<p>[position is in 1<sup>st</sup> grade GLCE]</p> <p><b>Create, explore, and describe shapes.</b>  G.GS.00.01 Relate familiar three-dimensional objects inside and outside the classroom to their geometric name, [also 2<sup>nd</sup> grade GLCE]</p> <p>[1<sup>st</sup> grade; 3<sup>rd</sup> grade GLCE]</p> <p><b>Explore geometric patterns.</b>  G.GS.00.03 Create, describe, and extend simple geometric patterns.</p>

## 1<sup>st</sup> Grade

Common Core Critical Areas	Common Core Standards	Michigan Focal Point	Michigan GLCE Topics & Expectations
<p>Developing understandings of addition and subtraction and strategies for basic addition facts and related subtraction facts</p>	<p><b>Operations and Algebraic Thinking 1-OA</b>  <b>Represent and solve problems involving addition and subtraction.</b>            1. Use addition and subtraction within 20 to solve word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, <i>e.g.</i>, by using objects, drawings, and equations with a symbol for the unknown number to represent the problem.            2. Solve word problems that call for addition of three whole numbers whose sum is less than or equal to 20, <i>e.g.</i>, by using objects, drawings, and equations with a symbol for the unknown number to represent the problem.</p> <p><b>Understand and apply properties of operations and the relationship between addition and subtraction.</b>            3. Apply properties of operations as strategies to add and subtract. <i>Examples: If <math>8 + 3 = 11</math> is known, then <math>3 + 8 = 11</math> is also known. (Commutative property of addition) To add <math>2 + 6 + 4</math>, the second two numbers can be added to make a ten, so <math>2 + 6 + 4 = 2 + 10 = 12</math>. (Associative property of addition)</i>            4. Understand subtraction as an unknown-addend problem. <i>For example, subtract <math>10 - 8</math> by finding the number that makes 10 when added to 8.</i>  <b>Add and subtract within 20.</b>            5. Relate counting to addition and subtraction (<i>e.g.</i>, by counting on 2 to add 2).            6. Add and subtract within 20, demonstrating fluency for addition and subtraction within 10. Use strategies such as counting on; making ten (<i>e.g.</i>, <math>8 + 6 = 8 + 2 + 4 = 10 + 4 = 14</math>); decomposing a number leading to a ten (<i>e.g.</i>, <math>13 - 4 = 13 - 3 - 1 = 10 - 1 = 9</math>); using the relationship between addition and subtraction (<i>e.g.</i>, knowing that <math>8 + 4 = 12</math>, one knows <math>12 - 8 = 4</math>); and creating equivalent but easier or known sums (<i>e.g.</i>, adding <math>6 + 7</math> by creating the known equivalent <math>6 + 6 + 1 = 12 + 1 = 13</math>).  <b>Work with addition and subtraction equations.</b>            7. Understand the meaning of the equal sign, and determine if equations involving addition and subtraction are true or false. <i>For example, which of the following equations are true and which are false? <math>6 = 6</math>, <math>7 = 8 - 1</math>, <math>5 + 2 = 2 + 5</math>, <math>4 + 1 = 5 + 2</math>.</i>            8. Determine the unknown number in a whole-number addition or subtraction equation. <i>For example, determine the</i></p>	<p>Developing understandings of addition and subtraction and strategies for basic addition facts and related subtraction facts</p>	<p><b>Add and subtract whole numbers.</b>            N.MR.01.10 Model addition and subtraction for numbers through 30 for a given contextual situation using objects or pictures; explain in words; record using numbers and symbols; solve.            N.MR.01.09 Compare two or more sets in terms of the difference in number of elements.            N.FL.01.14 Add three one-digit numbers.  <b>Work with money.</b>            M.PS.01.07 Add and subtract money in dollars only or in cents only.  <b>Solve problems.</b>            M.PS.01.08 Solve one-step word problems using addition and subtraction of length, money and time, including “how much more/less”, without mixing units.</p> <p>N.ME.01.08 List number facts (partners inside of numbers) for 2 through 10.            N.MR.01.11 Understand the inverse relationship between addition and subtraction.</p> <p>N.FL.01.12 Know all the addition facts up to <math>10 + 10</math>, and solve the related subtraction problems fluently.            N.MR.01.13 Apply knowledge of fact families to solve simple open sentences for addition and subtraction.            N.FL.01.16 Compute sums and differences through 30 using number facts and strategies, but no formal algorithm.</p>

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	<p><i>unknown number that makes the equation true in each of the equations <math>8 + ? = 11</math>, <math>5 = - 3</math>, <math>6 + 6 =</math>.</i></p>		
<p><b>Developing an understanding of whole number relationships and place value, including grouping in tens and ones</b></p>	<p><b><u>Number and Operations in Base Ten 1.NBT</u></b>  <b>Extend the counting sequence.</b>  1. Count to 120, starting at any number less than 120. In this range, read and write numerals and represent a number of objects with a written numeral.  <b>Understand place value.</b>  2. Understand that the two digits of a two-digit number represent amounts of tens and ones. Understand the following as special cases:  a. 10 can be thought of as a bundle of ten ones — called a “ten.”  b. The numbers from 11 to 19 are composed of a ten and one, two, three, four, five, six, seven, eight, or nine ones.  c. The numbers 10, 20, 30, 40, 50, 60, 70, 80, 90 refer to one, two, three, four, five, six, seven, eight, or nine tens (and 0 ones).  3. Compare two two-digit numbers based on meanings of the tens and ones digits, recording the results of comparisons with the symbols <math>&gt;</math>, <math>=</math>, and <math>&lt;</math>.  <b>Use place value understanding and properties of operations to add and subtract.</b>  4. Add within 100, including adding a two-digit number and a one-digit number, and adding a two-digit number and a multiple of 10, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used. Understand that in adding two-digit numbers, one adds tens and tens, ones and ones; and sometimes it is necessary to compose a ten.  5. Given a two-digit number, mentally find 10 more or 10 less than the number, without having to count; explain the reasoning used.  6. Subtract multiples of 10 in the range 10-90 from multiples of 10 in the range 10-90 (positive or zero differences), using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used.</p> <p>[Kindergarten CCSS]  [Counting backwards not in CCSS]</p>	<p><b>Developing an understanding of whole number relationships, including grouping in tens and ones</b></p>	<p><b>Count, write, and order numbers</b>  N.ME.01.01 Count to 110 by 1’s, 2’s, 5’s, and 10’s, starting from any number in the sequence; count to 500 by 100’s and 10’s; use ordinals to identify position in a sequence.  N.ME.01.02 Read and write numbers to 110 and relate them to the quantities they represent.</p> <p>N.ME.01.03 Order numbers to 110; compare using phrases such as “same as”, “more than”, “greater than”, “fewer than”; use = symbol. Arrange small sets of numbers in increasing or decreasing order.</p> <p><b>Explore place value</b>  N.ME.01.07 Compose and decompose numbers through 30, including using bundles of tens and units.</p> <p><b>Count, write, and order numbers.</b>  N.ME.01.04 Identify one more than, one less than, 10 more than, and 10 less than for any number up to 100.</p> <p>N.ME.01.05 Understand that a number to the right of another number on the number line is bigger and that a number to the left is smaller.  N.ME.01.06 Count backward by 1’s starting from any number between 1 and 100.</p>

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<p><b>Developing understanding of linear measurement and measuring lengths</b></p>	<p><a href="#">Measurement and Data 1.MD</a>  <b>Measure lengths indirectly and by iterating length units.</b>            1. Order three objects by length; compare the lengths of two objects indirectly by using a third object.            2. Express the length of an object as a whole number of length units, by laying multiple copies of a shorter object (the length unit) end to end; understand that the length measurement of an object is the number of same-size length units that span it with no gaps or overlaps. <i>Limit to contexts where the object being measured is spanned by a whole number of length units with no gaps or overlaps.</i></p> <p><b>Tell and write time.</b>            3. Tell and write time in hours and half-hours using analog and digital clocks.</p> <p><b>Represent and interpret data.</b>            4. Organize, represent, and interpret data with up to three categories; ask and 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.</p>	<p><b>Developing understanding of linear measurement and measuring lengths</b></p>	<p><b>Estimate and measure length.</b>            M.UN.01.02 Compare measured lengths using the words <i>shorter, shortest, longer, longest, taller, tallest, etc.</i> [indirect measurement in K GLCE]            M.UN.01.01 Measure the lengths of objects in non-standard units, e.g., pencil lengths, shoe lengths, to the nearest whole unit.</p> <p><b>Tell time.</b>            M.UN.01.03 Tell time on a twelve-hour clock face to the hour and half-hour.</p> <p><b>Use pictographs.</b>            D.RE.01.01 Collect and organize data to use in pictographs.            D.RE.01.02 Read and interpret pictographs.            D.RE.01.03 Make pictographs of given data using both horizontal and vertical forms of graphs; scale should be in units of one and include symbolic representation.</p>
<p><b>Reasoning about attributes of, and composing and decomposing geometric shapes.</b></p>	<p><a href="#">Geometry 1.G</a>  <b>Reason with shapes and their attributes.</b>            1. Distinguish between defining attributes (e.g., triangles are closed and three-sided) versus non-defining attributes (e.g., color, orientation, overall size) for a wide variety of shapes; build and draw shapes to possess defining attributes.            2. Compose two-dimensional shapes (such as rectangles, squares, trapezoids, triangles, half-circles, and quarter-circles) or three-dimensional shapes (such as cubes, right rectangular prisms, right circular cones, and right circular cylinders) to create a composite shape, and compose new shapes from the composite shape.            3. Partition circles and rectangles into two and four equal shares, describe the shares using the words <i>halves, fourths, and quarters</i>, and use the phrases <i>half of, fourth of, and quarter of</i>. Describe the whole as two of, or four of the shares. Understand for these examples that decomposing into more equal shares creates smaller shares.</p> <p>[position is K-CCSS]</p>		<p><b>Create and describe shapes.</b>            G.GS.01.01 Create common two-dimensional and three-dimensional shapes, and describe their physical and geometric attributes, such as color and shape.</p> <p>[recognizing fractions of shapes is in 2<sup>nd</sup> grade GLCE]</p> <p>G.LO.01.02 Describe relative position of objects on a plane and in space, using words such as <i>above, below, behind, in front of</i>.</p> <p><b>Create and Describe Patterns Involving Geometric Objects</b>            G.SR.01.03 Create and describe patterns, such as</p>

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			repeating patterns and growing patterns using number, shape, and size. G.SR.01.04 Distinguish between repeating and growing patterns. G.SR.01.05 Predict the next element in a simple repeating pattern. G.SR.01.06 Describe ways to get to the next element in simple repeating patterns.

**Second Grade**

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<p><b>Extending understanding of base-ten notation</b></p>	<p><b><u>Number and Operations in Base Ten 2.NBT</u></b>  <b>Understand place value.</b>            1. Understand that the three digits of a three-digit number represent amounts of hundreds, tens, and ones; e.g., 706 equals 7 hundreds, 0 tens, and 6 ones. Understand the following as special cases:                a. 100 can be thought of as a bundle of ten tens — called a “hundred.”                b. The numbers 100, 200, 300, 400, 500, 600, 700, 800, 900 refer to one, two, three, four, five, six, seven, eight, or nine hundreds (and 0 tens and 0 ones).            2. Count within 1000; skip-count by 5s, 10s, and 100s.            3. Read and write numbers to 1000 using base-ten numerals, number names, and expanded form.            4. Compare two three-digit numbers based on meanings of the hundreds, tens, and ones digits, using <math>&gt;</math>, <math>=</math>, and <math>&lt;</math> symbols to record the results of comparisons.</p> <p><b>Use place value understanding and properties of operations to add and subtract.</b>            5. Fluently add and subtract within 100 using strategies based on place value, properties of operations, and/or the relationship between addition and subtraction.            6. Add up to four two-digit numbers using strategies based on place value and properties of operations.            7. Add and subtract within 1000, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method.            Understand that in adding or subtracting three-digit numbers, one adds or subtracts hundreds and hundreds, tens and tens, ones and ones; and sometimes it is necessary to compose or decompose tens or hundreds.            8. Mentally add 10 or 100 to a given number 100-900, and mentally subtract 10 or 100 from a given number 100-900.            9. Explain why addition and subtraction strategies work, using place value and the properties of operations.</p>	<p><b>Developing an understanding of the base-ten numeration system and place-value concepts</b></p>	<p><b>Understand place value.</b>            N.ME.02.05 Express numbers through 999 using place value, e.g., 137 is 1 hundred, 3 tens, and 7 ones; use concrete materials.</p> <p><b>Count, write, and order whole numbers.</b>            N.ME.02.01 Count to 1000 by 1’s, 10’s and 100’s starting from any number in the sequence.            N.ME.02.02 Read and write numbers to 1000 in numerals and words, and relate them to the quantities they represent.            N.ME.02.04 Count orally by 3’s and 4’s starting with 0, and by 2’s, 5’s, and 10’s starting from any whole number.            N.ME.02.03 Compare and order numbers to 1000; use the symbols <math>&gt;</math> and <math>&lt;</math>.</p> <p><b>Add and subtract whole numbers.</b>            N.FL.02.10 Add fluently two numbers through 99, using strategies including formal algorithms; subtract fluently two numbers through 99.</p> <p>N.FL.02.12 Calculate mentally sums and differences involving: three-digit numbers and ones; three-digit numbers and tens; three-digit numbers and hundreds.</p>

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<p><b>Building fluency with addition and subtraction</b></p>	<p><a href="#">Operations and Algebraic Thinking 2.OA</a>  <b>Represent and solve problems involving addition and subtraction.</b>            1. Use addition and subtraction within 100 to solve one- and two-step word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.</p> <p><b>Add and subtract within 20.</b>            2. Fluently add and subtract within 20 using mental strategies. By end of Grade 2, know from memory all sums of two one-digit numbers.</p> <p><b>Work with equal groups of objects to gain foundations for multiplication.</b>            3. Determine whether a group of objects (up to 20) has an odd or even number of members, e.g., by pairing objects or counting them by 2s; write an equation to express an even number as a sum of two equal addends.            4. Use addition to find the total number of objects arranged in rectangular arrays with up to 5 rows and up to 5 columns; write an equation to express the total as a sum of equal addends.</p> <p>[Meaning of multiplication and division is in 3<sup>rd</sup> grade CCSS]</p>	<p><b>Developing quick recall of addition facts and related subtraction facts and fluency with multi-digit addition and subtraction</b></p>	<p><b>Add and subtract whole numbers.</b>            N.FL.02.06 Decompose 100 into addition pairs, e.g., <math>99 + 1</math>, <math>98 + 2</math>.            N.MR.02.08 Find missing values in open sentences, e.g., <math>42 + \blacksquare = 57</math>; use relationship between addition and subtraction.            N.MR.02.09 Given a contextual situation that involves addition and subtraction using numbers through 99: model using objects or pictures; explain in words; record using numbers and symbols; solve.            N.FL.02.11 Estimate the sum of two numbers with three digits.</p> <p>[Fluently add and subtract within 20 is in 1<sup>st</sup> grade GLCE]</p> <p>[Odd and even numbers are in 3<sup>rd</sup> grade GLCE]</p> <p><b>Understand meaning of multiplication and division.</b>            N.MR.02.13 Understand multiplication as the result of counting the total number of objects in a set of equal groups, e.g., <math>3 \times 5</math> gives the number of objects in 3 groups of 5 objects, or <math>3 \times 5 = 5 + 5 + 5 = 15</math>.            N.MR.02.14 Represent multiplication using area and array models.            N.MR.02.15 Understand division (<math>\div</math>) as another way of expressing multiplication, using fact families within the <math>5 \times 5</math> multiplication table; emphasize that division “undoes” multiplication.            N.MR.02.16 Given a situation involving groups of equal size or of sharing equally, represent with objects, words, and symbols; solve.            N.MR.02.17 Develop strategies for fluently multiplying numbers up to <math>5 \times 5</math>.</p>
<p><b>Using standard units of measure</b></p>	<p><a href="#">Measurement and Data 2.MD</a>  <b>Measure and estimate lengths in standard units.</b>            1. Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes.            2. Measure the length of an object twice, using length units of</p>		<p><b>Measure, add, and subtract length.</b>            M.UN.02.01 Measure lengths in meters, centimeters, inches, feet, and yards approximating to the nearest whole unit and using abbreviations.</p>

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	<p>different lengths for the two measurements; describe how the two measurements relate to the size of the unit chosen.</p> <p>3. Estimate lengths using units of inches, feet, centimeters, and meters.</p> <p>4. Measure to determine how much longer one object is than another, expressing the length difference in terms of a standard length unit.</p> <p><b>Relate addition and subtraction to length.</b></p> <p>5. Use addition and subtraction within 100 to solve word problems involving lengths that are given in the same units, e.g., by using drawings (such as drawings of rulers) and equations with a symbol for the unknown number to represent the problem.</p> <p>[Perimeter is in 3<sup>rd</sup> grade CCSS]</p> <p>6. Represent whole numbers as lengths from 0 on a number line diagram with equally spaced points corresponding to the numbers 0, 1, 2, ..., and represent whole-number sums and differences on a number line diagram.</p> <p><b>Work with time and money.</b></p> <p>7. Tell and write time from analog and digital clocks to the nearest five minutes, using a.m. and p.m.</p> <p>8. Solve word problems involving dollar bills, quarters, dimes, nickels, and pennies, using \$ and ¢ symbols appropriately. <i>Example: If you have 2 dimes and 3 pennies, how many cents do you have?</i></p> <p>[Decimal notation appears in 4th grade CCSS]</p> <p><b>Represent and interpret data.</b></p> <p>9. Generate measurement data by measuring lengths of several objects to the nearest whole unit, or by making repeated measurements of the same object. Show the measurements by making a line plot, where the horizontal scale is marked off in whole-number units.</p> <p>10. Draw a picture graph and a bar graph (with single-unit scale) to represent a data set with up to four categories. Solve simple put-together, take-apart, and compare problems using information presented in a bar graph.</p> <p>[Scaled bar graphs appear in 3<sup>rd</sup> grade CCSS]</p>		<p>M.PS.02.02 Compare lengths; add and subtract lengths (no conversion of units).</p> <p><b>Solve measurement problems</b></p> <p>M.PS.02.10 Solve simple word problems involving length and money.</p> <p>M.TE.02.11 Determine perimeters of rectangles and triangles by adding lengths of sides, recognizing the meaning of perimeter.</p> <p><b>Add and subtract whole numbers.</b></p> <p>N.MR.02.07 Find the distance between numbers on the number line.</p> <p><b>Tell time and solve time problems.</b></p> <p>M.UN.02.05 Using both a.m. and p.m., tell and write time from the clock face in 5 minute intervals and from digital clocks to the minute.</p> <p>M.UN.02.06 Use the concept of duration of time, e.g., determine what time it will be half an hour from 10:15.</p> <p><b>Record, add and subtract money.</b></p> <p>M.PS.02.08 Add and subtract money in mixed units.</p> <p>M.UN.02.07 Read and write amounts of money using decimal notations,</p> <p><b>Create, interpret, and solve problems involving pictographs.</b></p> <p>D.RE.02.01 Make pictographs using a scale representation, using scales where symbols equal more than one.</p> <p>D.RE.02.02 Read and interpret pictographs with scales, using scale factors of 2 and 3.</p> <p>D.RE.02.03 Solve problems using information in pictographs; include scales such as each ■ represents 2 apples; avoid ■ cases.</p>

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<p><b>Describing and analyzing shapes</b></p>	<p><u><a href="#">Geometry 2.G</a></u>  <b>Reason with shapes and their attributes.</b>            1. Recognize and draw shapes having specified attributes, such as a given number of angles or a given number of equal faces. Identify triangles, quadrilaterals, pentagons, hexagons, and cubes.</p> <p>2. Partition a rectangle into rows and columns of same-size squares and count to find the total number of them.</p> <p>3. Partition circles and rectangles into two, three, or four equal shares, describe the shares using the words <i>halves</i>, <i>thirds</i>, <i>half of</i>, <i>a third of</i>, etc., and describe the whole as two halves, three thirds, four fourths. Recognize that equal shares of identical wholes need not have the same shape.</p> <p>[Fractions begin as a domain in the 3<sup>rd</sup> grade CCSS]</p> <p>[Composing and orienting shapes is in K-CCSS]</p>	<p><b>Composing and decomposing geometric shapes</b></p>	<p><b>Identify and describe shapes.</b>            G.SR.02.05 Classify familiar plane and solid objects by common attributes such as shape, size, color, roundness, or number of corners and explain which attributes are being used for classification.            G.GS.02.01 Identify, describe, and compare familiar two-dimensional and three-dimensional shapes.</p> <p><b>Understand the Concept of Area.</b>            M.TE.02.04 Find the area of a rectangle with whole number side lengths by covering with unit squares and counting, or by using a grid of unit squares; write the area as a product.            M.UN.02.03 Measure area using non-standard units to the nearest whole unit.</p> <p><b>Work with unit fractions.</b>            N.ME.02.18 Recognize, name, and represent commonly used unit fractions with denominators 12 or less; model by folding strips.            N.ME.02.22 Recognize that fractions such as <math>\frac{2}{2}</math>, <math>\frac{3}{3}</math>, and <math>\frac{4}{4}</math> are equal to the whole (one).            N.ME.02.19 Recognize, name, and write commonly used fractions.            N.ME.02.20 Place 0 and halves, e.g., <math>\frac{1}{2}</math>, <math>1\frac{1}{2}</math>, <math>2\frac{1}{2}</math> on the number line; relate to a ruler.            N.ME.02.21 For unit fractions understand the inverse relationship between the size of a unit fraction and the size of the denominator; compare unit fractions.</p> <p><b>Identify and describe shapes.</b>            G.GS.02.02 Explore and predict the results of putting together and taking apart two-dimensional and three-dimensional shapes.            G.TR.02.06 Recognize that shapes that have been slid, turned, or flipped are the same shape.            G.GS.02.04 Distinguish between curves and straight lines and between curved surfaces and flat surfaces.</p>
	<p><b>No match to Common Core</b></p>	<p><b>Connections</b></p>	<p><b>Read Thermometers.</b>            M.UN.02.09 Read temperature using the scale on a thermometer in degrees Fahrenheit.</p> <p><b>Use coordinate systems.</b>            G.LO.02.07 Find and name locations using simple coordinate systems such as maps and first quadrant grids.</p>

**Third Grade**

Common Core Critical Areas	Common Core Standards	Michigan Focal Point	Michigan GLCE Topics & Expectations
<p><b>Developing understanding of multiplication and division and strategies for multiplication and division within 100</b></p>	<p><b><u>Operations and Algebraic Thinking 3.OA</u></b>  <b>Represent and solve problems involving multiplication and division.</b>            1. 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. <i>For example, describe a context in which a total number of objects can be expressed as <math>5 \times 7</math>.</i>            2. Interpret whole-number quotients of whole numbers, 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 or as a number of shares when 56 objects are partitioned into equal shares of 8 objects each. <i>For example, describe a context in which a number of shares or a number of groups can be expressed as <math>56 \div 8</math>.</i>            3. Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.            4. Determine the unknown whole number in a multiplication or division equation relating three whole numbers. <i>For example, determine the unknown number that makes the equation true in each of the equations <math>8 \times ? = 48</math>, <math>5 = \div 3</math>, <math>6 \times 6 = ?</math>.</i>  <b>Understand properties of multiplication and the relationship between multiplication and division.</b>            5. Apply properties of operations as strategies to multiply and divide. <i>Examples: If <math>6 \times 4 = 24</math> is known, then <math>4 \times 6 = 24</math> is also known. (Commutative property of multiplication.) <math>3 \times 5 \times 2</math> can be found by multiplying <math>3 \times 5 = 15</math> then multiplying <math>15 \times 2 = 30</math>, or by multiplying <math>5 \times 2 = 10</math> then multiplying <math>3 \times 10 = 30</math>. (Associative property of multiplication.) Knowing that <math>8 \times 5 = 40</math> and <math>8 \times 2 = 16</math>, one can find <math>8 \times 7</math> as <math>8 \times (5 + 2) = (8 \times 5) + (8 \times 2) = 40 + 16 = 56</math>. (Distributive property.)</i>            6. Understand division as an unknown-factor problem. <i>For example, divide <math>32 \div 8</math> by finding the number that makes 32 when multiplied by 8.</i>  <b>Multiply and divide within 100.</b>            7. Fluently multiply and divide within 100, using strategies such as the relationship between multiplication and division (e.g., knowing that <math>8 \times 5 = 40</math>, one knows <math>40 \div 5 = 8</math>) or properties of operations. By end of Grade 3, know from memory all products of one-digit numbers.</p>	<p><b>Developing understandings of multiplication and division and strategies for basic multiplication facts and related division facts</b></p>	<p><b>Multiply and divide whole numbers.</b></p> <p>N.MR.03.10 Recognize situations that can be solved using multiplication and division including finding “How many groups?” and “How many in a group?” and write mathematical statements for those situations.            N.MR.03.12 Find solutions to open sentences, such as <math>7 \times \square = 42</math> or <math>12 \div \square = 4</math>, using the inverse relationship between multiplication and division.            N.MR.03.14 Solve simple division problems involving remainders, viewing remainder as the “number left over” (less than the divisor), interpret based on problem context.</p> <p><b>Multiply and divide whole numbers .</b>            N.MR.03.09 Use multiplication and division fact families to understand the inverse relationship of these two operations, e.g., because <math>3 \times 8 = 24</math>, we know that <math>24 \div 8 = 3</math> or <math>24 \div 3 = 8</math>; express a multiplication statement as an equivalent division statement.  <b>Multiply and divide whole numbers.</b>            N.FL.03.11 Find products fluently up to <math>10 \times 10</math>; find related quotients using multiplication and division relationships.</p>

Common Core Critical Areas	Common Core Standards	Michigan Focal Point	Michigan GLCE Topics & Expectations
	<p><b>Solve problems involving the four operations, and identify and explain patterns in arithmetic.</b></p> <p>8. Solve two-step word problems using the four operations. Represent these problems using equations with a letter standing for the unknown quantity; assess the reasonableness of answers using mental computation and estimation strategies including rounding.</p> <p>9. Identify arithmetic patterns (including patterns in the addition table or multiplication table), and explain them using properties of operations. <i>For example, observe that 4 times a number is always even, and explain why 4 times a number can be decomposed into two equal addends.</i></p> <p><a href="#">Number and Operations in Base Ten 3.NBT</a></p> <p><b>Use place value understanding and properties of operations to perform multi-digit arithmetic.</b></p> <p>1. Use place value understanding to round whole numbers to the nearest 10 or 100.</p> <p>2. Fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction.</p> <p>3. Multiply one-digit whole numbers by multiples of 10 in the range 10-90 (e.g., <math>9 \times 80</math>, <math>5 \times 60</math>) using strategies based on place value and properties of operations.</p> <p>[Number notation and comparing numbers ends with 2<sup>nd</sup> grade CCSS]</p>		<p><b>Problem solving with whole numbers.</b> N.MR.03.15 Given problems that use any one of the four operations with appropriate numbers, represent with objects, words, (including "product" and "quotient"), and mathematical statements; solve.</p> <p><b>Add and subtract whole numbers.</b> N.FL.03.07 Estimate the sum and difference of two numbers with three digits (sums up to 1,000), and judge reasonableness of estimates.</p> <p><b>Count in steps, and understand even and odd numbers.</b> N.ME.03.05 Know that even numbers end in 0, 2, 4, 6, or 8; name a whole number quantity that can be shared in two equal groups or grouped into pairs with no remainders; recognize even numbers as multiples of 2. Know that odd numbers end in 1, 3, 5, 7, or 9. Work with patterns involving even and odd numbers.</p> <p><b>Add and subtract whole numbers.</b> N.FL.03.06 Add and subtract fluently two numbers through 999 with regrouping and through 9,999 without regrouping. N.FL.03.08 Use mental strategies to fluently add and subtract two-digit numbers.</p> <p><b>Multiply and divide whole numbers.</b> N.FL.03.13 Mentally calculate simple products and quotients: up to a three-digit number by a one-digit number involving multiples of 10.</p> <p><b>Understand and use number notation and place value.</b> N.ME.03.01 Read and write numbers to 10,000 in both numerals and words, and relate them to the quantities they represent, e.g., relate numeral or written word to a display of dots or objects. N.ME.03.02 Identify the place value of a digit in a number, e.g., in 3,241, 2 is in the hundreds place. Recognize and use expanded notation for numbers using place value through 9,999, e.g., 2,517 is <math>2000 + 500 + 10 + 7</math>; 4 hundreds and 2 ones is 402. N.ME.03.03 Compare and order numbers up to 10,000.</p> <p><b>Count in steps, and understand even and odd numbers.</b> N.ME.03.04 Count orally by 6's, 7's, 8's, and 9's starting with 0, making the connection between repeated addition and multiplication.</p>

Common Core Critical Areas	Common Core Standards	Michigan Focal Point	Michigan GLCE Topics & Expectations
<p><b>Developing an understanding of fractions, especially unit fractions</b></p>	<p><b><u>Number and Operations—Fractions</u>16 3-NF</b>  <b>Develop understanding of fractions as numbers.</b>            1. Understand a fraction <math>1/b</math> as the quantity formed by 1 part when a whole is partitioned into <math>b</math> equal parts; understand a fraction <math>a/b</math> as the quantity formed by <math>a</math> parts of size <math>1/b</math>.            2. Understand a fraction as a number on the number line; represent fractions on a number line diagram.                a. Represent a fraction <math>1/b</math> on a number line diagram by defining the interval from 0 to 1 as the whole and partitioning it into <math>b</math> equal parts. Recognize that each part has size <math>1/b</math> and that the endpoint of the part based at 0 locates the number <math>1/b</math> on the number line.                b. Represent a fraction <math>a/b</math> on a number line diagram by marking off <math>a</math> lengths <math>1/b</math> from 0. Recognize that the resulting interval has size <math>a/b</math> and that its endpoint locates the number <math>a/b</math> on the number line.            3. Explain equivalence of fractions in special cases, and compare fractions by reasoning about their size.                a. Recognize and generate simple equivalent fractions (e.g., <math>1/2 = 2/4</math>, <math>4/6 = 2/3</math>); explain why the fractions are equivalent, e.g., by using a visual fraction model.                b. Express whole numbers as fractions, and recognize fractions that are equivalent to whole numbers. <i>Examples: Express 3 in the form <math>3 = 3/1</math>; recognize that <math>6/1 = 6</math>; locate <math>4/4</math> and 1 at the same point of a number line diagram.</i>                c. Compare two fractions with the same numerator or the same denominator, by reasoning about their size; recognize that valid comparisons rely on the two fractions referring to the same whole. Record the results of comparisons with the symbols <math>&gt;</math>, <math>=</math>, or <math>&lt;</math>, and justify the conclusions, e.g., by using a visual fraction model.</p> <p>[Adding and subtracting fractions appears in 4<sup>th</sup> grade CCSS]</p> <p>[Decimal fractions first appear in 4<sup>th</sup> grade CCSS]</p>	<p><b>Developing an understanding of fractions and fraction equivalence</b></p>	<p><b>Understand simple fractions, relation to the whole, and addition and subtraction of fractions.</b>            N.ME.03.16 Understand that fractions may represent a portion of a whole unit that has been partitioned into parts of equal area or length; use the terms “numerator” and “denominator.”            N.ME.03.19 Understand that any fraction can be written as a sum of unit fractions.</p> <p>N.ME.03.17 Recognize, name and use equivalent fractions with denominators 2, 4, and 8, using strips as area models.            N.ME.03.18 Place fractions with denominators of 2, 4, and 8 on the number line; relate the number line to a ruler; compare and order up to three fractions with denominators 2, 4, and 8.</p> <p>N.MR.03.20 Recognize that addition and subtraction of fractions with equal denominators can be modeled by joining or taking away segments on the number line.  <b>Understand simple decimal fractions in relation to money.</b>            N.ME.03.21 Understand the meaning of \$0.50 and \$0.25 related to money.</p>

Common Core Critical Areas	Common Core Standards	Michigan Focal Point	Michigan GLCE Topics & Expectations
<p><b>Developing understanding of the structure of rectangular arrays and of area</b></p>	<p><b>Measurement and Data 3.MD</b>  <b>Solve problems involving measurement and estimation of intervals of time, liquid volumes, and masses of objects.</b>            1. Tell and write time to the nearest minute and measure time intervals in minutes; solve word problems involving addition and subtraction of time intervals in minutes, e.g., by representing the problem on a number line diagram.            2. Measure and estimate liquid volumes and masses of objects using standard units of grams (g), kilograms (kg), and liters (l). Add, subtract, multiply, or divide to solve one-step word problems involving masses or volumes that are given in the same units, e.g., by using drawings (such as a beaker with a measurement scale) to represent the problem.</p> <p>[Measure in mixed units and relative sizes of units appear in 4<sup>th</sup> grade CCSS]</p> <p><b>Represent and interpret data.</b>            3. Draw a scaled picture graph and a scaled bar graph to represent a data set with several categories. Solve one- and two-step “how many more” and “how many less” problems using information presented in scaled bar graphs. <i>For example, draw a bar graph in which each square in the bar graph might represent 1 pet, 5 pets, or 10 pets.</i>            4. Generate measurement data by measuring lengths using rulers marked with halves and fourths of an inch. Show the data by making a line plot, where the horizontal scale is marked off in appropriate units—whole numbers, halves, or quarters.  <b>Geometric measurement: understand concepts of area and relate area to multiplication and to addition.</b>            5. Recognize area as an attribute of plane figures and understand concepts of area measurement.                a. A square with side length 1 unit, called “a unit square,” is said to have “one square unit” of area, and can be used to measure area.                b. A plane figure which can be covered without gaps or</p>		<p><b>Measure and use units for length, weight, temperature and time.</b>            M.UN.03.01 Know and use common units of measurements in length, weight and time.</p> <p><b>Solve measurement problems.</b>            M.PS.03.12 Solve applied problems involving money, length, and time.</p> <p><b>Measure and use units for length, weight, temperature and time.</b>            M.UN.03.02 Measure in mixed units within the same measurement system for length, weight and time: feet and inches, meters and centimeters, kilograms and grams, pounds and ounces, liters and milliliters, hours and minutes, minutes and seconds, years and months.            M.UN.03.03 Understand relationships between sizes of standard units, e.g., feet and inches, meters and centimeters.</p> <p><b>Understand meaning of area and perimeter and apply in problems.</b>            M.UN.03.08 Visualize and describe the relative sizes of one square inch and one square centimeter.</p> <p><b>Use bar graphs.</b>            D.RE.03.01 Read and interpret bar graphs, in both horizontal and vertical forms.            D.RE.03.02 Read scales on the axes and identify the maximum, minimum, and range of values in a bar graph.            D.RE.03.03 Solve problems using information in bar graphs, including comparison of bar graphs.</p> <p><b>Understand meaning of area and perimeter and apply in problems.</b>            M.UN.03.05 Know the definition of area and perimeter and calculate the perimeter of a square and rectangle given whole number side lengths.            M.UN.03.06 Use square units in calculating area by covering the region and counting the number of square units.            M.UN.03.07 Distinguish between units of length and area,</p>

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	<p>overlaps by <math>n</math> unit squares is said to have an area of <math>n</math> square units.</p> <p>6. Measure areas by counting unit squares, using square cm, square m, square in, square ft, and improvised units.</p> <p>7. Relate area to the operations of multiplication and addition.</p> <ol style="list-style-type: none"> <li>Find the area of a rectangle with whole-number side lengths by tiling it, and show that the area is the same as would be found by multiplying the side lengths.</li> <li>Multiply side lengths to find areas of rectangles with whole-number side lengths in the context of solving real-world and mathematical problems; represent whole-number products as rectangular areas in mathematical reasoning.</li> <li>Use tiling to show in a concrete case that the area of a rectangle with whole-number side lengths <math>a</math> and <math>b + c</math> is the sum of <math>a \times b</math> and <math>a \times c</math>; use area models to represent the distributive property in mathematical reasoning.</li> <li>Recognize area as additive; find areas of rectilinear figures by decomposing them into non-overlapping rectangles and adding the areas of the non-overlapping parts, applying this technique to solve real-world problems.</li> </ol> <p><b>Geometric measurement: recognize perimeter as an attribute of plane figures and distinguish between linear and area measures.</b></p> <p>8. Solve real-world and mathematical problems involving perimeters of polygons, such as finding the perimeter given the side lengths, finding an unknown side length, and exhibiting rectangles with the same perimeter and different area or with the same area and different perimeter.</p> <p>[Estimating area and perimeter not in CCSS]</p>		<p>and choose a unit appropriate in the context.</p> <p><b>Solve measurement problems.</b> M.PS.03.13 Solve contextual problems about perimeters of rectangles and areas of rectangular regions.</p> <p><b>Estimate perimeter and area.</b> M.TE.03.09 Estimate the perimeter of a square and rectangle in inches and centimeters; estimate the area of a square and rectangle in square inches and square centimeters.</p>
<p><b>Describing and analyzing two-dimensional shapes</b></p>	<p><b><u><a href="#">Geometry 3.G</a></u></b> <b>Reason with shapes and their attributes.</b></p> <ol style="list-style-type: none"> <li>Understand that shapes in different categories (e.g., rhombuses, rectangles, and others) may share attributes (e.g., having four sides), and that the shared attributes can define a larger category (e.g., quadrilaterals); recognize rhombuses, rectangles, and squares as examples of quadrilaterals, and draw examples of quadrilaterals that do not belong to any of these subcategories.</li> <li>Partition shapes into parts with equal areas. Express the area of each part as a unit fraction of the whole. <i>For example,</i></li> </ol>	<p><b>Describing properties of two-dimensional shapes and classifying three-dimensional shapes</b></p>	<p><b>Name and explore properties of shapes.</b> G.GS.03.04 Identify, describe, compare and classify two-dimensional shapes, e.g., parallelogram, trapezoid, circle, rectangle, square and rhombus, based on their component parts (angles, sides, vertices, line segment) and the number of sides and vertices.</p>

Common Core Critical Areas	Common Core Standards	Michigan Focal Point	Michigan GLCE Topics & Expectations
	<p><i>partition a shape into 4 parts with equal area and describe the area of each part as 1/4 of the area of the shape.</i></p> <p>[Composing and orienting shapes is in K-CCSS]</p> <p>[Parallel lines appear in 4<sup>th</sup> grade CCSS]</p> <p>[3-D shapes appear in 2<sup>nd</sup> grade CCSS]</p>		<p>G.SR.03.05 Compose and decompose triangles and rectangles to form other familiar two-dimensional shapes; e.g., form a rectangle using two congruent right triangles, or decompose a parallelogram into a rectangle and two right triangles.</p> <p><b>Recognize the basic elements of geometric objects.</b></p> <p>G.GS.03.01 Identify points, line segments, lines, and distance.</p> <p>G.GS.03.02 Identify perpendicular lines and parallel lines in familiar shapes and in the classroom.</p> <p>G.GS.03.03 Identify parallel faces of rectangular prisms, in familiar shapes and in the classroom.</p> <p><b>Explore and name three-dimensional solids.</b></p> <p>G.GS.03.06 Identify, describe, build and classify familiar three-dimensional solids, based on their component parts (faces, surfaces, bases, edges, vertices).</p>

**Fourth Grade**

Common Core Critical Areas	Common Core Standards	Michigan Focal Point	Michigan GLCE Topics & Expectations
<p><b>Developing fluency with multiplication of whole numbers, and developing understanding of whole number division</b></p>	<p><b>Operations and Algebraic Thinking 4.OA</b>  <b>Use the four operations with whole numbers to solve problems.</b>            1. Interpret a multiplication equation as a comparison, <i>e.g.</i>, interpret <math>5 \times 7 = 35</math> as a statement that 35 is 5 times as many as 7 and 7 times as many as 5. Represent verbal statements of multiplicative comparisons as multiplication equations.            2. Multiply or divide to solve word problems involving multiplicative comparison, <i>e.g.</i>, by using drawings and equations with a symbol for the unknown number to represent the problem, distinguishing multiplicative comparison from additive comparison.            3. Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. Represent these problems using equations with a letter standing for the unknown quantity; assess the reasonableness of answers using mental computation and estimation strategies including rounding.</p> <p><b>Gain familiarity with factors and multiples.</b>            4. Find the factor pairs for a whole number in the range 1-100. Recognize that a whole number is a multiple of each of its factors. Determine whether a given whole number in the range 1-100 is a multiple of a given one-digit number. Determine whether a given whole number in the range 1-100 is prime or composite.</p> <p>[Solve problems about factors and multiples is not in the CCSS]</p> <p><b>Generate and analyze patterns.</b>            5. Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself. <i>For example: Given the rule "Add 3" and the starting number 1, generate terms in the resulting sequence and observe that the terms appear to alternate between odd and even numbers. Explain informally why the numbers will continue to alternate in this way.</i></p>	<p><b>Developing fluency with multiplication of whole numbers</b></p>	<p>[Multiplicative comparison is not explicit in the GLCE]</p> <p><b>Estimate.</b>            N.FL.04.34 Estimate the answers to calculations involving addition, subtraction, or multiplication.            N.FL.04.35 Know when approximation is appropriate and use it to check the reasonableness of answers; be familiar with common place value errors in calculations.            N.FL.04.36 Make appropriate estimations and calculations fluently with whole numbers using mental math strategies.</p> <p><b>Use factors and multiples.</b>            N.ME.04.04 Find all factors of a whole number up to 50, list factor pairs, and determine if a one-digit number is a factor of a given whole number.            N.ME.04.05 List the first ten multiples of a given one-digit whole number; determine if a whole number is a multiple of a given one-digit whole number.            N.MR.04.06 Know that some numbers, including 2, 3, 5, 7, and 11 have exactly two factors (1 and the number itself) and are called prime numbers.            N.MR.04.07 Solve problems about factors and multiples, <i>e.g.</i>, since <math>100 = 4 \times 25</math>, and <math>200 = 2 \times 100</math>, then <math>200 = 2 \times 4 \times 25 = 8 \times 25</math>.</p> <p>[3<sup>rd</sup> grade GLCE]</p>

Common Core Critical Areas	Common Core Standards	Michigan Focal Point	Michigan GLCE Topics & Expectations
	<p><b><u>Number and Operations in Base Ten</u> 4.NBT</b>  <b>Generalize place value understanding for multi-digit whole numbers.</b></p> <p>1. Recognize that in a multi-digit whole number, a digit in one place represents ten times what it represents in the place to its right. <i>For example, recognize that <math>700 \div 70 = 10</math> by applying concepts of place value and division.</i></p> <p>2. Read and write multi-digit whole numbers using base-ten numerals, number names, and expanded form. Compare two multi-digit numbers based on meanings of the digits, using <math>&gt;</math>, <math>=</math>, and <math>&lt;</math> symbols to record the results of comparisons.</p> <p>3. Use place value understanding to round multi-digit whole numbers to any place.</p> <p><b>Use place value understanding and properties of operations to perform multi-digit arithmetic.</b></p> <p>4. Add and subtract multi-digit whole numbers accurately and efficiently using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction.</p> <p>5. Multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers, using strategies based on place value and the properties of operations. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.</p> <p>6. Find whole-number quotients and remainders with up to four-digit dividends and one-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.</p>		<p><b>Understand and use number notation and place value.</b></p> <p>N.ME.04.01 Read and write numbers to 1,000,000; relate them to the quantities they represent; compare and order.</p> <p>N.ME.04.02 Compose and decompose numbers using place value to 1,000,000's.</p> <p>N.ME.04.03 Understand the magnitude of numbers up to 1,000,000; recognize the place values of numbers, and the relationship of each place value to the place to its right.</p> <p><b>Multiply and divide whole numbers.</b></p> <p>N.ME.04.09 Multiply two-digit numbers by 2, 3, 4, and 5, using the distributive property.</p> <p>N.FL.04.10 Multiply fluently any whole number by a one-digit number, and a three-digit number by a two-digit number; for two-digit by one-digit multiplication, use distributive property to develop meaning for the algorithm.</p> <p>N.FL.04.11 Divide numbers up to four-digits by one-digit numbers and by 10.</p> <p>N.FL.04.12 Find unknowns in equations such as <math>a \div 10 = 25</math>; <math>125 \div b = 25</math></p> <p>N.MR.04.13 Use the relationship between multiplication and division to simplify computations and check results.</p> <p>N.MR.04.14 Solve applied problems involving whole number multiplication and division.</p>
<p><b>Developing an understanding of fraction equivalence, addition and subtraction of fractions with like denominators, and multiplication of fractions by whole numbers</b></p>	<p><b><u>Number and Operations—Fractions</u> 4.NF</b>  <b>Extend understanding of fraction equivalence and ordering.</b></p> <p>1. Explain why a fraction <math>a/b</math> is equivalent to a fraction <math>(n \times a)/(n \times b)</math> by using visual fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size; use this principle to recognize and generate equivalent fractions.</p> <p>2. Compare two fractions with different numerators and different denominators, e.g., by creating common denominators or numerators, or by comparing to a benchmark fraction such as <math>1/2</math>; recognize that valid comparisons rely on the two fractions referring to the same whole. Record the results of comparisons with symbols <math>&gt;</math>,</p>	<p><b>Developing an understanding of fractions and decimals, including the connections between them</b></p>	<p><b>Understand fractions.</b></p> <p>N.ME.04.20 Understand fractions as parts of a set of objects.</p> <p>N.MR.04.21 Explain why equivalent fractions are equal, using models such as fraction strips or the number line, for fractions with denominators of 12 or less, or equal to 100.</p> <p>N.MR.04.22 Locate and compare fractions on the number line, including improper fractions and mixed numbers with denominators of 12 or less.</p> <p>N.MR.04.23 Understand the relationships among halves, fourths and eighths, and among thirds, sixths and twelfths.</p>

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	<p>=, or &lt;, and justify the conclusions, e.g., by using a visual fraction model.</p> <p><b>Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers.</b></p> <p>3. Understand a fraction <math>a/b</math> with <math>a &gt; 1</math> as a sum of fractions <math>1/b</math>.</p> <p>a. Decompose a fraction into a sum of fractions with the same denominator in more than one way, recording each decomposition by an equation (e.g., <math>3/8 = 1/8 + 1/8 + 1/8</math> and <math>3/8 = 1/8 + 2/8</math>). Justify decompositions, e.g., by using a visual fraction model.</p> <p>b. Add and subtract mixed numbers with like denominators, e.g., by replacing each mixed number with an equivalent fraction, and/or by using properties of operations and the relationship between addition and subtraction.</p> <p>c. Solve word problems involving addition and subtraction of fractions referring to the same whole and having like denominators, e.g., by using visual fraction models and equations to represent the problem.</p> <p>4. Apply and extend previous understandings of multiplication to multiply a fraction by a whole number.</p> <p>a. Understand a fraction <math>a/b</math> as a multiple of <math>1/b</math>. <i>For example, use a visual fraction model to represent <math>5/4</math> as the product <math>5 \times (1/4)</math>, recording the conclusion by the equation <math>5/4 = 5 \times (1/4)</math>.</i></p> <p>b. Understand a multiple of <math>a/b</math> as a multiple of <math>1/b</math>, and use this understanding to multiply a fraction by a whole number. <i>For example, use a visual fraction model to express <math>3 \times (2/5)</math> as <math>6 \times (1/5)</math>, recognizing this product as <math>6/5</math>. (In general, <math>n \times (a/b) = (n \times a)/b</math>.)</i></p> <p>c. Solve word problems involving multiplication of a fraction by a whole number, e.g., by using visual fraction models and equations to represent the problem. <i>For example: If each person at a party will eat <math>3/8</math> of a pound of roast beef, and there will be 5 people at the party, how many pounds of roast beef will be needed? Between what two whole numbers does your answer lie?</i></p> <p><b>Understand decimal notation for fractions, and compare decimal fractions.</b></p> <p>5. Express a fraction with denominator 10 as an equivalent fraction with denominator 100, and use this technique to add two fractions with respective denominators 10 and 100. <i>23 For example, express <math>3/10</math> as <math>30/100</math> and add <math>3/10 + 4/100 = 34/100</math>.</i></p> <p>6. Interpret a two-digit decimal as a fraction and use decimal</p>		<p>N.MR.04.26 Compare and order up to three fractions with denominators 2, 4, and 8, and 3, 6, and 12, including improper fractions and mixed numbers.</p> <p><b>Add and subtract fractions.</b></p> <p>N.MR.04.27 Add and subtract fractions less than 1 with denominators 12 or less and including 100, in cases where the denominators are equal or when one denominator is a multiple of the other.</p> <p>N.MR.04.28 Solve fraction problems involving sums and differences for fractions where one denominator is a multiple of the other (denominators 2 through 12, and 100).</p> <p>N.MR.04.29 Solve for the unknown in equations such as:</p> $\frac{1}{8} + x = \frac{5}{8} \text{ or } \frac{3}{4} - y = \frac{1}{2}$ <p><b>Multiply fractions by whole numbers.</b></p> <p>N.MR.04.30 Multiply fractions by whole numbers, using repeated addition and area or array models.</p> <p><b>Read, interpret and compare decimal fractions.</b></p> <p>N.ME.04.15 Read and interpret decimals up to two decimal places; relate to money and place value decomposition.</p> <p>N.ME.04.17 Locate tenths and hundredths on a number line.</p> <p>N.MR.04.19 Write tenths and hundredths in decimal and</p>

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	<p>notation for parts of wholes; round decimals to the nearest whole number by reasoning about their size. <i>For example, rewrite 1.62 as <math>1\frac{62}{100}</math>; describe a length as 1.62 meters; locate 1.62 on a number line diagram and round 1.62 to 2.</i></p> <p>7. Compare two decimals to hundredths by reasoning about their size; recognize that valid comparisons rely on the two decimals referring to the same whole. Record the results of comparisons with the symbols <math>&gt;</math>, <math>=</math>, or <math>&lt;</math>, and justify the conclusions, e.g., by using a visual model.</p>		<p>fraction forms, and know the decimal equivalents for halves and fourths.</p> <p>N.ME.04.18 Read, write, interpret, and compare decimals up to two decimal places.</p>
<p><b>Continuing to develop an understanding of area</b></p>	<p><b><u>Measurement and Data 4.MD</u></b>  <b>Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.</b></p> <p>1. Know relative sizes of measurement units within one system of units including km, m, cm; kg, g; lb, oz.; l, ml; hr, min, sec. Within a single system of measurement, express measurements in a larger unit in terms of smaller unit. Record measurement equivalents in a two-column table. <i>For example: Know that 1 ft is 12 times as long as 1 in; express the length of a 4 ft snake as 48 in; generate a conversion table for feet and inches listing the number pairs (1, 12), (2, 24), (3, 36), ....</i></p> <p>2. Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale.</p> <p>[Surface area appears in 6<sup>th</sup> grade CCSS]</p> <p>3. Apply the area and perimeter formulas for rectangles in real-world and mathematical problems. <i>For example, find the width of a rectangular room given the area of the flooring and the length, by viewing the area formula as a multiplication equation with an unknown factor.</i></p> <p><b>Represent and interpret data.</b></p> <p>4. Make a line plot to display a data set of measurements in fractions of a unit (<math>\frac{1}{2}</math>, <math>\frac{1}{4}</math>, <math>\frac{1}{8}</math>). Solve problems involving addition and subtraction of fractions by using information presented in line plots. <i>For example, from a line plot find and interpret the difference in length between the longest and shortest specimens in an insect collection.</i></p>		<p><b>Measure using common tools and appropriate units.</b></p> <p>M.UN.04.01 Measure using common tools and select appropriate units of measure.</p> <p>M.PS.04.02 Give answers to a reasonable degree of precision in the context of a given problem.</p> <p>M.UN.04.03 Measure and compare integer temperatures in degrees.</p> <p>M.TE.04.04 Measure surface area of cubes and rectangular prisms by covering and counting area of the faces.</p> <p><b>Use perimeter and area formulas.</b></p> <p>M.TE.04.06 Know and understand the formulas for perimeter and area of a square and a rectangle; calculate the perimeters and areas of these shapes and combinations of these shapes using the formulas.</p> <p>M.TE.04.07 Find one dimension of a rectangle given the other dimension and its perimeter or area.</p> <p>M.TE.04.08 Find the side of a square given its perimeter or area.</p> <p>M.PS.04.09 Solve contextual problems about perimeter and area of squares and rectangles in compound shapes.</p>

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	<p><b>Geometric measurement: understand concepts of angle and measure angles.</b></p> <p>5. Recognize angles as geometric shapes that are formed wherever two rays share a common endpoint, and understand concepts of angle measurement.</p> <ol style="list-style-type: none"> <li>An angle is measured with reference to a circle with its center at the common endpoint of the rays, by considering the fraction of the circular arc between the points where the two rays intersect the circle. An angle that turns through <math>\frac{1}{360}</math> of a circle is called a "one-degree angle," and can be used to measure angles.</li> <li>An angle that turns through <math>n</math> one-degree angles is said to have an angle measure of <math>n</math> degrees.</li> </ol> <p>6. Measure angles in whole-number degrees using a protractor; sketch angles of specified measure.</p> <p>7. Recognize angle measure as additive; when an angle is decomposed into non-overlapping parts, the angle measure of the whole is the sum of the angle measures of the parts. Solve addition and subtraction problems to find unknown angles on a diagram in real-world and mathematical problems, e.g., by using an equation with a symbol for the unknown angle measure.</p>		<p><b>Understand right angles.</b> M.TE.04.10 Identify right angles and compare angles to right angles.</p> <p><b>[See also 5<sup>th</sup> grade GLCE]</b></p> <p><b>Represent and solve problems for given data.</b> D.RE.04.01 Construct tables and bar graphs from given data. D.RE.04.02 Order a given set of data, find the median, and specify the range of values. D.RE.04.03 Solve problems using data presented in tables and bar graphs, e.g., compare data represented in two bar graphs; read bar graphs showing two data sets.</p>
<p><b>Understanding that geometric figures can be analyzed and classified using properties such as having parallel sides, perpendicular sides, particular angle measures, and symmetry</b></p>	<p><b><u>Geometry 4.G</u></b> <b>Draw and identify lines and angles, and classify shapes by properties of their lines and angles.</b></p> <ol style="list-style-type: none"> <li>Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines; identify these in two-dimensional figures.</li> <li>Classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines, or the presence or absence of angles of specified size. Recognize right triangles as a category, and identify right triangles.</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 matching parts; identify line-symmetric figures and draw lines of symmetry.</li> </ol>		<p><b>Understand perpendicular, parallel, and intersecting lines.</b> G.GS.04.01 Identify and draw perpendicular, parallel, and intersecting lines using a ruler and a tool or object with a square (<math>90^\circ</math>) corner.</p> <p><b>Identify basic geometric shapes and their components, and solve problems.</b> G.GS.04.02 Identify basic geometric shapes, including isosceles, equilateral and right triangles, and use their properties to solve problems.</p> <p><b>Recognize symmetry and transformations.</b> G.TR.04.04 Recognize plane figures that have line symmetry. G.TR.04.05 Recognize rigid motion transformations of a two-dimensional object.</p>

## Fifth Grade

Common Core Critical Areas	Common Core Standards	Michigan Focal Point	Michigan GLCE Topics & Expectations
	<p><b><u>Operations and Algebraic Thinking 5.OA</u></b>  <b>Write and interpret numerical expressions.</b>            1. Use parentheses, brackets, or braces in numerical expressions, and evaluate expressions with these symbols.            2. Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them. <i>For example, express the calculation "add 8 and 7, then multiply by 2" as <math>2 \times (8 + 7)</math>; recognize that <math>3 \times (18932 + 921)</math> is three times as large as <math>18932 + 921</math>, without having to calculate the indicated sum or product.</i>  <b>Analyze patterns and relationships.</b>            3. Generate two numerical patterns using two given rules. Graph pairs of corresponding terms on a coordinate plane, and identify apparent relationships between corresponding terms. <i>For example, given the rule "Add 3" and the starting number 0, and given the rule "Add 6" and the starting number 0, generate terms in the resulting sequences, and observe that the terms in one sequence are twice the corresponding terms in the other sequence. Explain informally why this is so.</i></p>		
	<p><b><u>Number and Operations in Base Ten 5.NBT</u></b>  <b>Understand the place value system.</b>            1. Recognize that in a multi-digit number, a digit in one place represents 10 times as much as it represents in the place to its right and 1/10 of what it represents in the place to its left.            2. Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use positive integer exponents to denote powers of 10.            3. Read, write, and compare decimals to thousandths.                a. Read and write decimals to thousandths using base-ten numerals, number names, and expanded form, e.g., <math>347.392 = 3 \times 100 + 4 \times 10 + 7 \times 1 + 3 \times (1/10) + 9 \times (1/100) + 2 \times (1/1000)</math>.                b. Compare two decimals to thousandths based on meanings of the digits, using <math>&gt;</math>, <math>=</math>, and <math>&lt;</math> symbols to record the results of comparisons.            4. Use place value understanding to round decimals to any place.</p>		<p><b>Understand meaning of decimal fractions and percentages.</b>            N.ME.05.08 Understand the relative magnitude of ones, tenths, and hundredths and the relationship of each place value to the place to its right, e.g., 1 is 10 tenths, one tenth is 10 hundredths.            N.ME.05.09 Understand percentages as parts out of 100, use % notation, and express a part of a whole as a percentage.</p>

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<p><b>Extending division to 2-digit divisors, integrating decimal fractions into the place value system and developing understanding of operations with decimals to hundredths, and developing fluency with whole number and decimal operations</b></p>	<p><b>Perform operations with multi-digit whole numbers and with decimals to hundredths.</b>            5. Fluently add, subtract, and multiply multi-digit whole numbers using the standard algorithm for each operation.            6. Find quotients of whole numbers with up to four-digit dividends and two-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division; express the quotient as a fraction or mixed number. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.            7. Add, subtract, multiply, and divide decimals of one or two digits, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method and explain the reasoning used.</p> <p>[Prime factorization is not explicit in the CCSS]</p> <p>[See 6<sup>th</sup> grade Common Core]</p>	<p><b>Developing an understanding of and fluency with division of whole numbers</b></p>	<p><b>Understand division of whole numbers.</b>            N.MR.05.01 Understand the meaning of division of whole numbers, with and without remainders; relate division to fractions and to repeated subtraction.            N.MR.05.02 Relate division of whole numbers with remainders to the form <math>a = bq + r</math>.            N.MR.05.03 Write mathematical statements involving division for given situations.</p> <p><b>Multiply and divide whole numbers.</b>            N.FL.05.04 Multiply a multi-digit number by a two-digit number; recognize and be able to explain common computational errors.            N.FL.05.05 Solve applied problems involving multiplication and division of whole numbers.            N.FL.05.06 Divide fluently up to a four-digit number by a two-digit number.</p> <p><b>Multiply and divide by powers of ten.</b>            N.MR.05.15 Multiply a whole number by powers of 10: 0.01, 0.1, 1, 10, 100, and 1000; identify patterns.            N.FL.05.16 Divide numbers by 10's, 100's, 1000's, using mental strategies.            N.MR.05.17 Multiply one-digit and two-digit whole numbers by decimals up to two decimal places.</p> <p><b>Find prime factorizations of whole numbers.</b>            N.MR.05.07 Find the prime factorization of numbers between 1 and 50, express in exponential notation, and understand that every whole number can be expressed as a product of primes.</p> <p><b>Express, interpret, and use ratios; find equivalences.</b>            N.MR.05.22 Express fractions and decimals as percentages, and vice versa.            N.ME.05.23 Express ratios in several ways, given applied situations, recognize and find equivalent ratios.</p>
<p><b>Developing fluency with addition and subtraction of fractions, and</b></p>	<p><b><a href="#">Number and Operations—Fractions 5-NF</a></b>  <b>Use equivalent fractions as a strategy to add and subtract fractions.</b>            1. Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators. <i>For example, <math>2/3 + 5/4 = 8/12 + 15/12 = 23/12</math>. (In general, <math>a/b + c/d = (ad + bc)/bd</math>.)</i></p>		<p><b>Add and subtract fractions using common denominators.</b>            N.FL.05.14 Add and subtract fractions with unlike denominators of 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12 and 100, using the common denominator that is the product of the denominators of the 2 fractions.</p>

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<p><b>developing understanding of the multiplication of fractions and of division of fractions in limited cases (unit fractions divided by whole numbers and whole numbers divided by unit fractions)</b></p>	<p>2. Solve word problems involving addition and subtraction of fractions referring to the same whole, including cases of unlike denominators, e.g., by using visual fraction models or equations to represent the problem. Use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers. <i>For example, recognize an incorrect result <math>2/5 + 1/2 = 3/7</math> by observing that <math>3/7 &lt; 1/2</math>.</i></p> <p><b>Apply and extend previous understandings of multiplication and division to multiply and divide fractions.</b></p> <p>3. Interpret a fraction as the result of dividing the numerator by the denominator (<math>a/b = a \div b</math>); solve word problems involving division of whole numbers leading to fractional answers, e.g., by using visual fraction models or equations to represent the problem. <i>For example, interpret <math>3/4</math> as the result of dividing 3 by 4, noting that <math>3/4</math> multiplied by 4 equals 3 and that when 3 wholes are shared equally among 4 people each person has a share of size <math>3/4</math>. If 9 people want to share a 50-pound sack of rice equally by weight, how many pounds of rice should each person get? Between what two whole numbers does your answer lie?</i></p> <p>4. Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction.</p> <p>a. Interpret the product <math>(a/b) \times q</math> as a parts of a partition of <math>q</math> into <math>b</math> equal parts; equivalently, as the result of a sequence of operations <math>a \times q \div b</math>. <i>For example, use a visual fraction model to show <math>(2/3) \times 4 = 8/3</math>, and create a story context for this equation; do the same with <math>(2/3) \times (4/5) = 8/15</math>. (In general, <math>(a/b) \times (c/d) = ac/bd</math>.)</i></p> <p>b. Find the area of a rectangle with fractional side lengths by tiling it, and show that the area is the same as would be found by multiplying the side lengths; multiply fractional side lengths to find areas of rectangles, and represent fraction products as rectangular areas.</p> <p>5. Interpret multiplication as scaling (resizing), including by:</p> <p>a. 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.</p> <p>b. Explaining why multiplying a given number by a fraction greater than 1 results in a product greater than the given number (recognizing multiplication by whole numbers greater than 1 as a familiar case); explaining why multiplying a given number by a fraction less than 1 results in a product smaller than the given number; and relating the principle of fraction equivalence <math>a/b = (n \times a)/(n \times b)</math> to the effect of multiplying <math>a/b</math> by 1.</p>	<p><b>Developing an understanding of and fluency with addition and subtraction of fractions and decimals</b></p>	<p><b>Solve applied problems with fractions.</b></p> <p>N.FL.05.18 Given an applied situation involving addition and subtraction of fractions, write mathematical statements describing the situation.</p> <p>N.MR.05.19 Solve word problems that involve finding sums and differences of fractions with unlike denominators, using knowledge of equivalent fractions.</p> <p>N.FL.05.20 Solve applied problems involving fractions and decimals; include rounding of answers and checking reasonableness; use examples involving money.</p> <p><b>Understand fractions as division statements; find equivalent fractions.</b></p> <p>N.ME.05.10 Understand a fraction as a statement of division, using simple fractions and pictures to represent.</p> <p>N.ME.05.11 Given two fractions, express them as equivalent fractions with a common denominator, but not necessarily a least common denominator, use denominators less than 12, or factors of 100.</p> <p><b>Multiply and divide fractions.</b></p> <p>N.ME.05.12 Find the product of two unit fractions with small denominators using area model.</p> <p>N.MR.05.13 Divide a fraction by a whole number and a whole number by a fraction, using simple unit fractions.</p>

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	<p>6. Solve real-world problems involving multiplication of fractions and mixed numbers, e.g., by using visual fraction models or equations to represent the problem.</p> <p>7. Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions.</p> <p>a. Interpret division of a unit fraction by a non-zero whole number, and compute such quotients. For example, create a story context for <math>(1/3) \div 4</math> and use a visual fraction model to show the quotient; use the relationship between multiplication and division to explain that <math>(1/3) \div 4 = 1/12</math> because <math>(1/12) \times 4 = 1/3</math>.</p> <p>b. Interpret division of a whole number by a unit fraction, and compute such quotients. For example, create a story context for <math>4 \div (1/5)</math> and use a visual fraction model to show the quotient; use the relationship between multiplication and division to explain that <math>4 \div (1/5) = 20</math> because <math>20 \times (1/5) = 4</math>.</p> <p>c. Solve real-world problems involving division of unit fractions by non-zero whole numbers and division of whole numbers by unit fractions, e.g., by using visual fraction models and equations to represent the problem. For example, How much chocolate will each person get if 3 people share <math>1/2</math> lb of chocolate equally? How many <math>1/3</math>-cup servings are in 2 cups of raisins?</p>		
	<p><b><u>Measurement and Data 5.MD</u></b>  <b>Convert like measurement units within a given measurement system.</b></p> <p>1. Convert among different-sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step real-world problems.</p> <p><b>Represent and interpret data.</b></p> <p>2. Make a line plot to display a data set of measurements in fractions of a unit (<math>1/2, 1/4, 1/8</math>). Use operations on fractions for this grade to solve problems involving information presented in line plots. <i>For example, given different measurements of liquid in identical beakers, find the amount of liquid each beaker would contain if the total amount in all</i></p>		<p><b>Know, and convert among, measurement units within a given system.</b></p> <p>M.UN.05.01 Recognize the equivalence of 1 liter, 1000 ml and 1000 cm<sup>3</sup> and include conversions among liters, milliliters, and cubic centimeters.</p> <p>M.UN.05.02 Know the units of measure of volume: and use their abbreviations.</p> <p>M.UN.05.03 Compare the relative sizes of one cubic inch to one cubic foot, and one cubic centimeter to one cubic meter.</p> <p>M.UN.05.04 Convert measurements of length, weight, area, volume, and time within a given system.</p> <p><b>Construct and interpret line graphs.</b></p> <p>D.RE.05.01 Read and interpret line graphs, and solve problems based on line graphs, e.g., <i>distance - time graphs, and problems with two or three line graphs on same axes, comparing different data.</i></p> <p>D.RE.05.02 Construct line graphs from tables of data; include axis labels and scale.</p>

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<p><b>Developing understanding of volume</b></p>	<p><i>the beakers were redistributed equally.</i></p> <p>[See 6<sup>th</sup> grade CCSS]</p> <p><b>Geometric measurement: understand concepts of volume and relate volume to multiplication and to addition.</b></p> <p>3. Recognize volume as an attribute of solid figures and understand concepts of volume measurement.</p> <ol style="list-style-type: none"> <li>A cube with side length 1 unit, called a “unit cube,” is said to have “one cubic unit” of volume, and can be used to measure volume.</li> <li>A solid figure which can be packed without gaps or overlaps using <math>n</math> unit cubes is said to have a volume of <math>n</math> cubic units.</li> </ol> <p>4. Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised units.</p> <p>5. Relate volume to the operations of multiplication and addition and solve real-world and mathematical problems involving volume.</p> <ol style="list-style-type: none"> <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 would be found by multiplying the edge lengths, equivalently by multiplying the height by the area of the base. Represent three-fold whole-number products as volumes, <i>e.g.</i>, to represent the associative property of multiplication.</li> <li>Apply the formulas <math>V = l w h</math> and <math>V = b h</math> for rectangular prisms to find volumes of right rectangular prisms with whole-number edge lengths in the context of solving real-world and mathematical problems.</li> <li>Recognize volume as additive; find volumes of solid figures composed of two non-overlapping right rectangular prisms by adding the volumes of the non-overlapping parts, applying this technique to solve real-world problems.</li> </ol>	<p><b>Developing understanding of volume</b></p>	<p><b>Find and interpret mean and mode for a given set of data.</b></p> <p>D.AN.05.03 Given a set of data, find and interpret the mean (using the concept of fair share) and mode.</p> <p><b>Understand the concept of volume.</b></p> <p>M.TE.05.08 Build solids with unit cubes and state their volumes.</p> <p>M.TE.05.09 Use filling (unit cubes or liquid), and counting or measuring to find the volume of a cube and rectangular prism.</p> <p>M.PS.05.10 Solve applied problems about the volumes of rectangular prisms using multiplication and division and using the appropriate units.</p>
	<p><b><u>Geometry 5.G</u></b></p> <p><b>Graph points on the coordinate plane to solve real-world and mathematical problems.</b></p> <p>1. Use a pair of perpendicular number lines, called axes, to define a coordinate system, with the intersection of the lines (the origin) arranged to coincide with the 0 on each line and a given point in the plane located by using an ordered pair of numbers, called its coordinates. Understand that the first</p>		<p>[See 6<sup>th</sup> grade GLCE]</p>

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	<p>number indicates how far to travel from the origin in the direction of one axis, and the second number indicates how far to travel in the direction of the second axis, with the convention that the names of the two axes and the coordinates correspond (e.g., <i>x</i>-axis and <i>x</i>-coordinate, <i>y</i>-axis and <i>y</i>-coordinate).</p> <p>2. 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.</p> <p><b>Classify two-dimensional figures into categories based on their properties.</b></p> <p>3. Understand that attributes belonging to a category of two-dimensional figures also belong to all subcategories of that category. <i>For example, all rectangles have four right angles and squares are rectangles, so all squares have four right angles.</i></p> <p>4. Classify two-dimensional figures in a hierarchy based on properties.</p>	<p><b>Analyzing properties of two-dimensional shapes, including angles</b></p>	<p><b>Solve problems about geometric shapes.</b>  G.GS.05.07 Find unknown angles using the properties of: triangles, including right, isosceles, and equilateral triangles; parallelograms, including rectangles and rhombuses; and trapezoids.</p> <p><b>Find areas of geometric shapes using formulas.</b>  M.PS.05.05 Represent relationships between areas of rectangles, triangles and parallelograms using models.  M.TE.05.06 Understand and know how to use the area formula of a triangle and represent using models and manipulatives.  M.TE.05.07 Understand and know how to use the area formula for a parallelogram and represent using models and manipulatives.</p> <p><b>Know the meaning of angles, and solve problems.</b>  G.TR.05.01 Associate an angle with a certain amount of turning.  G.GS.05.02 Measure angles with a protractor and classify them as acute, right, obtuse or straight.  G.GS.05.03 Identify and name angles on a straight line and vertical angles.  G.GS.05.04 Find unknown angles in problems involving angles on a straight line, angles surrounding a point and vertical angles.  G.GS.05.05 Know that angles on a straight line add up to 180° and angles surrounding a point add up to 360°; justify informally by “surrounding” a point with angles.  G.GS.05.06 Understand why the sum of the interior angles of a triangle is 180° and the sum of the interior angles of a quadrilateral is 360°, and use these properties to solve problems.</p>

**Sixth Grade**

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<p><b>Connecting ratio and rate to whole number multiplication and division and using concepts of ratio and rate to solve problems</b></p>	<p><b><u>Ratios and Proportional Relationships 6.RP</u></b>  <b>Understand ratio concepts and use ratio reasoning to solve problems.</b>                      1. Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. <i>For example, "The ratio of wings to beaks in the bird house at the zoo was 2:1, because for every 2 wings there was 1 beak."</i> <i>"For every vote candidate A received, candidate C received nearly three votes."</i>                      2. Understand the concept of a unit rate <math>a/b</math> associated with a ratio <math>a:b</math> with <math>b \neq 0</math>, and use rate language in the context of a ratio relationship. <i>For example, "This recipe has a ratio of 3 cups of flour to 4 cups of sugar, so there is <math>3/4</math> cup of flour for each cup of sugar."</i> <i>"We paid \$75 for 15 paperbacks, which is a rate of \$5 per paperback."</i>                      3. Use ratio and rate reasoning to solve real-world and mathematical problems, <i>e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations.</i>                          a. Make tables of equivalent ratios relating quantities with whole-number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane. Use tables to compare ratios.                          b. Solve unit rate problems including unit pricing and constant speed. <i>For example, If it took 7 hours to mow 4 lawns, then at that rate, how many lawns could be mowed in 35 hours? At what rate were lawns being mowed?</i>                          c. Find a percentage of a quantity as a rate per 100 (<i>e.g., 30% of a quantity means <math>30/100</math> times the quantity</i>); solve problems involving finding the whole given a part and the percentage.                          d. Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.</p>	<p><b>Developing an understanding of operations on all rational numbers</b></p>	<p><b>Find equivalent ratios.</b>                      N.ME.06.11 Find equivalent ratios by scaling up or scaling down.  <b>Solve decimal, percentage and rational number problems.</b>                      N.FL.06.12 Calculate part of a number given the percentage and the number.                      N.MR.06.13 Solve word problems involving percentages in such contexts as sales taxes and tips, and involving positive rational numbers.                      N.FL.06.14 For applied situations, estimate the answers to calculations involving operations with rational numbers.                      N.FL.06.15 Solve applied problems that use the four operations with appropriate decimal numbers.  <b>Calculate rates.</b>                      A.PA.06.01 Solve applied problems involving rates, including speed.</p>
<p><b>Completing understanding of division of</b></p>	<p><b><u>The Number System 6.NS</u></b>  <b>Apply and extend previous understandings of multiplication and division to divide fractions by fractions.</b>                      1. Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, <i>e.g., by using visual fraction models and equations to represent the problem. For example, create a story context for <math>(2/3) \div (3/4)</math> and use a visual fraction model to show the</i></p>		

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<p><b>fractions and extending the notion of number to the system of rational numbers, which includes negative numbers</b></p>	<p><i>quotient; use the relationship between multiplication and division to explain that <math>(2/3) \div (3/4) = 8/9</math> because <math>3/4</math> of <math>8/9</math> is <math>2/3</math>. (In general, <math>(a/b) \div (c/d) = ad/bc</math>.) How much chocolate will each person get if 3 people share <math>1/2</math> lb of chocolate equally? How many <math>3/4</math>-cup servings are in <math>2/3</math> of a cup of yogurt? How wide is a rectangular strip of land with length <math>3/4</math> mi and area <math>1/2</math> square mi?</i></p> <p><b>Compute fluently with multi-digit numbers and find common factors and multiples.</b></p> <p>2. Fluently divide multi-digit numbers using the standard algorithm.</p> <p>3. Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.</p> <p>4. Find the greatest common factor of two whole numbers less than or equal to 100 and the least common multiple of two whole numbers less than or equal to 12. Use the distributive property to express a sum of two whole numbers 1–100 with a common factor as a multiple of a sum of two whole numbers with no common factor. <i>For example, express <math>36 + 8</math> as <math>4(9 + 2)</math>.</i></p> <p><b>Apply and extend previous understandings of numbers to the system of rational numbers.</b></p> <p>5. Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, debits/credits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation.</p> <p>6. Understand a rational number as a point on the number line. Extend number line diagrams and coordinate planes familiar from previous grades to represent negative numbers and their distance from 0.</p> <p>a. Recognize opposite signs of numbers as indicating locations on opposite sides of 0 on the number line; recognize that the opposite of the opposite of a number is the number itself, e.g., <math>-(-3) = 3</math>, and that 0 is its own opposite.</p> <p>b. Understand signs of numbers in ordered pairs as indicating locations in quadrants of the coordinate plane; recognize that when two ordered pairs differ only by signs, the locations of the points are related by reflections across one or both axes.</p> <p>c. Find and position integers and other rational numbers on a horizontal or vertical number line diagram; find and position pairs of integers and other rational numbers on a coordinate plane.</p>		<p><b>Add and subtract integers and rational numbers.</b></p> <p>N.MR.06.08 Understand integer subtraction as the inverse of integer addition; add and subtract integers, using integers from 10 to -10.</p> <p>N.FL.06.09 Add, subtract, multiply, and divide integers between -10 and 10; use number line and strip models for addition and subtraction.</p> <p>N.FL.06.10 Add, subtract, multiply and divide positive rational numbers fluently.</p> <p><b>Understand rational numbers and their location on the number line.</b></p> <p>N.ME.06.17 Locate negative rational numbers (including integers) on the number line; know that numbers and their negatives add to 0, and are on opposite sides and at equal distance from 0 on a number line.</p> <p>N.ME.06.18 Understand that rational numbers are quotients of integers (non-zero denominators), e.g., a rational number is either a fraction or a negative fraction.</p> <p>N.ME.06.19 Understand that 0 is an integer that is neither negative nor positive.</p> <p>N.ME.06.20 Know that the absolute value of a number is the value of the number, ignoring the sign; or is the distance of the number from 0.</p> <p><b>Represent rational numbers as fractions or decimals.</b></p> <p>N.ME.06.05 Order rational numbers and place them on the number line.</p> <p>N.ME.06.06 Represent rational numbers as fractions or terminating decimals when possible, and translate between these representations.</p>

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	<p>7. Understand ordering and absolute value of rational numbers.</p> <p>a. Interpret statements of inequality as statements about the relative position of two numbers on a number line diagram. <i>For example, interpret <math>-3 &gt; -7</math> as a statement that <math>-3</math> is located to the right of <math>-7</math> on a number line oriented from left to right.</i></p> <p>b. Write, interpret, and explain statements of order for rational numbers in real-world contexts. <i>For example, write <math>-3^{\circ}\text{C} &gt; -7^{\circ}\text{C}</math> to express the fact that <math>-3^{\circ}\text{C}</math> is warmer than <math>-7^{\circ}\text{C}</math>.</i></p> <p>c. Understand the absolute value of a rational number as its distance from 0 on the number line; interpret absolute value as magnitude for a positive or negative quantity in a real-world situation. <i>For example, for an account balance of <math>-30</math> dollars, write <math> -30  = 30</math> to describe the size of the debt in dollars.</i></p> <p>d. Distinguish comparisons of absolute value from statements of order. <i>For example, recognize that an account balance less than <math>-30</math> dollars represents a debt greater than 30 dollars.</i></p> <p>[Fractions as quotients of integers is in 7<sup>th</sup> grade CCSS]</p> <p>[Scientific notation appears in 8<sup>th</sup> grade CCSS]</p> <p>8. Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane, including using coordinates and absolute value reasoning to find distances between points with the same first coordinate or the same second coordinate.</p>		<p>N.ME.06.07 Understand that a fraction or a negative fraction is a quotient of two integers.</p> <p><b>Use exponents.</b></p> <p>N.ME.06.16 Understand and use integer exponents, excluding powers of negative numbers; express numbers in scientific notation.</p> <p><b>Understand the coordinate plane.</b></p> <p>A.RP.06.02 Plot ordered pairs of integers and use ordered pairs of integers to identify points in all four quadrants of the coordinate plane.</p>
<p><b>Writing, interpreting, and using expressions and equations</b></p>	<p><b><u>Expressions and Equations 6.EE</u></b>  <b>Apply and extend previous understandings of arithmetic to algebraic expressions.</b></p> <p>1. Write and evaluate numerical expressions involving whole-number exponents.</p> <p>2. Write, read, and evaluate expressions in which letters stand for numbers.</p> <p>a. Write expressions that record operations with numbers and with letters standing for numbers. <i>For example, express the calculation "Subtract <math>y</math> from 5" as <math>5 - y</math>.</i></p> <p>b. Identify parts of an expression using mathematical language (<i>sum, term, product, factor, quotient, coefficient</i>); view one or more parts of an expression as a</p>	<p><b>Writing, interpreting, and using mathematical expressions and equations and solving linear equations</b></p>	<p><b>Use variables, write expressions and equations, and combine like terms.</b></p> <p>A.FO.06.03 Use letters, with units, to represent quantities in a variety of contexts.</p> <p>A.FO.06.04 Distinguish between an algebraic expression and an equation.</p> <p>A.FO.06.05 Use standard conventions for writing algebraic expressions.</p> <p>A.FO.06.06 Represent information given in words using algebraic expressions and equations.</p>

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	<p>single entity. <i>For example, describe the expression <math>2(8 + 7)</math> as a product of two factors; view <math>(8 + 7)</math> as both a single entity and a sum of two terms.</i></p> <p>c. Evaluate expressions at specific values of their variables. Include expressions that arise from formulas in real-world problems. Perform arithmetic operations, including those involving whole-number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations). <i>For example, use the formulas <math>V = s^3</math> and <math>A = 6s^2</math> to find the volume and surface area of a cube with sides of length <math>s = 1/2</math>.</i></p> <p>3. Apply the properties of operations as strategies to generate equivalent expressions. <i>For example, apply the distributive property to the expression <math>3(2 + x)</math> to produce the equivalent expression <math>6 + 3x</math>; apply properties of operations to <math>y + y + y</math> to produce the equivalent expression <math>3y</math>.</i></p> <p>4. Identify when two expressions are equivalent (i.e., when the two expressions name the same number regardless of which value is substituted into them). <i>For example, the expressions <math>y + y + y</math> and <math>3y</math> are equivalent because they name the same number regardless of which number <math>y</math> stands for.</i></p> <p><b>Reason about and solve one-variable equations and inequalities.</b></p> <p>5. Understand solving an equation or inequality as a process of answering a question: "Which values from a specified set, if any, make the equation or inequality true?" Use substitution to determine whether a given number in a specified set makes an equation or inequality true.</p> <p>6. Use variables to stand for numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can be used in cases where a number is unknown, or where, for the purpose at hand, it can be any number in a specified set.</p> <p>7. Solve real-world and mathematical problems by writing and solving equations of the form <math>x + p = q</math> and <math>px = q</math> for cases in which <math>p</math>, <math>q</math> and <math>x</math> are all nonnegative rational numbers.</p> <p>8. Write a statement of inequality of the form <math>x &gt; c</math> or <math>x &lt; c</math> to represent a constraint or condition in a real-world or mathematical problem. Recognize that inequalities of the form <math>x &gt; c</math> or <math>x &lt; c</math> have infinitely many solutions; represent solutions of such inequalities graphically on a number line diagram.</p> <p><b>Represent and analyze quantitative relationships between dependent and independent variables.</b></p> <p>9. Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an</p>		<p>A.FO.06.07 Simplify expressions of the first degree by combining like terms, and evaluate using specific values.</p> <p>[Inequalities appear in 8<sup>th</sup> grade GLCE]</p> <p><b>Solve equations.</b></p> <p>A.FO.06.11 Relate simple linear equations with integer coefficients to particular contexts.</p> <p>A.FO.06.12 Understand that adding or subtracting the same number to both sides of an equation creates a new equation that has the same solution.</p> <p>A.FO.06.13 Understand that multiplying or dividing both sides of an equation by the same non-zero number creates a new equation that has the same solution.</p> <p>A.FO.06.14 Solve equations of the form <math>ax + b = c</math>, e.g., <math>3x + 8 = 15</math>, by hand for positive integer coefficients less than 20, using calculators otherwise, and interpret the results.</p> <p><b>Represent linear functions using tables, equations, and graphs.</b></p> <p>A.RP.06.08 Understand that graphs and tables can suggest relationships between quantities.</p>

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	<p>equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. <i>For example, in a problem involving motion at constant speed, list and graph ordered pairs of distances and times, and write the equation <math>d = 65t</math> to represent the relationship between distance and time.</i></p>		<p>A.PA.06.09 Graph and write equations for linear functions of the form <math>y = mx</math> and solve related problems.  A.RP.06.10 Represent simple relationships between quantities, use verbal descriptions, formulas or equations, tables, and graphs.</p>
	<p><b><u>Geometry 6.G</u></b>  <b>Solve real-world and mathematical problems involving area, surface area, and volume.</b>  1. Find area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems.  2. Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths, and show that the volume is the same as would be found by multiplying the edge lengths of the prism. Apply the formulas <math>V = lwh</math> and <math>V = bh</math> to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems.  3. Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate. Apply these techniques in the context of solving real-world and mathematical problems.  4. Represent three-dimensional figures using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures. Apply these techniques in the context of solving real-world and mathematical problems.</p> <p>[See 5<sup>th</sup> grade CCSS]</p> <p>[See 8<sup>th</sup> grade CCSS]</p>	<p><b>Describing three-dimensional shapes and analyzing their properties, including volume and surface area</b></p>	<p><b>Find volume and surface area.</b>  M.TE.06.03 Compute the volume and surface area of cubes and rectangular prisms given the lengths of their sides, using formulas.</p> <p>M.PS.06.02 Draw patterns (of faces) for a cube and rectangular prism that, when cut, will cover the solid exactly (nets).</p> <p><b>Convert within measurement systems.</b>  M.UN.06.01 Convert between basic units of measurement within a single measurement system, e.g., square inches to square feet.</p> <p><b>Understand and apply basic properties.</b>  G.GS.06.01 Understand and apply basic properties of lines, angles, and triangles, including:</p> <ul style="list-style-type: none"> <li>• triangle inequality</li> <li>• relationships of vertical angles, complementary angles, supplementary angles</li> <li>• congruence of corresponding and alternate interior angles</li> </ul>

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			<p>when parallel lines are cut by a transversal, and that such congruencies imply parallel lines</p> <ul style="list-style-type: none"> <li>• locate interior and exterior angles of any triangle, and use the property that an exterior angle of a triangle is equal to the sum of the remote (opposite) interior angles</li> <li>• know that the sum of the exterior angles of a convex polygon is <math>360^\circ</math></li> </ul> <p><b>Understand the concept of congruence and basic transformations.</b></p> <p>G.GS.06.02 Understand that for polygons, congruence means corresponding sides and angles have equal measures.</p> <p>G.TR.06.03 Understand the basic rigid motions in the plane (reflections, rotations, translations), relate these to congruence, and apply them to solve problems.</p> <p>G.TR.06.04 Understand and use simple compositions of basic rigid transformations, e.g., a translation followed by a reflection.</p> <p><b>Construct geometric shapes.</b></p> <p>G.SR.06.05 Use paper folding to perform basic geometric constructions of perpendicular lines, midpoints of line segments and angle bisectors; justify informally.</p>
<p><b>Developing understanding of statistical thinking</b></p>	<p><b><u>Statistics and Probability 6.SP</u></b>  <b>Develop understanding of statistical variability.</b>  1. Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers. <i>For example, "How old am I?" is not a statistical question, but "How old are the students in my school?" is a statistical question because one anticipates variability in students' ages.</i>  2. Understand that a set of data collected to answer a statistical question has a distribution which can be described by its overall shape, center and spread.  3. Recognize that a measure of center for a numerical data set summarizes all of its values using a single number, while a measure of variation describes how its values vary using a single number.  <b>Summarize and describe distributions.</b>  4. Display numerical data in plots on a number line, including dot plots, histograms, and box plots.  5. Summarize numerical data sets in relation to their context, such as by:  a. Reporting the number of observations.  b. Describing the nature of the attribute under investigation, including how it was measured and its units of measurement.</p>		<p><b>(These are all addressed in various grades in the GLCE.)</b></p>

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	<p>c. Giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data was gathered.</p> <p>d. Relating the choice of measures of center and variability to the shape of the data distribution and the context in which the data was gathered.</p>		

**Seventh Grade**

Common Core Critical Areas	Common Core Standards	Michigan Focal Point	Michigan GLCE Topics & Expectations
<p><b>Developing understanding of and applying proportional relationships</b></p>	<p><b><u>Ratios and Proportional Relationships 7-RP</u></b>  <b>Analyze proportional relationships and use them to solve real-world and mathematical problems.</b>            1. Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. <i>For example, if a person walks 1/2 mile in each 1/4 hour, compute the unit rate as the complex fraction 1/2/1/4 miles per hour, equivalently 2 miles per hour.</i>            2. Recognize and represent proportional relationships between quantities.                a. Decide whether two quantities are in a proportional relationship, e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin.                b. Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.                c. Represent proportional relationships by equations. <i>For example, if total cost <math>t</math> is proportional to the number <math>n</math> of items purchased at a constant price <math>p</math>, the relationship between the total cost and the number of items can be expressed as <math>t = pn</math>.</i>                d. Explain what a point <math>(x, y)</math> on the graph of a proportional relationship means in terms of the situation, with special attention to the points <math>(0, 0)</math> and <math>(1, r)</math> where <math>r</math> is the unit rate.            3. Use proportional relationships to solve multistep ratio and percent problems. <i>Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error.</i></p>	<p><b>Developing an understanding of and applying proportionality, including similarity</b></p>	<p><b>Understand and solve problems involving rates, ratios, and proportions.</b>            N.FL.07.03 Calculate rates of change, including speed.            N.MR.07.04 Convert ratio quantities between different systems of units, such as feet per second to miles per hour.            N.FL.07.05 Solve simple proportion problems using such methods as unit rate, scaling, finding equivalent fractions, and solving the proportion equation <math>a/b = c/d</math>; know how to see patterns about proportional situations in tables.  <b>Understand and apply directly proportional relationships and relate to linear relationships.</b>            A.PA.07.01 Recognize when information given in a table, graph or formula suggests a proportional or linear relationship.            A.RP.07.02 Represent directly proportional and linear relationships using verbal descriptions, tables, graphs and formulas, and translate among these representations.            A.PA.07.03 Given a directly proportional or linear situation, graph and interpret the slope and intercept(s) in terms of the original situation; evaluate <math>y = kx</math> for specific <math>x</math> values, given <math>k</math>.            A.PA.07.04 For directly proportional or linear situations, solve applied problems using graphs and equations.            A.PA.07.05 Understand and use directly proportional relationships of the form <math>y = mx</math>, and distinguish from linear relationships of the form <math>y = mx + b</math>, <math>b</math> non-zero; understand that in a directly proportional relationship between two quantities one quantity is a constant multiple of the other quantity.</p>
<p><b>Developing understanding of operations with rational numbers and solving linear equations</b></p>	<p><b><u>The Number System 7.NS</u></b>  <b>Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.</b>            1. Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram.                a. Describe situations in which opposite quantities combine to make 0. <i>For example, a hydrogen atom has 0 charge because its two constituents are oppositely charged.</i>                b. Understand <math>p + q</math> as the number located a distance <math> q </math></p>		

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	<p>from <math>p</math>, in the positive or negative direction depending on whether <math>q</math> is positive or negative. Show that a number and its opposite have a sum of 0 (are additive inverses). Interpret sums of rational numbers by describing real-world contexts.</p> <p>c. Understand subtraction of rational numbers as adding the additive inverse, <math>p - q = p + (-q)</math>. Show that the distance between two rational numbers on the number line is the absolute value of their difference, and apply this principle in real-world contexts.</p> <p>d. Apply properties of operations as strategies to add and subtract rational numbers.</p> <p>2. Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers.</p> <p>a. Understand that multiplication is extended from fractions to rational numbers by requiring that operations continue to satisfy the properties of operations, particularly the distributive property, leading to products such as <math>(-1)(-1) = 1</math> and the rules for multiplying signed numbers. Interpret products of rational numbers by describing real-world contexts.</p> <p>b. Understand that integers can be divided, provided that the divisor is not zero, and every quotient of integers (with non-zero divisor) is a rational number. If <math>p</math> and <math>q</math> are integers, then <math>-(p/q) = (-p)/q = p/(-q)</math>. Interpret quotients of rational numbers by describing real world contexts.</p> <p>c. Apply properties of operations as strategies to multiply and divide rational numbers.</p> <p>d. Convert a rational number to a decimal using long division; know that the decimal form of a rational number terminates in 0s or eventually repeats.</p> <p>3. Solve real-world and mathematical problems involving the four operations with rational numbers.</p>		<p><b>Apply basic properties of real numbers in algebraic contexts.</b></p> <p>A.PA.07.11 Understand and use basic properties of real numbers: additive and multiplicative identities, additive and multiplicative inverses, commutativity, associativity, and the distributive property of multiplication over addition.</p> <p><b>Compute with rational numbers.</b></p> <p>N.FL.07.07 Solve problems involving operations with integers.</p> <p>N.FL.07.08 Add, subtract, multiply and divide negative rational numbers.</p> <p>N.FL.07.09 Estimate results of computations with rational numbers.</p>
	<p><b><u>Expressions and Equations 7.EE</u></b></p> <p><b>Use properties of operations to generate equivalent expressions.</b></p> <p>1. Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.</p> <p>2. Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how</p>	<p><b>Analyzing and representing linear functions and solving linear equations and systems of linear equations</b></p>	<p><b>Combine algebraic expressions and solve equations.</b></p> <p>A.FO.07.12 Add, subtract and multiply simple algebraic expressions of the first degree, e.g., <math>(92x + 8y) - 5x + y</math>, or <math>-2x(5x - 4)</math>, and justify using properties of real numbers.</p>

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	<p>the quantities in it are related. <i>For example, <math>a + 0.05a = 1.05a</math> means that "increase by 5%" is the same as "multiply by 1.05."</i></p> <p><b>Solve real-life and mathematical problems using numerical and algebraic expressions and equations.</b></p> <p>3. Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. <i>For example: If a woman making \$25 an hour gets a 10% raise, she will make an additional <math>\frac{1}{10}</math> of her salary an hour, or \$2.50, for a new salary of \$27.50. If you want to place a towel bar <math>9\frac{3}{4}</math> inches long in the center of a door that is <math>27\frac{1}{2}</math> inches wide, you will need to place the bar about 9 inches from each edge; this estimate can be used as a check on the exact computation.</i></p> <p>4. Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.</p> <p>a. Solve word problems leading to equations of the form <math>px + q = r</math> and <math>p(x + q) = r</math>, where <math>p</math>, <math>q</math>, and <math>r</math> are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach. <i>For example, the perimeter of a rectangle is 54 cm. Its length is 6 cm. What is its width?</i></p> <p>b. Solve word problems leading to inequalities of the form <math>px + q &gt; r</math> or <math>px + q &lt; r</math>, where <math>p</math>, <math>q</math>, and <math>r</math> are specific rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem. <i>For example: As a salesperson, you are paid \$50 per week plus \$3 per sale. This week you want your pay to be at least \$100. Write an inequality for the number of sales you need to make, and describe the solutions.</i></p> <p>[Functions appear in 8<sup>th</sup> grade CCSS]</p>		<p>A.FO.07.13 From applied situations, generate and solve linear equations of the form <math>ax + b = c</math> and <math>ax + b = cx + d</math>, and interpret solutions.</p> <p>[Inequalities are in the 8<sup>th</sup> grade GLCE]</p> <p><b>Understand and represent linear functions.</b></p> <p>A.PA.07.06 Calculate the slope from the graph of a linear function as the ratio of "rise/run" for a pair of points on the graph, and express the answer as a fraction and a decimal; understand that linear functions have slope that is a constant rate of change.</p> <p>A.PA.07.07 Represent linear functions in the form <math>y = x + b</math>, <math>y = mx</math>, and <math>y = mx + b</math>, and graph, interpreting slope and y-intercept.</p> <p>A.FO.07.08 Find and interpret the x and/or y intercepts of a</p>

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			linear equation or function. Know that the solution to a linear equation of the form $ax+b=0$ corresponds to the point at which the graph of $y=ax+b$ crosses the x axis.
<p><b>Solving problems involving scale drawings and informal geometric constructions and working with two- and three-dimensional shape to solve problems involving area, surface area, and volume</b></p>	<p><a href="#">Geometry 7.G</a>  <b>Draw, construct, and describe geometrical figures and describe the relationships between them.</b>  1. Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale  2. Draw (freehand, with ruler and protractor, and with technology) geometric shapes with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle.  3. 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>Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.</b>  4. Know the formulas for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle.  5. Use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure.  6. Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.</p> <p>[See 8<sup>th</sup> grade CCSS]</p>	<p><b>Connections</b></p>	<p><b>Understand the concept of similar polygons, and solve related problems.</b>  G.TR.07.06 Understand and use the fact that when two triangles are similar with scale factor of <math>r</math>, their areas are related by a factor of <math>r^2</math>.</p> <p><b>Draw and construct geometric objects.</b>  G.SR.07.01 Use a ruler and other tools to draw squares, rectangles, triangles, and parallelograms with specified dimensions.  G.SR.07.02 Use compass and straightedge to perform basic geometric constructions: the perpendicular bisector of a segment, an equilateral triangle, and the bisector of an angle; understand informal justifications.</p> <p>[Area of circle addressed in 8<sup>th</sup> grade GLCE]</p> <p>[See 6<sup>th</sup> grade GLCE]</p> <p><b>Understand the concept of similar polygons, and solve related problems.</b>  G.TR.07.03 Understand that in similar polygons, corresponding angles are congruent and the ratios of corresponding sides are equal; understand the concepts of similar figures and scale factor.  G.TR.07.04 Solve problems about similar figures and scale drawings.  G.TR.07.05 Show that two triangles are similar using the criteria: corresponding angles are congruent (AAA similarity); the ratios of two pairs of corresponding sides are equal and the included angles are congruent (SAS similarity); ratios of all pairs of corresponding sides are equal (SSS similarity); use these criteria to solve problems and to justify arguments.</p>

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<p><b>Drawing inferences about populations based on samples</b></p>	<p><a href="#">Statistics and Probability 7.SP</a>  <b>Use random sampling to draw inferences about a population.</b>            1. Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences.            2. Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions. <i>For example, estimate the mean word length in a book by randomly sampling words from the book; predict the winner of a school election based on randomly sampled survey data. Gauge how far off the estimate or prediction might be.</i>  <b>Draw informal comparative inferences about two populations.</b>            3. Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities, measuring the difference between the centers by expressing it as a multiple of a measure of variability. <i>For example, the mean height of players on the basketball team is 10 cm greater than the mean height of players on the soccer team, about twice the variability (mean absolute deviation) on either team; on a dot plot, the separation between the two distributions of heights is noticeable.</i>            4. Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations. <i>For example, decide whether the words in a chapter of a seventh-grade science book are generally longer than the words in a chapter of a fourth-grade science book.</i>  <b>Investigate chance processes and develop, use, and evaluate probability models.</b>            5. Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around 1/2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.            6. Approximate the probability of a chance event by collecting data on the chance process that produces it and observing its long-run relative frequency, and predict the approximate relative frequency given the probability. <i>For example, when rolling a number cube 600 times, predict that a 3 or 6 would</i></p>		<p>[See 8<sup>th</sup> grade and High School Common Core]</p> <p><b>Compute statistics about datasets.</b>            D.AN.07.04 Find and interpret the median, quartiles, and interquartile range of a given set of data.</p>

Common Core Critical Areas	Common Core Standards	Michigan Focal Point	Michigan GLCE Topics & Expectations
	<p><i>be rolled roughly 200 times, but probably not exactly 200 times.</i></p> <p>7. Develop a probability model and use it to find probabilities of events. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy.</p> <p>a. Develop a uniform probability model by assigning equal probability to all outcomes, and use the model to determine probabilities of events. <i>For example, if a student is selected at random from a class, find the probability that Jane will be selected and the probability that a girl will be selected.</i></p> <p>b. Develop a probability model (which may not be uniform) by observing frequencies in data generated from a chance process. <i>For example, find the approximate probability that a spinning penny will land heads up or that a tossed paper cup will land open-end down. Do the outcomes for the spinning penny appear to be equally likely based on the observed frequencies?</i></p> <p>8. Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation.</p> <p>a. Understand that, just as with simple events, the probability of a compound event is the fraction of outcomes in the sample space for which the compound event occurs.</p> <p>b. Represent sample spaces for compound events using methods such as organized lists, tables and tree diagrams. For an event described in everyday language (e.g., “rolling double sixes”), identify the outcomes in the sample space which compose the event.</p> <p>c. Design and use a simulation to generate frequencies for compound events. <i>For example, use random digits as a simulation tool to approximate the answer to the question: If 40% of donors have type A blood, what is the probability that it will take at least 4 donors to find one with type A blood?</i></p> <p>[See 8<sup>th</sup> grade CCSS]</p>		<p><b>Represent data and interpret.</b></p> <p>D.RE.07.01 Represent and interpret data using circle graphs, stem and leaf plots, histograms, and box-and-whisker plots, and select appropriate representation to address specific questions.</p> <p>D.AN.07.02 Create and interpret scatter plots and use an estimated line of best fit to answer questions about the data.</p> <p><b>Compute statistics about datasets.</b></p> <p>D.AN.07.03 Calculate and interpret relative frequencies and cumulative frequencies for given data sets.</p>

## Eighth Grade

Common Core Critical Areas	Common Core Standards	Michigan Focal Point	Michigan GLCE Topics & Expectations
	<p><b>The Number System 8.NS</b>  <b>Know that there are numbers that are not rational, and approximate them by rational numbers.</b>            1. Understand informally that every number has a decimal expansion; the rational numbers are those with decimal expansions that terminate in 0s or eventually repeat. Know that other numbers are called irrational.            2. Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g., <math>\pi^2</math>). <i>For example, by truncating the decimal expansion of <math>\sqrt{2}</math>, show that <math>\sqrt{2}</math> is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations.</i></p>	<p><b>Connections</b></p>	<p><b>Understand real number concepts.</b>            N.ME.08.04 Understand that irrational numbers are those that cannot be expressed as the quotient of two integers, and cannot be represented by terminating or repeating decimals; approximate the position of familiar irrational numbers on the number line.            N.FL.08.05 Estimate and solve problems with square roots and cube roots using calculators.            N.FL.08.06 Find square roots of perfect squares and approximate the square roots of non-perfect squares by locating between consecutive integers...</p>
<p><b>Formulating and reasoning about expressions and equations, including modeling an association in bivariate data with a linear equation, and solving linear equations and systems of linear equations</b></p>	<p><b>Expressions and Equations 8.EE</b>  <b>Work with radicals and integer exponents.</b>            1. Know and apply the properties of integer exponents to generate equivalent numerical expressions. <i>For example, <math>3^2 \times 3^{-5} = 3^{-3} = 1/3^3 = 1/27</math>.</i>            2. Use square root and cube root symbols to represent solutions to equations of the form <math>x^2 = p</math> and <math>x^3 = p</math>, where <math>p</math> is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that <math>\sqrt{2}</math> is irrational.            3. Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other. <i>For example, estimate the population of the United States as <math>3 \times 10^8</math> and the population of the world as <math>7 \times 10^9</math>, and determine that the world population is more than 20 times larger.</i>            4. Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology.  <b>Understand the connections between proportional relationships, lines, and linear equations.</b>            5. Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. <i>For example,</i></p>	<p><b>Connections</b></p>	

Common Core Critical Areas	Common Core Standards	Michigan Focal Point	Michigan GLCE Topics & Expectations
	<p><i>compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.</i></p> <p>6. Use similar triangles to explain why the slope <math>m</math> is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation <math>y = mx</math> for a line through the origin and the equation <math>y = mx + b</math> for a line intercepting the vertical axis at <math>b</math>.</p> <p><b>Analyze and solve linear equations and pairs of simultaneous linear equations.</b></p> <p>7. Solve linear equations in one variable.</p> <p>a. Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form <math>x = a</math>, <math>a = a</math>, or <math>a = b</math> results (where <math>a</math> and <math>b</math> are different numbers).</p> <p>b. Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.</p> <p>8. Analyze and solve pairs of simultaneous linear equations.</p> <p>a. 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.</p> <p>b. Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection. <i>For example, <math>3x + 2y = 5</math> and <math>3x + 2y = 6</math> have no solution because <math>3x + 2y</math> cannot simultaneously be 5 and 6.</i></p> <p>c. Solve real-world and mathematical problems leading to two linear equations in two variables. <i>For example, given coordinates for two pairs of points, determine whether the line through the first pair of points intersects the line through the second pair.</i></p> <p>[inequalities appear in 6<sup>th</sup> grade CCSS]</p>		<p>A.FO.08.11 Solve simultaneous linear equations in two variables by graphing, by substitution, and by linear combination; estimate solutions using graphs; include examples with no solutions and infinitely many solutions.</p> <p>A.FO.08.13 Set up and solve applied problems involving simultaneous linear equations and linear inequalities.</p> <p>A.FO.08.12 Solve linear inequalities in one and two variables, and graph the solution sets.</p>
<p><b>Grasping the concept of a function and using functions to describe quantitative relationships</b></p>	<p><b>Functions 8.F</b></p> <p><b>Define, evaluate, and compare functions.</b></p> <p>1. Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output.</p> <p>2. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). <i>For example, given a linear</i></p>		<p>[see 7<sup>th</sup> Grade GLCE]</p>

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	<p><i>function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change.</i></p> <p>3. Interpret the equation <math>y = mx + b</math> as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. <i>For example, the function <math>A = s^2</math> giving the area of a square as a function of its side length is not linear because its graph contains the points (1,1), (2,4) and (3,9), which are not on a straight line.</i></p> <p><b>Use functions to model relationships between quantities.</b></p> <p>4. Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two <math>(x, y)</math> values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.</p> <p>5. Describe qualitatively the functional relationship between two quantities by analyzing a graph (<i>e.g., where the function is increasing or decreasing, linear or nonlinear</i>). Sketch a graph that exhibits the qualitative features of a function that has been described verbally.</p>	<p><b>Analyzing and representing non-linear functions</b></p>	<p><b>Understand solutions and solve equations, simultaneous equations, and linear inequalities.</b></p> <p>A.FO.08.10 Understand that to solve the equation <math>f(x) = g(x)</math> means to find all values of <math>x</math> for which the equation is true, e.g., determine whether a given value, or values from a given set, is a solution of an equation (0 is a solution of <math>3x^2 + 2 = 4x + 2</math>, but 1 is not a solution).</p> <p><b>Understand the concept of non-linear functions using basic examples.</b></p> <p>A.RP.08.01 Identify and represent linear functions, quadratic functions, and other simple functions including inversely proportional relationships (<math>y = k/x</math>); cubics (<math>y = ax^3</math>); roots (<math>y = \sqrt{x}</math>); and exponentials (<math>y = a^x, a &gt; 0</math>); using tables, graphs, and equations.</p> <p>A.PA.08.02 For basic functions, e.g., simple quadratics, direct and indirect variation, and population growth, describe how changes in one variable affect the others.</p> <p>A.PA.08.03 Recognize basic functions in problem context, e.g., area of a circle, volume of a sphere, and represent them using tables, graphs, and formulas.</p> <p>A.RP.08.04 Use the vertical line test to determine if a graph represents a function in one variable.</p> <p><b>Understand and represent quadratic functions.</b></p> <p>A.RP.08.05 Relate quadratic functions in factored form and vertex form to their graphs, and vice versa; in particular, note that solutions of a quadratic equation are the <math>x</math>-intercepts of the corresponding quadratic function.</p> <p>A.RP.08.06 Graph factorable quadratic functions, finding where the graph intersects the <math>x</math>-axis and the coordinates of the vertex; use words "parabola" and "roots"; include functions in vertex form and those with leading coefficient -1</p>

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<p><b>Analyzing two- and three-dimensional space and figures using distance, angle, similarity, and congruence, and understanding and applying the Pythagorean Theorem.</b></p>	<p><b><u>Geometry 8.G</u></b>  <b>Understand congruence and similarity using physical models, transparencies, or geometry software.</b>            1. Verify experimentally the properties of rotations, reflections, and translations:                a. Lines are taken to lines, and line segments to line segments of the same length.                b. Angles are taken to angles of the same measure.                c. Parallel lines are taken to parallel lines.            2. Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them.            3. Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.            4. Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them.            5. Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. <i>For example, arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so.</i>  <b>Understand and apply the Pythagorean Theorem.</b>            6. Explain a proof of the Pythagorean Theorem and its converse.            7. Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.            8. Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.  <b>Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres.</b>            9. Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.</p> <p>[See 6<sup>th</sup> grade Common Core]</p>	<p><b>Analyzing two- and three-dimensional space and figures by using distance and angle</b></p>	<p>[See 6<sup>th</sup> grade GLCE]</p> <p><b>Understand and use the Pythagorean Theorem.</b>            G.GS.08.01 Understand at least one proof of the Pythagorean Theorem; use the Pythagorean Theorem and its converse to solve applied problems including perimeter, area, and volume problems.            G.LO.08.02 Find the distance between two points on the coordinate plane using the distance formula; recognize that the distance formula is an application of the Pythagorean Theorem.</p> <p><b>Understand concepts of volume and surface area, and apply formulas.</b>            G.SR.08.06 Know the volume formulas for generalized cylinders ((area of base) x height), generalized cones and pyramids (<math>\frac{1}{3}</math> (area of base) x height), and spheres (<math>\frac{4}{3} \pi</math> (radius)<sup>3</sup>) and apply them to solve problems.            G.SR.08.07 Understand the concept of surface area, and find the surface area of prisms, cones, spheres, pyramids, and cylinders.</p>

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	<p>[See High School Common Core]</p> <p>[See 7<sup>th</sup> grade Common Core]</p>	<p><b>Developing an understanding of and using formulas to determine surface areas and volumes of three-dimensional shapes</b></p>	<p><b>Solve problems about geometric figures.</b>  G.SR.08.03 Understand the definition of a circle; know and use the formulas for circumference and area of a circle to solve problems.  G.SR.08.04 Find area and perimeter of complex figures by sub-dividing them into basic shapes (quadrilaterals, triangles, circles).  G.SR.08.05 Solve applied problems involving areas of triangles, quadrilaterals, and circles.</p> <p><b>Visualize solids.</b>  G.SR.08.08 Sketch a variety of two-dimensional representations of three-dimensional solids including orthogonal views (top, front, and side), picture views (projective or isometric), and nets; use such two-dimensional representations to help solve problems.</p>
	<p><b><u><a href="#">Statistics and Probability 8.SP</a></u></b>  <b>Investigate patterns of association in bivariate data.</b>  1. Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.  2. Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line.  3. Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. <i>For example, in a linear model for a biology experiment, interpret a slope of 1.5 cm/hr as meaning that an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height.</i>  4. Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables. <i>For example, collect data from students in your class on whether or not they have a curfew on school nights and whether or not they have assigned chores at home. Is there evidence that those who have a curfew also tend to have chores?</i></p>	<p><b>Analyzing and summarizing data sets</b></p>	<p><b>Draw, explain, and justify conclusions based on data.</b>  D.AN.08.01 Determine which measure of central tendency (mean, median, mode) best represents a data set, for answering certain questions; justify the choice made.  D.AN.08.02 Recognize practices of collecting and displaying data that may bias the presentation or analysis.</p> <p>[See 7<sup>th</sup> grade GLCE]</p>

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	[Probability is addressed in HS CCSS]	Connections	<p><b>Understand probability concepts for simple and compound events.</b></p> <p>D.PR.08.03 Compute relative frequencies from a table of experimental results for a repeated event. Interpret the results using relationship of probability to relative frequency.</p> <p>D.PR.08.04 Apply the Basic Counting Principle to find total number of outcomes possible for independent and dependent events, and calculate the probabilities using organized lists or tree diagrams.</p> <p>D.PR.08.05 Find and/or compare the theoretical probability, the experimental probability, and/or the relative frequency of a given event.</p> <p>D.PR.08.06 Understand the difference between independent and dependent events, and recognize common misconceptions involving probability,</p>